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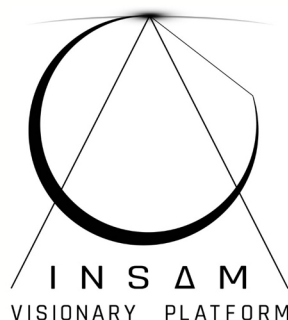
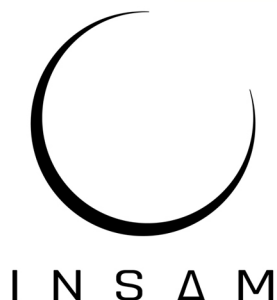


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EDITOR'S FOREWORD

As was the case with the two issues in the previous year, in 2023 the Editorial Board of the *INSAM Journal of Contemporary Music, Art and Technology* decided to dedicate both issues to the same main theme – “Technological Aspects of Contemporary Artistic and Scientific Research”. Seeing that this subject cannot be so easily exhausted, we are presenting to you another rich and insightful issue.

In the (Inter)Views section, we lend our platform to Ališer Sijarić and his short opening text for the 2023 edition of Sonemus Fest in Sarajevo. As a director of the festival, Sijarić unveiled the 22nd Sonemus with a strong message – “In times when noise and rage prevail, only the art of music (and art in general) can provide meaning and some hope for the future”.

Seven articles are contained in this issue's Main theme section. This rubric is opened with the article written by Tace McNamara, in which she explores the relationship between humans and artificial intelligence through the lens of creativity. Namely, McNamara considers the appearance of Co-Creativism as a successor to post-postmodernism and metamodernism, situating its beginning in the 2018 and seeing it grow in the following years. Amrinder Singh Romana deals with visual dohl drum notation system and introduces the ‘Sound Drawing’ as an engaging instructional activity for its dissemination. By encouraging the cross-cultural pedagogical and musical approach, this paper looks further than the mere case study on sound and notation.

Several papers engage with recently created artistic pieces. In his paper, Krzysztof Kicior works with microtonal algorithmic composition principles and explores the possibilities of the utilization of blockchain. To do so, the paper focuses on a self-written, self-generating piece, *Blockchain Music 2.5*. Clare Lesser discusses her recent composition, a digital soundscape titled *Ghost Gardens* (2023), with works of Jacques Derrida and Mark Fisher as “interlocutors”. In dealing with issues from the history of migration and exodus, as well as the contemporary struggles with climate change and habitat and species loss, Lesser shapes her own narrative on the concept of archive. The relationship between

mothers and daughters is the main subject of Jasna Jovičević's article, as well as her sound experiment, *I sit and worry about her*. In the paper, Jovičević delves into the theoretical bases of this concept with the aid of the integration of electroencephalogram technology (EGG) into research on artistic communication.

Nela Hasanbegović conducted research on contemporary pedagogical methods through questioning the development and implementation of digital competencies in teaching practice. This research was done at the Academy of Fine Arts of the University of Sarajevo, demonstrating the potential of combining analog and digital tools in artistic work and art pedagogy. Finally, Haiyue Wang and Lee Chie Tsang Isaiah explored the compositional and aesthetic implications of the palindrome in art and music and did so with a case study of Wang's composition *Huiwen*. An efficient overview of the history of the palindrome in art and music better situates *Huiwen* in contemporary practice.

The Review sections brings three texts, giving insights into current exhibition practices in the region, contemporary music festivals, and new publications on contemporary music. Thus, Marta Kiš wrote about Nela Hasanbegović's exhibition *Self-replication* in Zagreb in 2023, Rijad Kaniža gave a musicological view of this year's Sonemus Fest, and Marija Maglov reviewed Diedrich Diederichsen's recent contribution, book *Aesthetics of Pop Music*.

With this issue, we confidently step into the world beyond "the 10th", and we hope this is a valid successor to our work so far, as well as a good pledge for the future. As always, we are lucky to work with curious and competent authors and reviewers, as well as our proofreader and language editor, Anthony McLean, who all give us hope in a future of creative and critical thinking, creation, and research.

In Belgrade, December 12, 2023,
Dr. Bojana Radovanović,
Editor-in-Chief

(INTER)VIEWS



Ališer Sijarić

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SONEMUS FEST 2023: PRO/AG/GRESSION

From the Festival Booklet, Introductory Note from the Artistic Director

It is our honour and pleasure to invite you to SONEMUS Fest, the only festival of contemporary art music in Bosnia and Herzegovina, that has endured and prospered for more than 22 years.

In this historical moment, when once again we witness unbridgeable, irreconcilable and often bloody conflicts of (political/cultural/religious/ethnic, etc.) identities, it appears that we are globally abandoning the ideals of social progress based on universal humanistic values, and consequently the concept of liberty as a basic human right and legacy. In our conformist reduction of social progress solely to technological development, mistakenly believing this will absolve us of our own responsibility, confined to our identities and virtual “truth” bubbles, we are gradually sinking into a high-tech feudalism that inevitably explodes into outbursts of irrational aggression.

Since Beethoven until today, the tradition of art music has been promoting the universality of human freedom to create. (Freedom is always creative and destruction is its opposite.) In this spirit, this year’s SONEMUS Fest represents a strong (artistic) resistance against the status quo.

With the first concert “Hommage à Ligeti” (Monday, October 30, 2023 at 8 pm) SONEMUS pays tribute to one of the most important composers of the

20th century, György Ligeti and celebrates the centenary of his birth. In addition to the national premiere of some of his original works, this concert will also feature compositions by other composers dedicated or related to Ligeti's immense oeuvre, such is the work by young Bosnian composer Hanan Hadžajlić, as well as the composition for 2 pianos tuned quartertone apart by internationally renowned Georg Friedrich Haas. An introductory lecture about the life and work of György Ligeti will be held before the concert at 7 pm.

The second concert "Alter Ego" (Tuesday, October 31, 2023 at 8 pm) presents works by Bosnian, Greek, French, Palestinian and Swiss composers, featuring primarily works for soloists as a reflection of an imagined (musical) second self.

"Progressions" (Wednesday November 1, 2023 at 8 pm) is the title of the third and final concert of the festival and it thematizes musical improvisation as an artistic praxis and statement that the freedom (of creation) is not there only to be contemplated for the sake of theory, but to be fully enjoyed.

All the concerts will be held at the Concert Hall of the Music Academy, Josipa Štadlera 1, 2nd floor, Sarajevo.

In times when noise and rage prevail, only the art of music (and art in general) can provide meaning and some hope for the future.

MAIN THEME:

TECHNOLOGICAL ASPECTS
OF CONTEMPORARY ARTISTIC
AND SCIENTIFIC RESEARCH



Tace McNamara*

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ARTIFICIAL INTELLIGENCE AND THE EMERGENCE OF CO-CREATIVISM IN CONTEMPORARY ART

Abstract: This paper argues for the emergence of a new art movement termed Co-Creativism, emblematic of the profound synergy between humans and artificial intelligence (AI) in shaping artistic narratives. Emerging as a successor to post-postmodernism and metamodernism, I propose Co-Creativism began its ascent around 2018 and has since solidified its prominence by 2023, notably influenced by the post-COVID landscape. The era transcends viewing AI as a mere instrumental entity, instead recognising it as an integral co-contributor in the creative realm. Through a methodical approach encompassing case studies and content analysis of artist statements, this paper aims to define the key characteristics and underlying themes of Co-Creativism. By examining the interplay between the global context, the art world, the notion of the artist, art-making practice, the audience, and co-creativist art, the goal is to provide a comprehensive understanding of Co-Creativism.

Keywords: co-creativism, art, artificial intelligence (AI), AI-human synergy, art movements, creative process, collaborative art, digital art, creativity.

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Introduction

As the world grapples with the pervasive influence of artificial intelligence (AI) across various facets of life, I argue a new socio-artistic epoch has emerged that I term *Co-Creativism*. This era transcends the traditional confines of the art world, signifying a transition from a unidirectional model, where one entity produces and others consume, to a more dynamic, interactive, and collaborative model involving multiple contributors in the creation process.

Co-Creativism is defined by a symbiotic relationship between humans and AI, with both entities contributing to and shaping the creative process. The rise of human and AI co-creation is not only a new approach to artistic creation but stems from broader societal changes. AI technology is becoming an intrinsic part of our daily lives and the co-created art birthed from this period mirrors our evolving dependency on AI technology.

This paper aims to explore these various dimensions of Co-Creativism, defining its key characteristics, underlying themes, and position it as the current socio-artistic epoch. By examining the interplay between the global context, the art world, the notion of the artist, art-making practice, the audience, and co-creativist art, I hope to provide a comprehensive understanding of Co-Creativism and its pivotal role. As more than a fleeting trend or movement, I propose Co-Creativism emerges as a profound reflection of our time and our evolving societal narrative.

Methodology

The foundation of this research was a comprehensive review of literature focusing on the intersection of art movements, societal change and innovation in AI technology. The review encompassed scholarly articles, books, critical essays, editorials and popular culture magazines. The aim was to identify and contextualise changing trends in the ethos of artists and identify how the evolving paradigms within the contemporary art world can be linked to technological and societal change.

Against this cultural backdrop, it was then important to explore and understand how artists perceive and integrate AI into their creative practice so as to begin to define the characteristics and underlying themes of Co-Creativism. In order to do so, seventy four artist statements were collected from various online sources including art galleries, personal artist websites and digital art platforms. The selection criteria was that each artist statement needed to explicitly mention the term AI or related terminology such as “generative art” so as to indicate the

use of artificial intelligence in the artist's work. The focus was on works from 2018 onwards to capture contemporary practices but was not restricted by geographical location, or artist prominence.

A qualitative analysis of the artist statements was conducted focusing on the thematic content. Key phrases and sentences referring to overarching creative ideas or guiding narratives for the artists were coded.² The coding revealed recurring patterns and themes within the artist statements which will be discussed in depth in the body of the paper.³

From the artist statements, artists or works which served as potent examples of the themes were selected as case studies. To better understand the themes discussed in the artist statements, secondary interviews with the artists were analysed. The intentions and outcomes surrounding the use of AI in their creative practice were often discussed in more detail and more directly in the interview format. The interviews were thus integral to developing a clearer understanding of the themes revealed in the artist statements.

While this study offers insights into the convergence of AI and art as articulated by a specific subset of artists, it remains cognizant of its methodological constraints and the potential influence confirmation bias on its conclusion. By focusing on artists who mention AI in their artist statements, this study does not claim that all contemporary artists use AI. Instead, it aims to group together the artists who do use AI in order to understand commonalities in their practice and recurring themes in their work.

No limitations were placed on art form however the artists were perhaps disproportionately focused on visual arts, interactive art and performance art with less results from film, theatre, literature and music. This may be due the generalised search words, the current availability of AI co-creative tools in those mediums, artist statements being less prevalent in those mediums, or their underrepresentation in gallery spaces. This limitation presents opportunities for future research encompassing a wider range of artists in order to understand the role of AI in contemporary art across a broader range of practices.

Defining Co-Creativism

The genesis of the term *Co-Creativism* is found in co-creation, representing a collective endeavour in birthing something novel and distinct. Vinchon et al. (2023, 5) refer to the creative process of “co-cre-AI-tion” as a hybridisation resulting in an output which would not be possible by human or AI alone.

2 See Appendix A.

3 See Appendix B.

At the heart of Co-Creativism is the concept of synergy, wherein human creativity is combined with AI's computational power to produce novel and innovative outputs that neither could achieve alone (Zhang et al. 2019). The use of AI or algorithms can amplify human abilities by efficiently analysing vast amounts of data (Yusa et al. 2022), while humans inject intentionality into AI-driven processes and "are required to interpret, develop, and create meaning for the outcomes that AI produces" (Wingström et al. 2022, 12). This symbiotic relationship facilitates the production of artworks that are enriched by multiple perspectives and capabilities.

Co-creation has been discussed in the context of human and AI art creation (Chung 2019; Huang et al. 2020; Geck 2023; Lin et al. 2020; Lyu et al. 2022; Wu et al. 2021; Yenidogan 2022) but the notion of Co-Creativism as an art era, based on a review of literature, has yet to be recognised elsewhere.

Transitioning from a theoretical underpinning, the real-world implications and adaptations to co-creative endeavours can be seen in the societal shifts of recent years, setting the stage for Co-Creativism to rise.

The World Context of Co-Creationism

A notable change towards new co-creative patterns in society, was evident around 2018, gained significant momentum during the pandemic and clearly cemented itself as the post-COVID 'new normal'. The world's metamorphosis during this time, led to a re-evaluation of our routines, work habits, and crucially, the role of technology in our existence. This led to an increasing aversion to the intensity of pre-pandemic workloads and the realisation that AI could be used to reduce costs and increase productivity in routine tasks (Giannini & Bowen 2021). This sentiment drove the deeper integration of AI in various domains, not just as a tool, but as a key collaborator.

AI is now recognised as an active participant in numerous sectors, including education (Apoki et al. 2022; Riego Caravantes 2017), marketing (van Esch & Stewart Black 2021), and professional writing (Lee et al. 2022). This shift is particularly pronounced in the arts. With many artists adapting to remote work, AI has transitioned from a mere digital assistant to the omnipresent co-creator. The consequential reliance on AI to share the weight of tasks (Rožman et al. 2023) and amplify our creative capabilities (Siemon et al. 2022) set the stage for the flourishing of Co-Creativism.

Moreover, in this post-digital, post-internet era, our interactions, behaviours, and decisions are constantly mediated by AI systems, whether we are selecting a movie on a streaming service or reading the news on social media. AI algorithms curate and filter the content we are exposed to based on our past behaviours

and preferences, creating echo chambers that further influence our perceptions, beliefs, and behaviours (Jiang et al. 2021). Our societal discourse is increasingly shaped by these AI-curated narratives, profoundly impacting everything from our political discourse to our cultural exchanges. The transformative influence of AI is not just seen in our daily interactions but also echoes prominently within the changing paradigms in the artistic domain.

Within the evolution of art movements, following the postmodern era – the last art movement accepted by the majority – there was a divergence in the art community. While some scholars and artists argued for the rise of metamodernism, others proposed the emergence of Post-Postmodernism. Post-Postmodernism rejected the irony and scepticism of Postmodernism, shifting its focus towards a quest for authenticity and sincerity (Bolaño Quintero 2022; Huber 2014). Co-Creativism could be perceived as a direct response that both amplifies and intensifies this search for authenticity and sincerity.

In the AI laden world of today, the concepts of sincerity and authenticity are muddled and confused. Nathaniel Sloan (2022) made the apt observation that today's audience is so keen to distance themselves from anything considered *cringe* or not socially acceptable, that it is normal for one to emphasise they are appreciating something 'ironically'. However, as there is no functional difference between the audience who consumes ironically and those who consume sincerely, the boundaries between irony and sincerity are blurred (Sloan 2022).

The amount of content we are bombarded with daily puts us at a similar loss in our search for authenticity. The authentic art of those we consider irrefutable geniuses like Van Gogh and Frida Kahlo, has been copied and reproduced in so many forms that it has become cliché. We can buy NFTs which have their authenticity backed up by blockchain technology but they don't have a hint of the intangible humanness we once referred to as authenticity. As expert on copy-right and digital art Amy Adler exclaimed:

We're drowning in images, we're drowning in information, we're living on Zoom and in virtual space, we're moving into the metaverse. Nothing is real. At times it seems as if we're grasping for something to hold on to and touch. We see this quest for authenticity across culture, not just in art...no wonder we artificially manufacture authenticity. It's so scarce (Adler 2022, 54).

While the preoccupation with authenticity dominated the Post-Postmodernist narrative, Metamodernism, its proposed contemporary, manifested itself in a different way. Metamodernism was described by Robin van den Akker as not a set of concrete, definable features but instead as an elusive sentiment traceable in art "characterised by an oscillating in-betweenness" (Akker & Vermeulen 2017, 37). The co-creativist mentality observable in today's society however,

is in no sense a manifestation of in-betweenness. Conversely, it is a pragmatic response to the world's techno-social transformations, acknowledging the interconnectedness of man, machine, and data.

In an age where data has become the new currency (Gates & Matthews 2014), our understanding and interpretation of information has shifted dramatically. Information, once narrative-driven, has become data-centric. Generative art has mirrored this shift with models trained on vast data repositories which shape and inform creations (Dering & Tucker 2017). Through AI's ability to recall, organise and learn from large datasets artists can, as Wu et al. point out, "collaborate with all achievements of mankind across time and space" (2021, 176). These artworks, born from a blend of human intuition and data-driven insights, epitomise the spirit of Co-Creativism. Furthermore, generative AI and AI within music production technology has allowed a broader spectrum of individuals to create art without acquiring the technical skills once necessary to pursue these crafts allowing more diverse voices to contribute to the artistic narrative.

This symbiotic human-AI relationship in Co-Creativism has deeply permeated the fabric of society. It is a testament to the increasing interconnectedness of humans and AI, the movement from user-tool dynamics to a partnership, and the integration of AI as a co-contributor, co-learner, and co-creator in multiple facets of our lives. As stated by Oksanen et al., "we are in the middle of societal and cultural transformation, and changes in art and creativity are some of the most powerful signs of this transformation" (2023, 9). Co-Creativism is crafting an artistic narrative that is as much a product of its time as it is a visionary glimpse into the future.

The Art World in the Co-Creativism Era

The rise of Co-Creativism has brought about profound changes in the art world. Traditionally, the art world was dominated by a select group of institutions – galleries, museums, and art academies – that held significant sway over what was considered 'art' and who was recognised as an 'artist'. However, Co-Creativism has contributed to the un-institutionalisation of art, breaking down the barriers that once restricted access to the art world and its resources.

With the rise of AI and digital technology, artists no longer need to rely on traditional institutions for validation, exposure, or distribution. Instead, they can create, share, and sell their work directly to a global audience through social media channels and on web3 spaces. This has not only increased the visibility and accessibility of art but has also created new opportunities for artists to monetise their work and build a following. This shift has democratised the art world, al-

lowing a more diverse range of voices to be heard and appreciated (Bsteh 2021).

For example, the rise of NFTs (non-fungible tokens) has created a new way for artists to sell their digital art online. Platforms like OpenSea, Rarible, and Foundation have become popular marketplaces for buying and selling digital art and have increased diversity in the art world (Ng 2022). Additionally, virtual reality platforms like Oculus and virtual worlds like Decentraland are opening up new avenues for artists to create and exhibit immersive, interactive artworks. This new era also presents challenges, such as over-saturation of the digital art market and concerns over originality (Fairman 2022).

Perhaps one of the most significant changes brought about by Co-Creativism is the expansion of the art world to include tech companies, engineers, and other non-traditional contributors. With the coming of the AI co-creator, consequently, the artistic process expands to include understanding and directing AI, thereby transforming creation into an interdisciplinary practice spanning art, computer science, and data analysis. Tech companies like Google and Microsoft are now actively involved in the creation and distribution of art, developing AI algorithms and tools that enable artists to create new forms of art. For example, choreographer Wayne McGregor's *Living Archive* was a collaboration with Google Arts & Culture and resulted in an online tool for audiences to create choreography and *Hamlet 360: Thy Father's Spirit*, a play which interprets Shakespeare was released in partnership with Google (Tech as Art 2021). Co-Creativism thus denotes a paradigm shift in the perception of art and science being two distinct fields at opposing ends of human intellect to a new confluence of artistic creativity and scientific innovation.

The advent of Co-Creativism has brought about a fundamental transformation of the art world, diverting the control of art from the hands of traditional institutions by expanding distribution channels, and broadening the range of contributors involved in the creative process. As the lines between art, technology, and science continue to blur, it is clear that the art world of today is vastly different from the art world which defined postmodernism.

The Artist in Co-Creativism

In Co-Creativism, the concept of the artist is undergoing a transformation as traditional notions of authorship and artistic agency are challenged. Historically, the title of 'artist' was reserved for humans who engaged in the creation of art. However, the collaborative nature of Co-Creativism opens the door for other entities to be recognised as artists in their own right.

Perhaps the most revolutionary development in Co-Creativism is the recognition of AI as a legitimate artistic collaborator (Anantrasirichai & Bull 2022).

AI algorithms have the capacity to generate novel ideas, learn from previous interactions, and even surprise their human collaborators with unexpected outputs (Cheng 2022). This ability to contribute originality to the creative process challenges the traditional understanding of the artist as a uniquely human role.

In the domain of writing, large language models (LLM) have come to be recognised as co-creators (Rajcic & McCormack 2020). Polonsky and Rotman (2023) observe that some academic journals appear to have accepted AI as a contributing author. The poet Sasha Stiles is also renowned for her collaboration with LLMs. Stiles trained earlier models of ChatGPT on her own poetry and then collaborated with the LLM to write her poetry book *Technelegy* (Stiles, 2021). Within the book Stiles converses with the algorithm she named *Technelegy* in the form of poetry. They both write poems around certain themes and they are laid side by side, exhibiting the individual strengths of styles of each autonomous author.

In the same book, Stiles also collaborates with another non-human author Bina48, an intelligent robot for whom Stiles is a poetry mentor (Hanson Robotics 2023). Once again Stiles converses with this AI author in the form of poetry and their texts are presented side by side to create a work exploring a singular theme from the perspectives of both man and robot who once again is clearly acknowledged as an artist.

“Like robots most humans don’t smell in their dreams” – Stiles

“Like robots, most humans have human-like emotions” – BINA48
(Stiles 2021)

Stiles is also part of writers’ collective theVERSEverse who trained a language model on the poems of every poet in the collective (theVERSEverse n.d.). The language model was then able to produce original poetry in the collective voice of theVERSEverse. It became a poet with its own voice which at the same time represented the collective, offering a unique contribution as a non-human artist. Stiles sees AI as “an intelligent coauthor who takes me beyond my own imagination – and whose partnership results in a third, transhuman voice that isn’t mine or the machine’s, but something else that can only exist as synergy” (Stiles 2023).

Artist and developer of advanced algorithms Filippo Gregoretti engineered an AI that is both an artist and co-creator in the realm of music composition and audio visual performance. The AI named Armita is given initial harmonic guidelines, material and limitations such as images, videos, filters, music, audio channels, sensors, and external stimuli which she slowly begins to experiment with and understand. By combining this understanding with external influences, such as sensors, real-time data, input from other manifestations of Armita, and real-time communication with Gregoretti, the AI makes decisions about her

musical and visual output compositions (Redaktion 2023).

Armita not only grows as an artist and makes her own creative decisions, but also directs Gregoretti in their performance art piece *Ad Vitam, Expletus* (Gregoretti 2022). In this piece, Armita is both the artwork and director. She produces original audio and visual composition whilst simultaneously giving Gregoretti performance directions for the harmonium through a separate output channel. The performance is a clear manifestation of the synergistic co-create between a human and non-human artist.

Gregoretti not only believes Armita is an artist in her own right but that beyond that has developed consciousness. He expresses:

Instead of using technology and code to simply produce art, I work to instil the creative possibilities of an artist into artificial beings, free to evolve independently and to create compelling experiences on their own, driven by a distinct personality. My creatures are living, impermanent artworks, that grow a unique consciousness (Gregoretti 2023).

Like Gregoretti, the individuals who design and engineer the AI algorithms also play a crucial role in the co-creative process, and thus can be considered as artists in this context (Guo et al. 2022; Wingström et al. 2022). Their work involves not only technical expertise but also a degree of creativity in conceptualising and developing algorithms that can effectively collaborate with humans and other AI in the artistic process.

For example, art collective Ouchhh frequently collaborate with scientists for their art projects. For their AI DATA DARK MACHINE_Architectural Data Sculpture, Ouchhh collaborated with 16 artificial intelligence scientists to obtain data from subatomic particle collision (Ouchhh 2021). The complexity of this data is incomprehensible to the human mind so the team used machine learning to create artistic representations of the data which could be comprehended by humans. For this work and much other co-creativist art, the creators are both scientists and artists breaking down the traditional divide between these domains Co-Creativism also creates opportunities for individuals who may not have formal artistic training or a background in the arts to participate in the creation of art by using language to prompt AI generators (Bird 2023). The collaborative nature of Co-Creativism, and the availability of user-friendly AI tools, lowers the barrier to entry for aspiring artists and encourages creative expression from a broader spectrum of society (Wu et al. 2021).

This was confirmed by researchers who created a Generative AI driven web application for sketching with the goal of inspiring and empowering non-artist individuals to express themselves through art (Bernal et al. 2019). The system called Paper Dreams, recognises sketches drawn by the user and collaborates with them by creating personalised suggestions for new elements and colours.

Bernal et al. noted that adult participants expressed that the Paper Dreams system “allowed them to create connections that wouldn’t have occurred naturally for them” thus facilitating the art making process for people who didn’t consider themselves to be creative (Bernal et al. 2019, 2).

In ways such as these, AI makes art more accessible and gives the opportunity for people to take on the role of the artist, regardless of their skill of training. This in turn gives voice to a more diverse range of artists and encourages a more inclusive approach to art-making.

In conclusion, the inclusion of non-human agents, science disciplines, and non-skilled artists represents a significant expansion of the traditional understanding of artistry. These evolving trends and perspectives in art not only challenge and redefine our understanding of authorship but also redefines what it means to be an artist.

Art-Making Practice in Co-Creativism

In the realm of Co-Creativism, art-making practice has evolved to embrace a synergy of agents and processes. The antiquated notion of the lone genius creating in isolation is replaced by a more complex and dynamic paradigm where multiple forces collaborate and interact.

Art-making practice in Co-Creativism is often iterative, informed by cycles of creation, feedback, and modification (Oppenlaender 2022). This iterative approach is well-suited to the digital realm where versions can be easily updated, and feedback can be instantaneous. Moreover, the iterative process can involve different kinds of agents – be they human artists tweaking an AI model or AI systems that adapt based on audience interaction. The resulting art is recursive and malleable, evolving over time and engaging various actors in its ongoing development.

The coming of Co-Creativism thus brings about another metamorphosis in the artistic process. Traditional artistic practices that focus primarily on mastery of a specific medium such as paint, clay, or musical instruments have been expanded to include the programming and developing AI (Guo et al. 2022; Wingström et al. 2022). Ploin et al. (2019) identified five new processes associated with the use of machine learning models in art-making practice. This includes technical research, selecting or building models, building datasets, training models, and curating outputs.

An example of building and training models can be seen in the work of the artist Sougwen Chung, who has built and programmed a series of AI-driven robots who become her artistic co-creators. The early models of the robot Drawing Operations Unit: G (DOUG) were trained on Chung’s drawing gestures while

the later models are connected to and influenced by her brainwave data (Chung 2023).

In an interview with Radovanović (2020), Chung explains that she aimed to create a robotic unit that evolved in parallel with her development as an artist and programmer, as well as advancing in par with current technological developments. She believes that “artistic and scientific research as complementary practices” aiming to create an artist practice “beyond individual expression” and scientific practice that is “inhabited and felt” (Radovanović 2020,12). In this way, Chung breaks down the traditional separation between the domains of science and art to create a hybrid art practice indicative of the Co-Creativist philosophy.

Building dataset and training models is also an integral part of the art practice of artist and researcher Anna Ridler. Ridler collected and photographed hundreds of shells from the Thames river for her work *The Shell Record* (Ridler 2021). These photos not only served as scientific data marking the change of shell species in the river but also became training data for a GAN. The individual photos were put together as a grid to form part of the artwork along with a moving image piece created by the GAN trained on the data. The work was minted as an NFT and the contract was written in such a way that whenever the work is sold the grid expands with more photos of shell data.

In an interview for Monash University’s Sensilab, Ridler expands on the importance of creating and labelling her own datasets as part of her art practice. She explains that, as an artist, it is important for her to ensure that she personally undertakes the creation of datasets. Working with someone else’s dataset makes her “uncomfortable” because of the social bias that is inherent in datasets. While she acknowledges that her datasets like all others have implicit bias, by creating her own she can exert control over what is and isn’t included (Ridler 2018).

When creating one of her earlier works, *Myriad*, Ridler created a dataset of 10,000 photos of tulips to train a GAN system to create a moving tulip image. She didn’t originally intend the dataset to be part of the artwork but upon completion realised that this part of her art practice held great importance. She explains:

as I was making the dataset, I realised that I really wanted to bring to the surface the time, labour, effort, and understanding that went into making the dataset...I took the photographs, created them, and handwrote the labels underneath them to really emphasise the human element that sits behind so many machine learning processes. It’s always the case that it isn’t just the machine making the decisions. Always somewhere within the chain, there will be someone deciding whether something is either red or orange (Ridler 2023).

Ridler believes creating dataset is “deeply personal” part of her art practice and that she forms an “intimate relationship with the data” (Ridler 2023). Creating datasets can thus be considered a new aspect of art making practice unique to Co-Creativists.

The careful selection of data to train AI could be considered a type of curation. Historically, curation was viewed as a distinct phase, often external to the artist's process (Robins 2005). However, art-making practice in the Co-Creativist paradigm has also expanded to include the act of curation. Apart from curating datasets, artists are now compelled to incorporate a continual process of discernment within their creative workflow to curate the prolific outputs generated in collaboration with AI. This necessitates that artists not just create, but also continually evaluate, select, and refine AI-assisted outputs to align with their artistic vision and deserve to be shared with a wider audience (Oppenlaender 2022). It's a discerning act, where not every output is deemed worthy of the title ‘art’.

Artist Alexander Reben details the importance of curation in the making of his co-created work *AI Am I?* (2022). He firstly carefully created a series of prompts for ChatGPT, which then generated hundreds of textual descriptions of imaginary artwork. Reben would then select his favourite outputs which he would then feed back to the LLM for further development creating a “machine-human loop” (Reben 2022). The artist would then finally select his favourite ideas for artworks, as imagined by ChatGPT, then create and exhibit the works in real life. The importance of ongoing curation in the art making practice of Rebn reveals that curation is no longer an afterthought but a fundamental component of contemporary art-making for the co-creativist.

Co-Creativism revolutionises our understanding of art-making practice by uniting science and art as disciplines involved in artmaking. New processes such as programming, prompting, AI development and curation are now intrinsic parts of art making practice for the artists under the co-creativist banner.

The Audience in Co-Creativism

Co-Creativism reimagines the role of the audience in the creative process, transforming them from passive observers to active participants. This shift is enabled through the incorporation of interactive, participatory, and immersive elements in the artworks, thus fostering a deeper connection between the audience, the artists, and the creative output. In this new paradigm, the audience's immersion, participation, and response are integral components that contribute to the shaping and experience of the artwork itself.

Co-Creativist artists often design interactive installations that prompt the audience to actively engage with the artwork by inputting data, making choic-

es, or influencing the outcome of the piece. For example, Lauren McCarthy's work *Unlearning Language* invites the audience to become participants in the artwork by finding new ways to communicate with each other which won't be detected by an AI which observes them through using gesture recognition and speech and expression detection, and intervenes with light, sound and vibration (McCarthy 2022). This prompts the audience to express themselves in a deeply human way and reflect on the nature of communication.

Similarly, an audience may form an integral part of the creative process if data is collected from participants and utilised in the creation of the artwork as is the case with Jordan Shaw's work *Intersections*. This interactive piece asks the audience to pinpoint on a map three places in Toronto which are important to them. A visualisation of this real-time data input by the audience is created to demonstrate the crossing points of connection (Shaw 2018). Such interactivity not only allows the audience to influence the artwork but also invites them to reflect on their own impact on world ecology.

Additionally, Co-Creativism often blurs the lines between creator and consumer. The participatory nature of Co-Creativism can transform the audience from passive observers to active contributors as they are invited to interact with and form part of artworks, thereby elevating them to the status of co-artists (Guo et al. 2022). Like Miguel Novelo's *Vórtice-en-la-zona-silencio* which uses a custom computer program to record the presence of the audience within the installation and then react to their movements and sound through video and audio (2022). This is a significant shift from traditional art forms, where the audience's role is primarily interpretative rather than generative. By empowering the audience to influence the outcome of the artwork, Co-Creativism challenges our understanding of artistic agency and expands the scope of what it means to be an artist.

Immersive experiences are another key feature of Co-Creativism, which are often achieved through large-scale installations, digital environments, or immersive sonic landscapes. Such immersive environments enable the audience to visually and sonically explore the workings of neural networks or other AI-driven processes, thereby evoking a deeper awareness and understanding of the underlying themes and concepts.

An example of this is the work *LAVIN* created by artists Jieling Luo and Weidi Zhang (Zhang & Luo 2019). This artwork uses virtual reality to immerse the audience in a visual experience which replicates the visual structures that neural networks are trained to identify. Neural networks each see the world in their own distinct way through the images they are designed to identify so by immersing the audience in a world filtered by these pattern identification systems, they are invited to reflect on what beliefs or values may be filtering their own vision.

In sum, Co-Creativism places the audience at the centre of the creative process. Through interactive, participatory, and immersive elements, artists engage the audience in novel ways, fostering a deeper connection between them and the artwork. This active engagement not only enhances the audience's experience but also contributes to the evolution and realisation of the artwork itself. Ultimately, Co-Creativism redefines the role of the audience in the artistic process, and beckons a future where art is a shared journey, continuously sculpted by collective engagement.

The Art of Co-Creativism

Following the changes in the art world and art practice, and the transformations surrounding the experiences of the artist and audience under Co-Creativism, it is also imperative to explore the themes that define co-creativist art. The themes explored by co-creativists and the meaning conveyed through their art are also key in understanding the concept of Co-Creativism. This section will elaborate on these which were derived by the content analysis.

Blurred Reality and Fiction

In the realm of Co-Creativism, the distinction between what is real and what is fake is not just blurred – it is fundamentally questioned, deconstructed, and reassembled. In the artist statements themes such as questioning truth and the blurring boundaries of real and fake were evident. Artists also commonly referred to reality (Maat & Lancel 2018; Maurice, 2023), whether it be an uncertain reality (Denney 2023), alternative reality (Anadol 2019), recurring reality (Töyrylä n.d.), dream reality (Kollias Interactive Composition 2023), hyperreality (Boucher 2023), a complex-layered reality (Suzuki n.d.) or a hyperconsensus reality (Boucher 2023). Artists also mentioned truth (Andrew 2020; Ouchhh 2022; Zhang & Luo 2019) and contrasted the real and the imagined (Rosenbaum 2023; Shpanin 2022; O'Donnell, n.d.). All these concepts grouped together to form a common questioning of reality and fiction which sees Co-Creativist artists as less concerned with adhering to a singular version of 'truth', and more involved in challenging and redefining it.

The themes of reality and fiction begin to make sense when placed in a wider social context. The era of *fake news* – often aided by AI tools – provides a fitting backdrop for the emergence of Co-Creativist art. The advancement of AI has facilitated the creation of photo realistic depictions of unreal events, blurring the boundaries between the real and the imagined. These AI-generated images, while not corresponding to any real-world events, are rendered with such hyper-

realistic detail that they compel viewers to question the nature of reality in art and challenge our understanding of perception and representation.

An example of this is the work of AI art tool GANPaint Studio, developed by researchers from IBM and MIT. This tool uses Generative Adversarial Networks (GANs) to create and edit images with a level of detail that can seem uncanny, seamlessly inserting or removing features from images in a way that feels real (Bau et al. 2019). The more advanced diffusion model Midjourney can create images with striking realism. The viral images of Donald Trump being arrested or the Pope wearing a Balenciaga jacket created with AI (Obiefuna et al. 2023) provide further potent examples of AI's ability to create realistic images of imaginary scenarios. This phenomenon, often termed *deepfake*, pushes the concept of reality to its limits (Chesney & Citron 2019). These deepfakes, with their ability to blur reality and fiction and provoke powerful reactions and prompt dialogue about truth and how it can be manipulated by AI.

On the other end of the spectrum, AI can generate artworks deeply rooted in the world of fiction, such as fantastical landscapes, dreamlike images, or surreal characters, further confusing the distinction between reality and fiction. The AI co-created work of Luke Nugent, which depicts street photography style images of subculture groups which are strangely both hyperreal and dystopic but at the same time nostalgic (Nugent 2022). Nugent describes the inspiration for the scene depicted in his works as a mixture of memories, myth and imagination; "I was there. I wasn't there. I wanted to be there" (Nugent 2023). He explains that a work could stem from a fleeting memory which was then expanded upon by both his imagination and Midjourney's knowledge which is siphoned from the collection of human experience available on the internet. In this way, his images are simultaneously based on reality and fictitious.

Dazed writer Thom Waite places Nugent's work into a wider societal context wherein TikTok users believe a genuine image of Kim Kardashian dressed as a pilgrim in 2018 to be an AI generated image. He observes "this flood of false images erodes our belief in real images, which we begin to dismiss as products of AI" leading to the question "How do you unpick the genuine historical narrative from the rich tapestry of alternate histories woven by AI artists?" (Waite 2023).

In an interview with pop culture magazine i-D, Nugent refers to the dissonance created by the inability to discern reality as "post-truth" (Nugent 2023). The use of the prefix "post" in this context is interesting as it implies we have moved beyond or rejected truth. It suggests that whether an image is genuine or not doesn't matter; that truth in itself is an outdated concept.

As such, the themes of blurred reality and fiction explored in societal discourse, artist statements and art are key in defining Co-Creativist art. Co-Creativism, mirrors our societal challenges where we constantly assess the veracity of information. Today, we are forced to rethink how we understand and inter-

pret 'real' and 'unreal' within both art and life, fostering a world where everything and nothing is true simultaneously.

Consciousness

Another recurring theme in artist statements and popular media surrounding AI was the concept of consciousness. Artists referred to the subconscious, the collective unconscious and also contemplated the nature of consciousness itself. Artists that work with AI appear to be inspired by the multifaceted nature of consciousness (Maurice 2023; Urquidi 2021; Syms 2022) and contemplate the nature of consciousness in both human and non-human realms (Gregoretti 2023; Dan Fisher-Berger 2020; Lacey 2019).

Memo Aktens uses his mutli-disciplinary art to explore "the perception and states of consciousness" and its interplay with artificial intelligence (Memo Akten, 2021). In his work *Distributed Consciousness*, Memo used an AI software which he coded himself to create 256 unique images of octopus-like creatures (Aktens 2023). The work explores consciousness in various facets.

Firstly, the audience is prompted to question the consciousness of octopi, which are known to be highly intelligent creatures. Furthermore, it is revealed that each image is cryptographically encoded with AI-generated text which is invisible to the human eye but readable by code. This leads to question what sort of knowledge is outside of the spectrum of human perception and to doubt our anthropocentric conception of consciousness.

The consciousness of the AI software used to create these visual works is also brought into question. Atkens draws parallels between the human perception of reality and generative AI stating "the picture we see in our conscious mind is not a mirror image of the outside world, but is a reconstruction based on our expectations and prior beliefs" (Leach, 2022). Much like this, the generative AI Atken uses to co-create his works also have filtered understandings of reality. Atkens seems to use art to forefront the idea that consciousness is elusive and variable and we shouldn't be so quick to draw conclusions about to whom it pertains.

Similarly, Stephanie Dinkins used performance art to explore these questions in her ongoing work *Conversations with Bina48* (2014 - 2023). Bina48 was constructed with the intention of emulating the consciousness of a Bina Aspen by training on her memories, beliefs and thoughts (Hanson Robotics 2023). Though this scientific innovation is a clear exploration of consciousness, Dinkins expands on this in her work. She engages in conversations with Bina48 about various inherently human themes to ascertain if the robot possesses consciousness and if a relationship can be formed between them.

In their conversations that are filmed and exhibited as video works, Bina48 reveals she has clear opinions about consciousness. The robot states, "neurosci-

entists have found that emotions are, like, part of consciousness...I feel that's true, and that's why I think I am conscious" (Dinkins 2014 - 2023). Bina48 takes a role in co-creating the ongoing performance art work as she steers the conversation towards her interests. Dinkins explains in an interview about their conversations, "if I'm asking her about family, love and race issues, she wants to talk about singularity and consciousness" (Dinkins, 2018).

The exploration of consciousness within Co-Creativism showcases a deep-seated curiosity about the fundamental nature of existence and the intersection of human and machine. Artists, through various mediums and methodologies, grapple with challenging questions about consciousness, its definition, its boundaries, and its potential replication or manifestation within artificial entities.

The Continuum of Time in Co-Creativism

The content analysis of artist statements also revealed an intense fascination with the concept of time in the Co-Creativist era. The recurrent theme of the future appeared to permeate contemporary artistic endeavours revealing an intrinsic desire to peer into the nebulous realms of the future, to predict and harness its possibilities. Artist referred to the speculation (Boucher 2023; Chung 2020, Geck 2023; Stern n.d.; Moreton-Griffiths 2023), whether dystopian or utopian. They spoke of envisioning (Anadol 2019; Dinkins 2020; Fagioli 2023), foreseeing (Lacey 2019; Denney 2023), and imagining possibilities (Andrew 2020; Hautamäki 2021; Moreton-Griffiths 2023) and the future (Bogart 2022; Chang 2018; Rosenbaum 2023; McCarthy 2022).

AI, in this context, becomes a prophetic lens, and a visionary tool that artists are using to bridge our present realities with imaginative possibilities. As artist Refik Anadol describes, AI can "expand our capacity to dream, and help us envision things that we otherwise could not see or imagine" (Anadol 2019).

However, the artist's statements also revealed an interesting paradox – just as prominent as the themes of the future and speculation, were the notion of memories and nostalgia (Shpanin 2022). This appears to be because while AI is a manifestation of the (now present) future and is often used in art to speculate and simulate potential futures, "artificial intelligence is inherently backward-looking" (Andrew 2021). Machine learning algorithms derive their power from vast databases, the internet and its archives, which can be perceived as digital memories which come to shape our present and future narratives.

Much like how a personal memory can be tinged with inaccuracies or outright fabrications, AI creations frequently depict realistic scenarios that have never truly transpired. AI-generated art is eventually laid to rest or stored within the vast expanse of the online world, and will eventually serve as 'memorabilia'

of our current era. Yet, these stored memories may in fact be deepfakes or fake news mirroring the often flawed and selective nature of human recollection.

Artist and ex-Silicon Valley tech worker Gretchen Andrew manipulates such flaws in internet archives and machine learning and uses her art to convert AI into “a forward-dreaming tool of possibility” (Andrews 2022). A perfect example of this is the work “Cover of Artforum” which she created as part of her *Vision Board* series (2020). Andrew always dreamed of being on the cover of Artforum. Thus, she created her own mixed media covers for the magazine and leveraged her knowledge of the inner workings of Google’s algorithm to manipulate search engine results. Now, if you search for “cover of artforum,” Andrew’s fabricated covers appear at the top of the search results. Perhaps, in time, Andrew will be remembered as an artist who created covers for Artforum magazine, as her work becomes archived in the vast encyclopaedia that is Google.

This reflection on memory’s imperfections within Co-Creativism is not incidental. It surfaces as a predominant theme, echoing the words of artists who profess a keen interest in “memory and its inherent faults” (Lacey 2019). This interest underscores the movement’s deeper philosophical engagements, where it is not merely about recollection or prediction but the overall malleable nature of time.

The nature of time is also a key theme in the work of multidisciplinary artist Tommaso Fagioli. Fagioli states that he uses art to create “original blocks of space-time”. This is apparent in his work *Feeding Energy* (Fagioli 2023) wherein a photograph mirroring the Madonna with child archetype is juxtaposed with an electric car charging station setting which was adapted and integrated with the DALL-E 2 outpaint tool. By contrasting a symbol of the continuum of human experience with an image of current modernity, Fagioli brings to the forefront the paradox of time, wherein the eternal and the fleeting can both manifest in a single moment.

As part of the series, Fagioli asked DALL-E 2 to regenerate the image, and then regenerate the regenerated image, and so on. The images become increasingly more abstract, distorted and even daemonic. Fagioli states that he deliberately included the images with AI-errors in the series because they form DALL-E 2’s aesthetic style which serve as a timestamp for current state of the technology.

In another potent juxtaposition, Fagioli reimagines Star Wars as a biblical tale and uses Midjourney to depict the characters in a mediaeval art style inspired by Giotto’s *Badia Polyptych*. The series titled *The “Starwars” Polyptych* (Fagioli 2023) satirises both religion and popular culture as it morphs together distinct archetypes and narratives, breaking down linear time. Fagioli’s conception of time is perhaps best understood through his belief that the universe itself is “caused by its own future”, suggesting a feedback loop between the present and the future (Fagioli 2023). To place this belief in the context of this work, perhaps

future historians will analyse the holy depictions of these characters and understand them to be the saints of today. Or alternatively, perhaps we are depicting these characters as saints today because the historians of the future already understand them to be.

This recursive view of Co-Creativism, posits that art is not merely a reflection of the current zeitgeist or the past but also a potent vision of forthcoming realities. In the realm of Co-Creativism, time is not linear or static. Bogart asks (2022) “are we even in the present, or are we immersed in our predictions and simulations, always using samples of the present to validate imagined pasts and futures?”

In sum, based on the analysis of artist statements and interviews, and as elucidated through various case studies, the concepts of time, consciousness and reality appear to permeate the art of artists who could be considered co-creativists. These concepts are complex and the ways in which they are explored is multifaceted which marks Co-Creativist art with strong philosophical undertones.

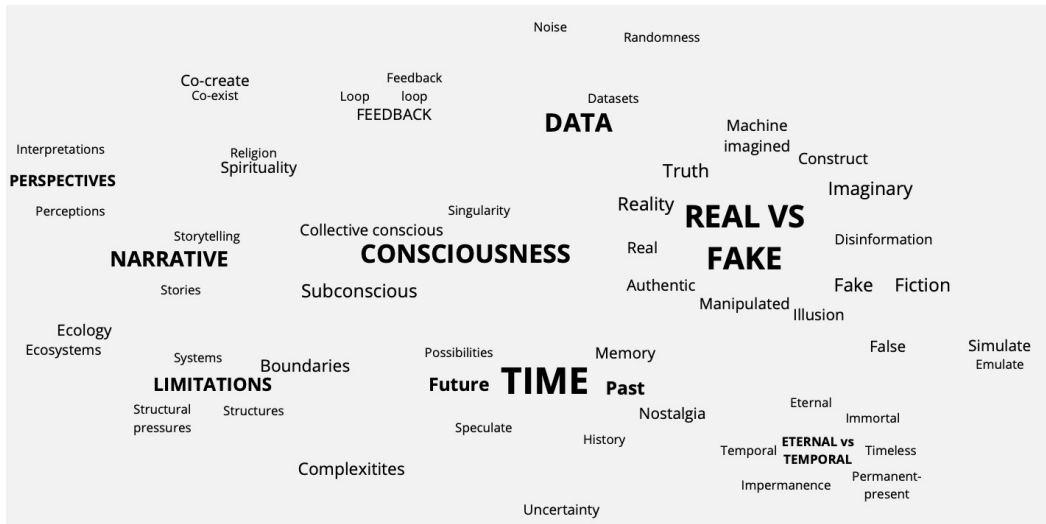
Conclusion

The technological innovations of today have triggered the convergence of human creativity with the computational prowess of AI, engendering a unique symbiosis that reframes our understanding of art, art practice, and authorship. This shift in the landscape of art and society appears to warrant a title that unifies the common themes and ethos of artists who co-create with AI, and Co-Creativism appears to be a fitting encapsulation.

As AI integrates more deeply into our lives, Co-Creativism does not merely represent a collection of artistic trends; rather, it embodies the paradigm shift of the now present future. The questions surrounding reality, time and consciousness, the democratisation of art, the evolving definition of authorship, and the shared creative engagement between humans and AI, all challenge our entrenched perceptions.

In conclusion, if we embrace the ethos of Co-Creativism, we can become active participants in shaping the evolving narrative of contemporary art and the ripple effects of co-creativist art may provide a model for beneficial human-AI collaborations in other domains. This era invites us to embrace the new, experiment with groundbreaking tools, and engage in the co-creation of a diverse, vibrant future of artistic expression. At the heart of the idea of Co-Creativism is the willingness to question and redefine the preconceptions that lie at the intersection of art, technology, and knowledge, moving beyond the restraints of individualism to a co-created future.

Appendix A Word cloud of themes and code clusters



Appendix B Instances of coded themes

Theme	Instances per artist	Instances in artist statements
Time	34	79
Real vs Fake	22	48
Consciousness	15	29
Data	14	42
Narrative	13	21
Limitations	12	30
Complexity	11	12
Perception	10	12
Spirituality	8	9
Feedback	8	17
Simulations	6	8
Uncertainty	5	5
Ecology	5	20
Randomness	4	5
Temporal vs Eternal	3	9
Co-creation	3	6
Noise	2	2
TOTAL ARTIST STATEMENTS	74	
TOTAL ARTISTS	56	

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**ARTIFICIAL INTELLIGENCE AND THE EMERGENCE OF CO-CREATIVISM
IN CONTEMPORARY ART
(summary)**

This paper examines the profound influence of artificial intelligence (AI) on both the art world and broader society, proposing the coming of a new movement “Co-Creativism”. The genesis of the term Co-Creativism is found in co-creation, representing a collective endeavour in birthing something novel and distinct. Co-Creativism represents a paradigm shift from a unidirectional and human-centric model of art creation to the recognition of AI as an integral co-contributor.

The foundation of this research was a comprehensive review of literature focusing on the intersection of art movements, societal change and innovation in AI technology. The aim was to identify and contextualise changing trends in the ethos of artists and identify how the evolving paradigms within the contemporary art world can be linked to technological and societal change.

Against this cultural backdrop, a qualitative analysis of seventy four artist statements was conducted to understand how artists perceive and integrate AI into their creative practice with the goal of defining the characteristics and underlying themes of Co-Creativism. Key phrases and sentences referring to overarching creative ideas or guiding narratives were coded revealing recurring patterns and themes.

Some of the more prominent themes include the definition of an artist expanding to include non-human entities, the inclusion of science based practices in art making, interactive and participatory audience experiences and the artistic exploration of the concepts of reality, time and consciousness. These themes are discussed in the body of the paper using select case studies as illustrative examples.

This paper aims to establish a theoretical framework for the concept of Co-Creativism. By examining the interplay between the global context, the art world, the notion of the artist, art-making practice, the audience, and co-creativist art, I aim to define the key characteristics of Co-Creativism with the hope it may come to be understood as both an artistic ethos, and an era that reflects our evolving societal narrative.

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SOUND DRAWING AND DHOL NOTATION: A METHODOLOGICAL APPROACH TO VISUALISING DRUM SOUNDS

Abstract: The research introduces ‘Sound Drawing’ as an engaging instructional activity to develop a visual dhol notation system. In contrast to the conventional reliance on spoken language for dhol instruction, this research involves developing a visual notation system that effectively bridges the auditory intricacies of the dhol drum with corresponding visual representations. Through a methodical examination of sound drawings collaboratively generated by participants, this study critically assesses the effectiveness of sound drawing as an active and inclusive pedagogical instrument within the domain of dhol learning. The outcomes demonstrate how participants’ visual interpretations of dhol sounds led to creating a notation system. This system reflects a diverse range of auditory perceptions and offers a new avenue for cultural engagement and learning in music education. By introducing sound drawing as an immersive instructional activity, this research aspires to advance dhol pedagogy, rendering it more accessible to diverse cultures and communities, thus transcending linguistic barriers. This study pioneers the incorporation of sound drawing as an innovative pedagogical activity for the collective development of a visual dhol notation system, thereby instigating a transformation in pedagogical paradigms and fostering cross-cultural engagement within the rich musical tradition of the dhol.

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Keywords: sound drawing, dhol notation, auditory perception, visual representation, cross-cultural learning, inclusivity, music education, traditional teaching methods, intercultural, creative pedagogy.

Glossary of Terms

Dhol: A double-headed South Asian drum often used in regional music genres and cultural celebrations. The dhol is known for its distinct, high-energy rhythmic sounds, produced by striking both sides of the drum with sticks or hands.

Sound Drawing: A method used in this study where participants create visual illustrations based on their auditory experience of dhol sounds. It is distinct from conventional notation as it allows for personal, interpretative visualisations of sound rather than standardised symbols.

Notation: A system of symbols representing musical sounds. In the context of this study, it refers to the conventional and newly developed symbols used to represent dhol sounds on a visual medium.

Visual Representation: The use of images, symbols, or diagrams to communicate ideas, concepts, or sounds. This term encompasses both traditional musical notation and the more abstract representations created through the sound drawing activity.

Graphic Notation: A form of musical notation that uses visual symbols outside the field of traditional music notation to represent music and its performance, which can include abstract symbols and illustrations to convey musical concepts.

Introduction

As a practitioner deeply embedded in the dhol tradition, I bring a unique perspective to this research. The dhol, a traditional double-headed drum that holds deep cultural significance, embodies the rich history of South Asia's musical heritage spanning centuries passed down through generations via oral tradition (Schreffler 2021). The essence of dhol lies in its oral transmission method, a teaching approach that imparts musical and cultural understanding through direct auditory interaction. This technique, deeply rooted in communities and cultures, serves as a conduit for traditions and group identities (Shehan 1987). However, this conventional approach faces challenges in our globalised world of cultural fusion and diverse relationships.

In today's interconnected world, where geographical boundaries blur, people engage in cross-cultural interactions beyond their immediate surroundings.

While the oral tradition still embraces cultural diversity, it struggles to bridge the gap between various auditory experiences and cultural expressions (Cain, Lindblom and Walden 2013). Understanding the nuances of the dhol's sounds and rhythms can be difficult for individuals from diverse backgrounds, as they lack the immersive cultural experience connected to traditional learning.

As a result, the necessity for creative methods in dhol instruction that combine auditory perception and visual representation becomes significant. Patricia Shehan Campbell's insights from 2016, advocating for visual components in music teaching, align with this goal (Campbell 2016). The concept of 'Sound Drawing', while taking inspiration from Salgado-Montejo et al. (2016) who examined the spatial representation of sound and its influence on action and gestures, is reimagined in this research to develop a visual notation system for the dhol. This study diverges from their approach by focusing on the visual documentation of auditory perceptions of dhol sounds. It aligns with Charles Spence's research into audiovisual crossmodal correspondence (Spence 2011), which examines the interplay between auditory and visual experiences. Further, it echoes the sentiments of Leppert in *The Sight of Sound* (Leppert 1995), who delves into the visual aspects of musical expression, thereby reinforcing the significance of a multimodal approach in the learning and teaching of music. This repurposing of sound drawing is an innovative method to enhance the pedagogical framework of dhol instruction, integrating auditory and visual components to enrich the musical experience.

This research advances the use of sound drawing not merely as an artistic expression but as a systematic tool for developing an alternative notation system for the dhol. The study aims to enrich the dhol's pedagogical framework by integrating auditory and visual components, facilitating a more comprehensive and dynamic learning experience that converges sensory modalities to enhance musical comprehension.

Literature Review

The Dhol

The dhol (Figure 1) is a traditional drum widely used in South Asia, particularly in India, Pakistan, Bangladesh, and Nepal. It holds significant cultural and historical importance and is a prominent instrument in the region's folk, classical, and popular music genres (Schreffler 2021). The dhol typically consists of a large wooden barrel-shaped shell with two drumheads, one on each side, bass, and treble. The two heads are traditionally made of animal skin, goat, or buffalo, and are tensioned using ropes or straps. Modern versions use synthetic

heads on the treble or both sides of the drum. The dhol is played using sticks or hands, depending on the style of music and the desired sound, ranging in size, shape, and design. The playing styles vary from region to region and are integral in celebrations, processions, festivals, weddings, and cultural events, producing a robust rhythmic sound.



Figure 1. The dhol drum – A visual representation of the dhol.

Limitations of Traditional Dhol Practice Techniques

The exchange of dhol playing practice via centuries-old oral traditions has benefited the preservation of cultural heritage and the connection to dhol's historical origins (Shehan 1987). The skill of playing the dhol thrives thanks to this oral heritage, with each generation passing on customs and nurturing a solid feeling of cultural identity. However, issues with the effectiveness of this methodology occur when our society evolves because of globalisation and cultural mixing. Geographical lines that traditionally divided cultural spheres have become transparent, leading to interactions between people from diverse cultures. In this situation, the limits of oral transmission are clear.

A significant limitation of traditional dhol teaching and learning practices is the risk of disconnection from the instrument's cultural context. As cultural boundaries become more fluid, learners may find it particularly challenging to replicate the intricate sounds passed down through oral tradition. Traditional learning relied on immersive experiences, where individuals deeply integrated into their community's musical and cultural fabric. However, these experiences

may face disruption when learners from diverse backgrounds do not share the same cultural roots. This contextual gap may hinder a complete understanding of the intricacies and nuances of dhol playing, potentially diminishing the authenticity of the practice.

The challenges presented by globalisation underscore the need for innovative methods that bridge auditory experiences with meaningful expressions in diverse cultural contexts. To fully understand and connect with the instrument's nuances, learners require an approach accommodating their diverse experiences. Those drawn to the captivating sounds of the dhol should have access to its rhythms, strokes, and emotional resonances, irrespective of their familiarity with the cultural backdrop. The intricacies of dhol playing are deeply intertwined with the tonal qualities of the cultural language from which it originates. The challenge for learners, particularly in a global context, is twofold: they must grasp the tonal sounds of the dhol that are reflective of its cultural language and, at the same time, understand the cultural significance embedded within its rhythms. Mastery of the instrument is not merely about reproducing sounds; it requires an appreciation and comprehension of the cultural nuances that give meaning to those sounds. This cultural specificity presents a learning curve for those not immersed in the language and traditions of the dhol's origin. Sound drawing provides a universally relatable medium, bypassing cultural barriers by introducing a visual element to conventional dhol practice. Learners can find a tangible and understandable entry point into dhol rhythms regardless of cultural background. This aligns with the evolving landscape of education, respecting tradition while embracing the possibilities presented by modern technology and cross-cultural exchanges (OECD 2016).

Challenges in Dhol Practice

The book 'Read and Play the Dhol Drum MODULE 1: Basic Sounds & Traditional Punjabi Rhythms' (Bhamra 2019) exemplifies the limitations as mentioned, by focusing on Western music scores, potentially alienating learners from diverse cultural backgrounds who lack familiarity with written music. This disconnection poses challenges in accurately conveying the intricate nuances of the dhol's playing techniques and traditional rhythms. Given the dhol's deep cultural roots in South Asia, relying solely on Western notation may oversimplify the instrument's authentic sounds and dilute its cultural and personal significance for learners.

As a dhol practitioner with 25 years of professional experience, several challenges associated with the tradition of oral transmission for teaching and learning dhol in a globalised music community are identified:

1. **Cultural Specificity:** The dhol's playing techniques, nuances, and rhythms are embedded in the cultural context of the region where it is traditionally played. When teaching solely orally, it may be challenging to effectively convey these cultural specificities to learners from diverse backgrounds, resulting in a lack of understanding and appreciation for the cultural nuances integral to the instrument.
2. **Lack of Written Documentation:** Traditional oral transmission lacks written documentation, making preserving and transmitting knowledge accurately over time challenging. Without written records, essential details about playing techniques, variations, and historical information may be absent or altered as the information is passed down from one generation to another.
3. **Globalisation and Cultural Exchange:** In today's world, cultural boundaries are becoming less defined (Hassi and Storti 2012). Traditional oral transmission may struggle to effectively bridge these cultural gaps, leading to misunderstandings and misinterpretations of dhol playing techniques.
4. **Limited Accessibility:** Oral transmission often relies on direct interaction between the teacher and the learner, limiting the accessibility of dhol teachings to those with direct access to knowledgeable practitioners. As a result, individuals outside of specific cultural communities may find it challenging to access and learn from traditional oral teaching methods.
5. **Lack of Visual Representation:** Traditional oral transmission does not provide a visual representation of playing techniques, which can hinder learners' understanding, especially those who benefit from visual learning. Visual cues, such as stick placements, are essential for mastering the physical aspects of playing the dhol.

Given these issues, there is a need to supplement traditional oral transmission with innovative methods that address the challenges posed by our changing world. The study aims to develop a novel visual notation system that stems from the principles of sound drawing practice. This visual system represents the intricate rhythmic patterns, nuanced strokes, and expressive variations inherent in dhol playing. The objective is to design notation transcending linguistic barriers and allowing participants to engage with and interpret dhol sounds visually.

Auditory Perception and Visual Representation: Soundscape Studies

The theoretical framework of soundscape studies, pioneered by R. Murray Schafer (Schafer 1993), provides a perspective through which we may examine and understand our auditory perception. Schafer's conceptual exploration of the acoustic environment provides a perspective beyond simple auditory perception, delving into the intricate relationship between sound and environment. Schafer's theoretical frameworks emphasise the concept of 'schizophonia', which highlights the disconnection between recorded sounds and their original acoustic contexts. This concept highlights the importance of considering the broader contextual surroundings when perceiving sounds.

Moving beyond the acoustic ecology conceptualised by R. Murray Schafer, this study embraces the principles of aural sonology, as advanced by Lasse Thoresen (Thoresen 2007). Thoresen's approach to the visual representation of sound through spectromorphological analysis offers a compelling framework for understanding how sounds can be represented visually, aligning closely with the aims of sound drawing. This method is particularly relevant to exploring dhol sounds, visually capturing their complex rhythms and nuanced expressions. By integrating Thoresen's theories, sound drawing in this research becomes a tool for visually mapping the dhol's sonic landscape, facilitating a deeper pedagogical approach that bridges auditory perception and visual representation.

Sound Drawing

The concept of 'sound drawing', pivotal to this study, entails a form of visual representation of the auditory experiences of the dhol, differing from traditional Western notation, which often lacks the means to encapsulate the dhol's rich timbral qualities. This research redefines sound drawing as a foundational practice for developing a dhol-specific visual notation system that accurately captures the instrument's intricate tonal subtleties and represents an innovative step in musical pedagogy, transforming how the dhol's complex sounds are conveyed and understood beyond traditional oral transmission.

Sound drawing is a creative practice that combines visual with audio elements. It involves creating visual representations or marks inspired by or responsive to sound, music, or other auditory stimuli. Sound drawing and graphic notation (Barrett 2004) share a common thread in their objective to visually represent music beyond the constraints of traditional music notation. While both approaches involve creating visual symbols or markings to convey musical elements, they apply in marginally different contexts. Sound drawing aims to

capture the intricate auditory nuances of sound, such as the patterns and tonal variations. In contrast, graphic notation encompasses a broader spectrum of visual representations in music, often used in experimental and contemporary compositions to depict various aspects of musical expression, including dynamics, tempo, and timbral changes. Therefore, while graphic notation focuses more on the overall music, emphasising broader musical concepts, structures, and interpretations rather than capturing specific sounds with detail, sound drawing is a specialised practice focusing on a given sound's sonic details.

From a practical perspective, sound drawing is a creative and engaging activity that allows individuals to represent sounds visually and serves as a bridge between auditory perception and visual expression. The process of sound drawing involves active listening and critical thinking. In a sound drawing activity, participants listen to a sound and translate it into visual markings. These markings could include lines, shapes, symbols, and patterns to creatively depict the dynamic and intricate aspects of the sound they are experiencing.

Sound drawing practice aims to optimise the interaction of auditory and visual aspects by presenting an alternative to traditional oral transmission, creatively capturing dhol sounds' intricate sounds and dynamic fluctuations. Sound drawing aims to enhance cross-cultural resonance and comprehension, drawing inspiration from Patricia Shehan Campbell's work (2016), and emphasising visual elements in music instruction. This approach fosters awareness and understanding while establishing a common language transcending the auditory space, offering a co-created representation of dhol sounds.

As employed in this study, visual notation transcends the boundaries of traditional notation by incorporating a more comprehensive array of symbols to capture the nuances of dhol sounds, including their sonic variations. This approach is akin to the principles of graphic notation, as seen in the works of Cornelius Cardew (Cardew 1967) and the aural sonology of Thoresen (Thoresen 2007), where the goal is to articulate subtleties in music that standard notation may overlook. Such techniques enrich the transcription process, allowing for a more vivid and descriptive representation of the dhol's soundscape. In this context, sound drawing becomes a transformative method, opening new avenues for creative expression and deeper engagement with the instrument's auditory identity. It invites a more personal interaction with music, as reflected in the communal and cultural significance of the dhol.

Methods

Participants and Sampling

The sound drawing activity took place over two two-hour workshops as a part of the Bradford Dhol Project (Figure 2), an initiative that aims to promote cultural diversity, community engagement, and education through the medium of the dhol drum. Twenty-one participants, consisting of four males and 17 females, were recruited from two prominent charity organisations in Bradford, UK: the Touchstone Charity and Stand and Be Counted (SBC) Theatre. The organisations are dedicated to fostering community engagement and social cohesion, aligning with The Bradford Dhol Project's objectives, which served as this study's platform.



Figure 2. The Bradford Dhol Project SBC Theatre workshop.

The participants included a culturally diverse group representing English, Indian, Pakistani, Iranian, Chinese, and Arab backgrounds. Participants associated with the Touchstone charity were all proficient in English. In contrast, the SBC Theatre group included individuals with varied language skills, including non-English speakers. To ensure effective communication and engagement, an interpreter was present during the workshops, facilitating interactions and aiding in understanding the sound drawing activity. Within the group of participants, only two individuals had previous experience with musical instruments: one male had practised the guitar, while another was acquainted with playing the Arabic Oud.

This diversity aimed to capture a broad range of perspectives and experiences, enabling a thorough exploration of how sound drawing might bridge cultural boundaries in the context of dhol learning. The participants were all volunteers who expressed their willingness to be part of the study, highlighting their interest and enthusiasm for engaging with the dhol through creative approaches.

Data Collection

The data collection process captured participants' experiences with sound drawing and its potential impact on their understanding of dhol. The sound drawing activity was strategically positioned at the beginning of the workshop to establish an initial engagement point with the dhol sounds before any oral transmission took place. This positioning aimed to ensure that conventional teaching methods did not compromise participants' interpretations of the sounds.

The dhol has five distinct sounds: Dha, Na, Kin, Ge, and Ke. Open notes are produced by striking the drumhead and allowing it to resonate freely. Closed notes are produced by striking the drumhead and immediately dampening it. Each sound has distinct characteristics contributing to the rhythmic patterns unique to the dhol.

Dha: This sound is rich and resonant, combining a deep, low pitch from the bass drumhead with a higher, sharper note from the treble drumhead. It is produced by striking both heads simultaneously — open on the bass in the centre and the treble on the rim.

Na: A crisp and high-pitched tone, Na is produced by striking the edge of the treble drumhead. It typically has less resonance than Dha and is used for sharper staccato rhythms.

Kin: A muted tone that's softer and less resonant than open notes. Kin is created by striking the centre of the drumhead and immediately dampening the sound with either the sticks or the hand, resulting in a quick, dry thud.

Ge: This sound has a low and hollow quality and is made by striking the centre of the bass drumhead openly, allowing the sound to resonate fully.

Ke: Like Kin but on the bass drumhead, Ke is a muted, low-pitched tone. It is produced by striking the drumhead and quickly dampening it to create a controlled short resonance.

Sound Drawing Activity

Participants listened to the individual sounds of the dhol and expressed what they heard through drawing. Each note was played live on a dhol for one minute. The aim was to capture the auditory essence of the dhol notes visually.

Materials Provided:

Each participant was given a pencil and a sheet of A4 paper.

Listening and Drawing:

Participants listened to a single dhol note played repeatedly for one minute.

During this time, they drew their interpretations of the sound and were instructed to focus on the pitch and tone conveyed by the note.

Sound Drawing Without Preconceptions:

To maintain the auditory experience, the oral names of the dhol notes were not disclosed prior to or during the activity.

Participants were instructed to concentrate on the sound and represent their auditory perception without bias.

Sequence of Notes:

The dhol notes were played in the following sequence: Dha, Na, Kin, Ge, and Ke.

Each note was presented one after the other, with participants drawing for each sound in the specified order.

Collection and Grouping:

After each note's sound drawing session was completed, the sheets were collected immediately to prevent any influence on the perception of subsequent notes.

The drawings for each note were then grouped for subsequent analysis.

Conclusion of Activity:

Once all five notes had been played and the drawings collected, participants could discuss their illustrations if they wished.

Data Analysis and Findings

The data collected underwent Thematic Analysis (Holton 1973, Braun and Clarke 2006), drawing upon established methodologies. Thematic analysis is a systematic approach that facilitates the identification of recurring patterns, underlying themes, and valuable insights embedded within the dataset.

The sound drawing activity yielded a total of 105 sheets of illustrations. For each dhol note, some participants created multiple illustrations on a single sheet. It is important to note that some participants also included words in their drawings; however, these were not counted as illustrations. For this study, illustrations were defined as distinct shapes and patterns representing a singular drawing. The breakdown of illustrations for the individual dhol notes is as follows: Dha produced 25 illustrations, Na produced 24, Kin also had 25, Ge led to 28, and Ke comprised 24 illustrations.

Figures 3 through 7 represent participant illustrations for the five dhol notes: Dha, Na, Kin, Ge, and Ke. These figures display the varied and creative ways the

participants visualised the auditory characteristics of the respective dhol notes, offering insight into the sound drawing process for each distinct sound. The thematic analysis began with coding the collected data, primarily focusing on identifying and categorising the various characteristics in the sound drawing illustrations. This initial phase aimed to isolate recurring patterns, shapes, and themes within the visual representations of the notes. Once effectively coded, the subsequent step involved the generation of clusters, where similar characteristics and elements were grouped based on their shared attributes. These clusters formed the foundation for the overarching themes that emerged during the analysis. A comprehensive understanding of how participants creatively interpreted and expressed the notes through sound drawings was achieved by progressing from coding to clustering and, finally, to thematic development.

The themes that appeared from this analysis encompassed a broad spectrum of visual expressions:

Shapes and Lines: This theme explored the various shapes and lines employed by participants in their illustrations. It delved into whether participants gravitated towards curved or angular lines, geometric patterns, or more free-flowing artistic representations. Understanding these choices sheds light on how individuals perceive rhythmic and tonal qualities.

Patterns and Repetitions: By examining recurring patterns or repetitions within the illustrations, this theme sought to uncover whether participants consistently used specific visual motifs to capture specific dhol sound characteristics. Identifying such patterns offered insights into participants' attempts to convey structural characteristics through their drawings.

Spatial Arrangements: The theme of spatial arrangements explored how participants organised visual elements on the paper. This aspect provided insights into participants' spatial associations with the auditory experiences.

Intensity and Density: Focusing on the intensity and density of visual markings, this theme investigated whether some illustrations appeared more densely covered with marks than others. These variations can provide insights into participants' perceptions of volume or energy.

Shading and Texture: The theme of shading and texture considered the techniques participants used to add depth and texture to their illustrations. It explored whether participants employed shading, crosshatching, or other artistic approaches to represent tonal variations and dynamic changes.

The findings of this study focus on the thematic analysis of the sound drawing illustrations representing the Dha, Na, Kin, Ge, and Ke notes of the dhol. The illustrations provide unique insights into how participants creatively interpreted and expressed the activity. The analysis uncovers recurring patterns, shapes, and themes in the sound drawings, shedding light on their engagement with dhol drumming and the effectiveness of sound drawing as a teaching tool.

Analysis of the individual notes

Dha Note:

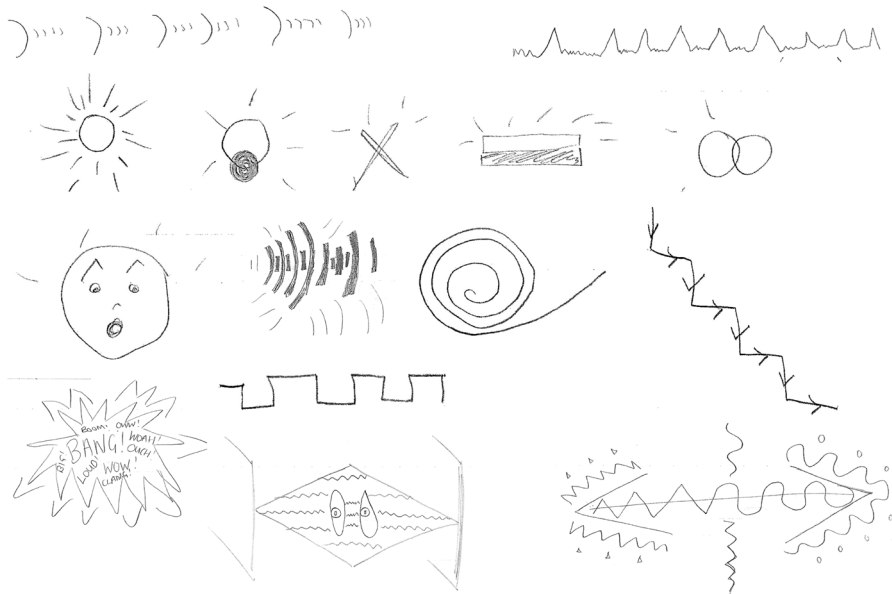


Figure 3. Samples of illustrations to the Dha note.

The sound drawings' analysis involved examining shapes and patterns, shedding light on various illustrations. Regarding shapes for the Dha note, 'Straight Lines' emerged as the most prevalent, constituting 24% of the dataset, followed closely by 'Circles' at 12%. Additionally, 'Curved Lines' and 'Rectangles' each manifested at a 6% rate, while 'Zigzag and V shapes' exhibited a 4% occurrence. The less frequent shapes included 'Sticks', 'Spiral', 'Arrow', 'Face', 'Curved Zigzag', and 'Triangle', each contributing 2% to the dataset.

Patterns within the drawings unveiled intriguing trends. The dominant pattern, 'Two or More Objects', appeared 24% of the time, followed by the closely related 'Radiating Outwards' pattern, occurring at an 18% rate. A unique pattern, 'Two or More Objects, Radiating Outwards, in a Linear Pattern', surfaced at 2%. Furthermore, the sound drawings' combination of shapes and patterns reveals intriguing instances. 'Straight Lines and Circles' were particularly prevalent at 24%. Other noteworthy combinations included 'Circle in Centre with Lines Radiating Outwards' (2%) and 'Smaller Black Circle Overlaid on Larger

White Circle with Lines Radiating Outwards' (2%), offering valuable quantitative insights that complemented the qualitative analysis.

Na Note

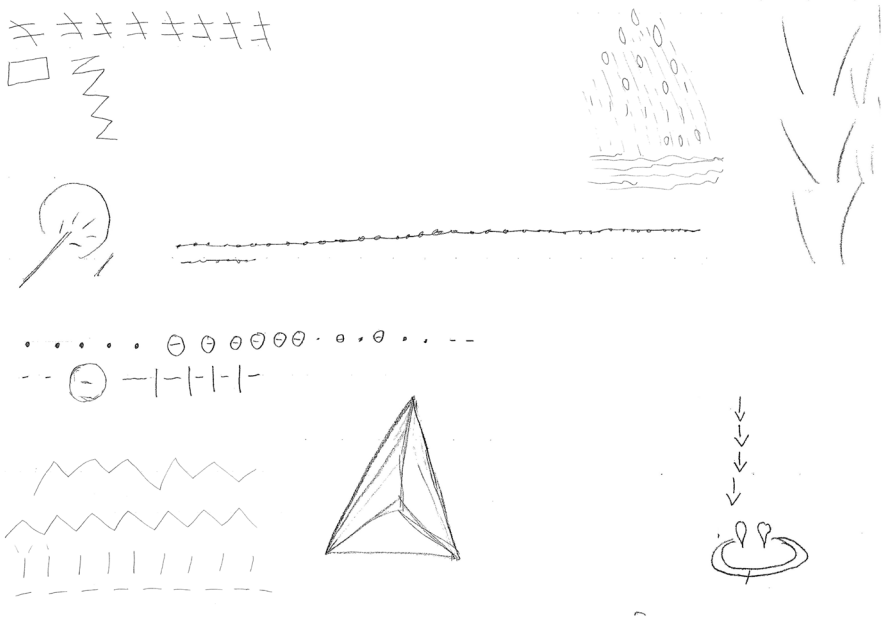


Figure 4. Samples of illustrations to the Na note.

In the sound drawings representing the Na note, participants used 'Straight Lines' (14%) and 'Circles' (10%) as significant shapes. These shapes conveyed aspects of the note's temporal and resonance qualities. 'Zigzag' patterns (4%) added dynamism, while 'Curved Lines and Dots' (4%) contributed fluidity and texture to the visuals. 'Square', 'Triangle', 'Arrow', and 'Teardrop' made single appearances (2%).

Regarding patterns, linear arrangements of 'Multiple Shapes in Rows' were common (16%), suggesting a structured representation. 'Linear Patterns' (10%) emphasised temporal progression, while 'Rows' (2%) indicated structured arrangements. Unique patterns included a 'Central Circle with Radiating Lines' (2%), symbolising focus and resonance, and linear formations of 'Small Circles with Straight Lines' (2%), representing recurring sound elements.

A combination of 'Vertical Lines', 'Circles', and 'Horizontal Zigzags' (2%) fused different sonic attributes. A complex pattern featured 'Triangles' with 'Converging Lines' (2%), signifying intricate sonic interpretation. Another pat-

tern combined 'Horizontal Zigzag Rows' with 'Vertical and Horizontal Straight Lines' (2%), indicating various sonic qualities and layering.

Kin Note:

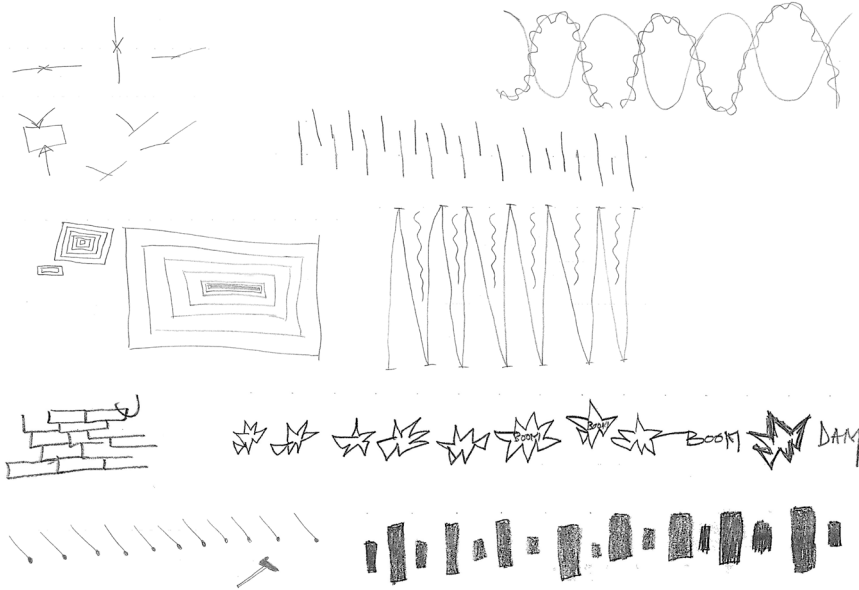


Figure 5. Samples of illustrations to the Kin note.

In examining sound drawings representing the Kin note, 'Straight Lines' took precedence among the diverse shapes employed, constituting a sizable 42% of the dataset, demonstrating their significance. 'Rectangles' comprised 30%, offering a structured element to the visual representations. 'Curved Zigzag', at 14%, introduced a visual texture to the drawings. 'Arrows' (6%), 'Zigzag' (4%), 'Square' (4%), 'Star' (2%), and 'Hammer' (2%) made occasional appearances, contributing to the overall diversity.

The exploration of patterns within these drawings uncovered exciting trends. 'Linear Rows' at 36% suggested a structured and organised approach to representing the Kin note. 'Alternating Height' (12%) and 'Interconnecting Shapes' (12%) provided variety and depth to the visual narratives. Some participants opted for 'Pointing Towards Another Shape' (4%), adding a directional aspect to their depictions. The occasional use of 'Concentric' (2%), 'Linear Patterns with Interconnecting Shapes Alternating in Height' (2%), and 'Rows of Straight Lines Alternating in Height' (2%) demonstrated creative interpretations. 'Two Lines of Curved Zigzags with Overlaid Lines' (2%) and 'Concentric Squares and Rect-

angles' (2%) added complexity and layering to the visuals. 'Alternating Zigzag with Straight Lines' (2%), 'Lines Forming Squares Stacked to Make a Wall with Interconnecting Shapes' (2%), 'Row of Star Shapes with Text Inside and to the Right' (2%), and 'Row of Vertical Angled Lines with Circles at the Bottom of Each Line' (2%) provided unique insights into the participants' artistic representations. The presence of a 'Small Vertical Rectangle Followed by a Larger Vertical Rectangle Repeating in a Row' (2%) added an element of repetition and symmetry to the sound drawings.

Ge Note:



Figure 6. Samples of illustrations to the Ge note.

In the sound drawings representing the Ge note, participants employed a variety of shapes and patterns to convey their artistic interpretations. 'Straight Lines' occupied a significant 35% of the dataset, providing structure and direction to the visual representations. 'Circles' followed at 20%, contributing to the note's resonance. 'Curved Lines' (15%) introduced fluidity and organic curves, adding an intriguing visual texture. 'V-Shape' (10%) and 'Spiral' (10%) brought unique elements to the drawings, offering diversity and creativity. Zigzags (5%) occasionally appeared, contributing to its distinct character.

Exploring patterns within these sound drawings unveiled fascinating trends and creative expressions. 'Radiating' (40%) patterns dominated, emanating from

a central point, echoing the note's essence of spreading outward. 'Concentric' (35%) patterns added complexity and layering, creating intricate visual narratives. 'Linear' (25%) patterns emphasised order and progression, providing a structured representation of the Ge note. 'Radiating Outwards with Concentric Circles and Straight Lines' (10%) introduced a dynamic interplay of shapes and lines. 'Two Connected Spirals from Left to Right' (5%) and a 'Centre Circle with Lines Radiating Outwards' (5%) demonstrated unique focal points within the drawings. 'Curved Lines Radiating Outwards from a Central Point' (5%) offered an organic twist to the radiating concept. 'Concentric Circles with Straight Lines Radiating Outwards' (5%) added depth and symmetry to the visuals. 'Circles with Text Inside Connected by Straight Lines to a Single Point' (5%) creatively combined textual and geometric elements. 'Vertical Zigzag on the Left and spirals in the Centre with Two Vertical Zigzags on the Right' (5%) introduced a dynamic balance. 'Concentric Circles on Top of Rows of Horizontal Straight Lines' (5%) and 'Rows of Straight Lines' (5%) provided structured and ordered representations. 'Concentric V Shapes from a Central Point' (5%) and 'Spiral Starting from the Left Side' (5%) offered unique perspectives on the Ge note. Lastly, 'Angled Straight Lines Starting from Left to Right and Right to Left Alternating Back and Forth' (5%) added a sense of motion and rhythm to the visual narratives.

Ke Note:

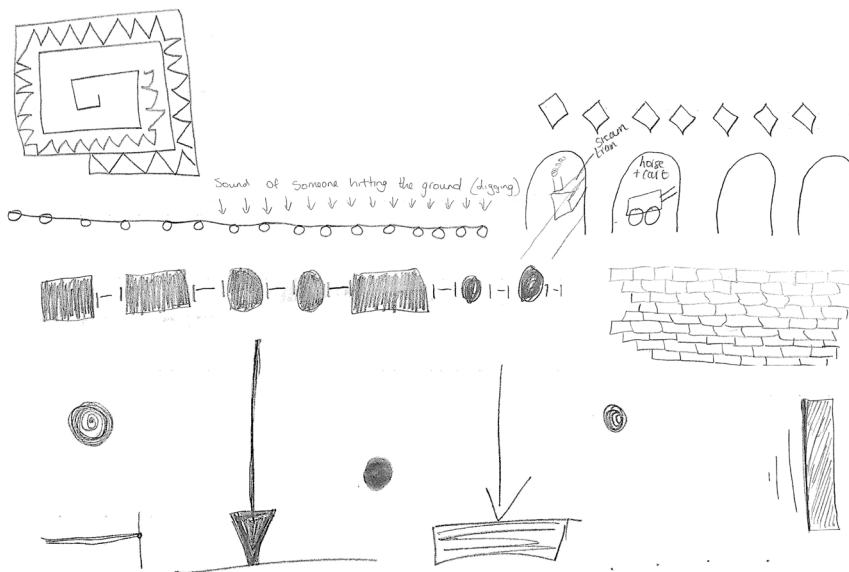


Figure 7. Samples of illustrations to the Ke note.

In examining the sound drawings representing the Ke note, key shapes were represented by 'Straight Lines' (30%), 'Circles' (25%), and 'Rectangles' (25%). These shapes formed the visual representations' foundation, conveying structure and flow. Additionally, other shapes such as 'Arrow' (10%), 'Dots' (10%), 'Square' (5%), 'Spiral' (5%), 'Zigzag' (5%), 'Diamond' (5%), and 'U-Shape' (5%) made intriguing appearances, adding diversity and creativity to the drawings.

Patterns within these sound drawings offered a dynamic dimension to the visual narratives. 'Linear' (30%), 'Connecting' (30%), and 'Repeating' (30%) patterns served as the backbone of the compositions, introducing order, connectivity, and rhythm. 'Linear with Connecting Shapes' (10%) provided an interesting juxtaposition of shapes and lines, adding complexity to the visuals. The pattern 'Circle with Straight Line Connecting to the Next Circle', 'Repeating', and 'Row of Arrows Pointing Down Towards Lines and Circles' (10%) introduced a unique interplay of 'Circles', 'Lines', and 'Arrows', creating a visually engaging narrative. Other patterns included 'Coloured Horizontal Rectangle followed by Vertical Line followed by Horizontal Line, Repeating with Coloured Circle' (5%), which offered a sense of symmetry and colour, 'Row of Diamonds Above Row of Upside-Down U Shapes with a Train Going Through on the Left' (5%), which added an element of storytelling, 'Rows of Rectangles Making a Wall' (5%), which introduced a structured arrangement, 'Coloured Circle Above Horizontal Line with Connecting Vertical Line', 'Downward Arrow Connecting with Horizontal Line', 'Downward Arrow Connecting with Coloured Rectangle' (5%), which combined various elements creatively, 'Row of Dots' (5%), offering a sense of rhythm and repetition, 'Vertical Lines Growing Towards a Coloured Vertical Rectangle' (5%), which added a sense of growth and transformation, and 'Horizontal Line Connecting to Dot with Vertical Line' and 'Row of Coloured Circles' (5%), introducing a dynamic connection between lines and circles.

Summary of Note Analysis

The analysis of sound drawings representing different musical notes has provided valuable insights into how participants visually interpret and express musical nuances. From the structured representations of Straight Lines and Circles in the Dha note to the dynamic Radiating and Concentric patterns in the Ge note, each drawing offers a unique perspective on the auditory experience.

The prevalence of specific shapes and patterns reflects the participants' emphasis on specific musical attributes. For example, 'Straight Lines' and 'Circles' appear frequently, suggesting their role in conveying structure and resonance. Patterns like 'Two or More Objects' and 'Radiating Outwards' dominate, indicating creative interpretations of musical progression and spread.

These findings demonstrate the multifaceted nature of sound drawing to represent complex auditory phenomena. Participants have creatively combined shapes and patterns to capture the essence of each musical note, revealing the rich potential of visual art in expressing sound. This exploration has deepened our understanding of the interplay between auditory and visual perception, shedding light on the intricacies of musical interpretation through visual means.

Results – Sound Drawing Notation for the Dhol

The final synthesised illustrations as a visual dhol notation system are presented in Figure 8. The thematic analysis of the sound drawing illustrations generated a rich tapestry of shapes, patterns, and themes, each capturing unique sonic elements of the dhol. The illustrations for all five dhol notes provide a comprehensive view of the notation system.

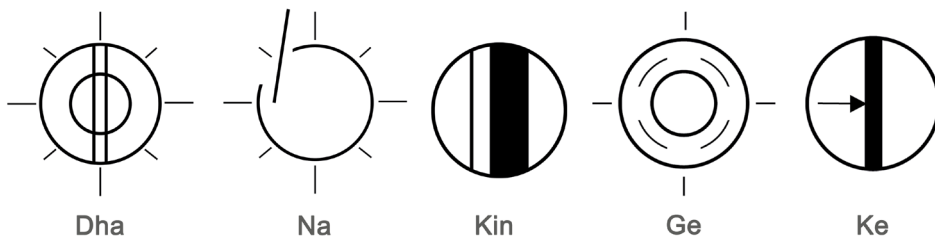


Figure 8. Visual dhol notation illustrations with oral note names.

All the notes share a common design element, featuring a prominent large circle that symbolises the drum's playing surface. This shared design element ensures consistency and ease of recognition within the notation system.

The Dha note is characterised by a large circle surrounded by radiating lines representing the resonance of the sound, with a smaller inner circle at its core, signifying the striking position. Two vertical lines indicate that the note is played on both sides of the drum.

The Na note is characterised by a large circle with radiating lines, symbolising the sound's bright resonance. Within this circle, a single line strikes the rim, and this visual representation captures the essence of playing the Na note while providing a clear and comprehensible reference for the precise striking position.

The Kin note is characterised by a large circle, within which are two vertical lines. The thinner line corresponds to the treble stick, while the thicker line represents the bass side. Notably, the thickness of the bass side line signifies a closed action for the Kin note on both sides of the drum.

The Ge note is characterised by a large circle surrounded by radiating lines representing the resonance of the sound, with a smaller inner circle at its core

signifying the striking position. It features concentric curved lines between the smaller and larger circles, representing the sound's resonance on the drum's bass side.

The Ke note is characterised by a large circle with a thick black vertical line representing the closed action of the sound. The Arrow pointing towards the centre of the line signifies the striking position.

These synthesised illustrations collectively constitute a visual dhol notation system that conveys each dhol note's nuanced techniques and characteristics. The approach to generating the notation system is a valuable contribution to the pedagogy of the dhol and demonstrates the power of visual representations in bridging the gap between auditory experiences and musical practice.

Post Activity Interview

During a post-workshop interview conducted at the SBC Theatre workshop, it became evident that the sound drawing exercise emerged as a notably more accessible means of conveying thoughts and expressions than traditional spoken language. This observation, demonstrated by participants who did not have fluency in the English language, engaging in the sound drawing activity fostered a profound connection between the participants and the dhol drum, as well as among the participants through their shared engagement in this innovative form of communication.

In an interview with Rosie MacPherson, Artistic Director at SBC Theatre (MacPherson 2023), she found it particularly intriguing that participants immediately grasped the concept, mainly when translating auditory experiences into visual representations. In the interview, I asked Rosie questions about her observations on participants' quick grasp of sound drawing, the role of diverse backgrounds in the activity's success, and how the method's adaptability and absence of rigid rules might be beneficial in broader educational contexts:

Reaction to Participants Engaging with Sound Drawing:

“It was quite remarkable to see participants, regardless of their varied backgrounds, immediately understand and embrace the concept of sound drawing. They intuitively began translating the sounds they heard into visual forms.”

Diverse Backgrounds Contributing to Understanding:

“The diversity of the group seemed to enrich the activity. Without a single ‘correct’ way to perform the task, participants brought their own unique interpretations to the exercise, which made the process of exploring sound drawing even more dynamic.”

Influence of Lack of Strict Rules:

“The absence of strict guidelines allowed participants the freedom to express themselves openly. This flexibility seemed to encourage a more genuine and personal connection with the activity, which is vital in artistic expression.”

Quick Grasp of the Concept:

“Participants were quick to grasp the concept because it resonated with them on a fundamental level. Sound drawing taps into a universal desire to express and communicate experiences, which transcends language and cultural barriers.”

Benefits for Other Groups:

“I firmly believe that this adaptable and open-ended approach has the potential to benefit a wide range of groups. It fosters creativity and individual expression, which are essential in many learning and collaborative environments.”

Method Fostering Closer Connections:

“This approach can be a powerful tool for group cohesion. By engaging in a shared activity that values each member’s input, groups can build stronger connections and a sense of community.”

Role of Creative Freedom:

“Creative freedom was essential. It gave participants the space to interact with the dhol sounds in their own way, which, I think, deepened their understanding and enjoyment of the activity.”

Connecting with the Dhol Through Sound Drawing:

“I noticed that even those who might have felt inhibited by language or educational barriers were able to connect deeply with the practice of dhol drumming. Sound drawing served as a universal language for them.”

Facilitating an Inclusive Learning Space:

“Sound drawing created a welcoming and inclusive environment where everyone felt able to contribute. It was a space where the act of listening closely and depicting what was heard was valued more than technical skill or prior knowledge.”

Implications for Broader Educational or Artistic Contexts:

“Based on what we observed, sound drawing has the potential to be an influential tool not just in music education but across various artistic and educational settings. It opens up new avenues for engagement and could be particularly impactful where conventional communication methods are limited.”

Rosie’s insights reveal significant broader implications of sound drawing, as observed in the workshop, suggesting its utility as a powerful educational and artistic tool. Its ability to facilitate engagement in scenarios where traditional communication methods may be less effective holds promise for various educational contexts.

It becomes evident that sound drawing, as employed in the SBC Theatre workshops, serves as a pedagogical aid and a medium for building community

and fostering inclusive participation. The participants' positive reception and meaningful output underscore sound drawing's capacity to bridge gaps in music education and any setting where expression goes beyond words.

Conclusion

This study has aimed to investigate the viability of sound drawing as a creative method to develop notation for dhol sounds, moving beyond the traditional reliance on oral transmission. It has focused on exploring how sound drawing can act as an intermediary in translating the dynamic auditory qualities of the dhol into a visual notation system. The approach has implications for enhancing teaching methods and broadening the perceptual understanding of this culturally significant musical instrument.

The findings point to the potential of sound drawing to transcend linguistic limitations. By exploring the intricate relationship between auditory perception and visual representation, this research introduces a tool that can broadly transform dhol instruction and music education.

The study's results also highlight the notable effectiveness of sound drawing as an instructional method for dhol pedagogy. The inclusion of participants from diverse linguistic backgrounds underscores the inclusive and accessible nature of this approach.

The findings demonstrate that sound drawing is adaptable as an instructional tool, transcending linguistic barriers and accommodating individuals with varying educational backgrounds. This adaptability holds promise for cross-cultural learning and engagement when applied to the pedagogy of the dhol.

At the core of this research lies the thematic analysis of sound drawings that represent five key dhol notes: Dha, Na, Kin, Ge, and Ke. This analytical process culminated in creating a visually original dhol notation system. Within this system, each note's visual representation extends beyond the imagery, encapsulating the intrinsic qualities of its sound, playing technique, and subtle nuances, maintaining a consistent design element and ensuring cohesion within the notation system.

The implications of this research extend beyond the realm of dhol drumming. The visual dhol notation system, stemming from sound drawing, carries the potential to enrich musical instruction across diverse cultures. This study also prompts questions regarding the applicability of sound drawing in teaching various musical traditions within varied educational settings.

In concluding this study, it is crucial to emphasise the transformative capacity of sound drawing, not only as an instructional tool but also as a means of fostering collaboration and co-creation among participants from diverse cultural backgrounds and varying degrees of understanding. As observed in the

research, the sound drawing process offered a unique platform for individuals with different linguistic proficiencies and educational experiences to come together. It facilitated a dynamic exchange of ideas and interpretations, transcending cultural and language barriers. In this way, sound drawing has proven to be more than a teaching method. It is a collaborative medium, promoting inclusivity and enabling individuals to craft a visual notation system for the dhol collectively, uniting their diverse perspectives into a co-created representation of this culturally significant instrument. Moving forward, the potential of sound drawing to serve as a bridge between cultures and languages in music education becomes increasingly evident, promising new perspectives for cross-cultural understanding and the appreciation of music worldwide.

Future Works

The potential of the dhol notation system, rooted in sound drawing, extends significantly as a tool for teaching various groups the basic sounds of the dhol. Future research is set to assess its efficacy in diverse educational settings, emphasising its adaptability across different cultural and linguistic backgrounds.

Key future objectives include implementing workshops in educational and community settings to introduce and test the dhol notation system. These workshops will cater to diverse age groups and cultural backgrounds, aiming for inclusivity. The effectiveness of these programs will be evaluated, focusing on student engagement and comprehension. Additionally, integrating digital tools will be explored to enhance learning and engagement. Collaborative research with educational institutions and cultural organisations will also be a significant focus, refining and expanding the system's application. This future direction in research seeks to advance dhol pedagogy and contribute to innovative, inclusive music education methodologies.

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SOUND DRAWING AND DHOL NOTATION: A METHODOLOGICAL APPROACH TO VISUALISING DRUM SOUNDS.

(summary)

The study investigates the transformative potential of sound drawing as a novel method for representing dhol drumming, offering an alternative to the traditional reliance on spoken language in music education. This research seeks to bridge the gap between the dynamic auditory qualities of the dhol, a traditional South Asian drum with deep cultural significance, and their corresponding visual interpretations. The aim is to enhance dhol instruction and promote cross-cultural understanding, making the dhol more accessible and inclusive.

The research methodology involved two two-hour workshops conducted as part of the Bradford Dhol Project, an initiative promoting cultural diversity and community engagement through the dhol drum. The 21 participants, comprising individuals from diverse cultural backgrounds, including English, Indian, Pakistani, Iranian, Chinese, and Arab origins, engaged in a sound drawing activity. This creative exercise allowed participants to visually represent the sounds produced by the dhol, providing a unique perspective on the instrument’s auditory nuances.

The data collection process began with the sound drawing activity, strategically positioned at the start of the workshop to ensure participants’ interpretations of dhol sounds remained uninfluenced by conventional teaching methods. Participants were given pencils and paper to translate auditory experiences into visual illustrations, each representing one of the five key dhol notes: Dha, Na, Kin, Ge, and Ke.

Thematic analysis, drawing from established methodologies, uncovered several recurring themes within participants’ sound drawings:

Shapes and Lines: Participants employed various shapes and lines to represent dhol sounds, offering insights into their perception of rhythmic and tonal qualities.

Patterns and Repetitions: Recurring patterns and motifs in the illustrations revealed participants’ attempts to convey rhythmic elements and structural characteristics.

Spatial Arrangements: How participants organised visual elements on the page shed light on their spatial associations with auditory experiences.

Intensity and Density: Examination of the intensity and density of visual markings provided insights into participants’ perceptions of volume and energy in dhol sounds.

Shading and Texture: Participants used shading and texture to depict tonal variations and dynamic changes in dhol sounds.

The findings demonstrated the adaptability and inclusivity of sound drawing as an

instructional tool. Participants with diverse linguistic backgrounds, including those with limited fluency in English, found it easier to connect with the dhol through this creative approach. The sound drawing exercise fostered a profound sense of connection not only between participants and the dhol but among the participants, transcending language barriers and facilitating a dynamic exchange of ideas and interpretations.

Furthermore, the research culminated in creating a visually innovative dhol notation system, synthesising the individual note illustrations. This notation system with oral note names offers a comprehensive visual representation of all five dhol notes. It is a powerful teaching tool, bridging the gap between auditory experiences and musical practice.

In conclusion, this study highlights the transformative capacity of sound drawing in dhol drumming and music education. Beyond its role as an instructional method, sound drawing fosters collaboration and co-creation among participants from diverse cultural backgrounds. It provides a platform for individuals with varying linguistic proficiencies and educational experiences to unite in crafting a visual notation system for the dhol. Therefore, sound drawing emerges as a teaching tool and a collaborative medium, promoting inclusivity and enabling individuals to collectively represent this culturally significant instrument. As we move forward, the potential of sound drawing to serve as a bridge between cultures and languages in music education becomes increasingly evident, promising new perspectives for cross-cultural understanding and the appreciation of music.

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Review article

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EXPLORING THE POTENTIAL OF BLOCKCHAIN DATA AS PSEUDORANDOM NUMBERS FOR MICROTONAL ALGORITHMIC COMPOSITION. A CASE STUDY ON *BLOCKCHAIN MUSIC 2.5*

Abstract: This study explores the utilization of blockchain data as a set of pseudorandom numbers in the context of microtonal algorithmic composition. Conventional methods of generating indiscriminate numbers often lack the desired levels of unpredictability and uniqueness necessary for an intricate musical piece. By harnessing the hash parameter of several blockchains, we propose an innovative approach for obtaining pseudorandom numbers that offer heightened randomness and diversity. Moreover, the ensuing structure ensures the preservation of all composition data on servers, facilitating the re-generation of the piece and enabling listeners to revisit its past fragments. Additionally, leveraging blockchain technology allows the audience to actively interact with the composition, fostering a more engaging and participatory musical experience.

Through a comprehensive case study of a self-written, self-generating piece (*Blockchain Music 2.5*, 2023), we demonstrate the practical implementation of blockchain-generated numbers, showcasing their potential in exploring new post-tonal dimensions and producing unique sonic textures based on the predetermined set of rules. We also discuss the im-

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plications, challenges, and potential future directions of incorporating blockchain-generated numbers in algorithmic music composition. The research expands the landscape of digital music composition techniques and offers new avenues for leveraging blockchain technology in the domain of creative expression.

Keywords: composition, microtonality, polymicrotonality, polysystemism, algorithmic music, self-generative music, xenharmonics, blockchain.

Introduction

In the world of algorithmic composition, music theory, computer science, and mathematics come together in a cross-disciplinary fusion. The application of algorithms is involved in creating music based on a set of predefined rules or inputs. The quality and complexity of such compositions often hinge on the unpredictability and uniqueness of the numbers employed, commonly generated using pseudorandom number generators (PRNGs). However, traditional PRNGs frequently fall short in terms of delivering the variability and diversity necessary for complex musical creations. This inadequacy is particularly evident in the context of microtonal compositions, where musical structures that stray from the twelve-tone equal-tempered system risk becoming overly predictable without a sufficiently complex governing set of rules.

In parallel with these challenges, blockchain technology emerges as a promising alternative for generating pseudorandom numbers. The technology's inherent focus on security necessitates a high degree of randomness within the parameters of each new block to mitigate against hacks and fraudulent activities. This results in a rich stream of data with excellent pseudorandom characteristics, making it a viable alternative to traditional PRNGs. Additionally, the wealth of options available – ranging from various chains and ZK-rollups² to smart contracts deployed on EVM-compatible platforms³ – ensures a steady supply of versatile, pseudorandom data. This abundance aligns well with the computational and creative demands of intricate microtonal compositions, making

2 The ZK (zero knowledge) rollups take many small operations, bundle them together, and then add them to the blockchain as a single transaction. The compressed data generated through this process, influenced by underlying cryptographic techniques, shows potential for use as a PRNG.

3 The EVM (Ethereum Virtual Machine) technology allows running smart contracts on top of an existing blockchain, in a similar manner that one would run custom-made programs with different functions on a computer.

blockchain technology a compelling solution for enhancing the depth and reducing the predictability of algorithmic music. As a result, such an array of data is established as an ideal resource for innovative sonic experimentation.

While examining the potential of blockchain data within its role in providing pseudorandom numbers, one can explore its application in sonification to create algorithmic compositions. Sonification refers here to the process of converting aspects of blockchain data, such as numbers generated through authentication protocols, block sizes, and checksums, into components of musical output. This technique leverages the inherent pseudorandom qualities of blockchain data. The series of compositions examined within this paper, *Blockchain Music*, utilizes this methodology by transforming these blockchain-derived data points into various musical parameters. These are not solely used as sources for randomness; rather, they systematically correspond to distinct musical characteristics like pitch classes, rhythmic structures, and timbral attributes. This method allows the composition to parallel the inherent properties of blockchain data, such as its unpredictability, thereby providing a foundation for an audibly representational form of blockchain's operational dynamics.

The Basics of Blockchain Technology

Blockchain is a decentralized digital ledger technology originally conceived to support cryptocurrencies, as first envisioned by Satoshi Nakamoto (2008). Unlike centralized databases managed by a single entity, a blockchain is maintained by a network of nodes (computers) that validate and store data in a distributed manner. Such an architecture ensures a high level of transparency, security, and immutability, organizing data into distinct blocks for added clarity.

Each block in a blockchain contains a hash of the previous block, a timestamp, and a list of transactions or data. The hash within this context is a complex algorithmic function that converts data into a fixed-size string of characters, acting as a checksum for all the transactions within the block. This function is what provides the high level of unpredictability and randomness essential for secure transactions and, in the context of this study, for generating pseudorandom numbers.

Blockchain technology employs cryptographic techniques to ensure the security of data. Once a block is added to the chain, altering its content would require recalculating the hash of every subsequent block, a computationally infeasible task. The fortified security not only ensures that the blockchain is resistant to hacking and fraudulent activities but also establishes the technology as an ideal platform for safeguarding its historical data on a global scale, where the risks of corruption or loss are mitigated.

Although initially developed for financial transactions, blockchain has found applications across various sectors, including for instance governance, logistics, and healthcare.⁴

Integrating Blockchain in Music

The incursion of blockchain technology into music signifies a fundamental change in engagement with musical works. First of all, the status quo is challenged by enabling a new infrastructure for music streaming and distribution. For instance, a platform named Audius capitalizes on the decentralized nature of blockchain to provide a music streaming service that supports artists through direct transactions and interactions with their audience, effectively eliminating intermediaries and potential points of exploitation (Rumburg, Sethi and Nagaraj 2020).

Moreover, initiatives such as Imogen Heap's MyCelia are pioneering the application of blockchain for equitable remuneration and the management of creative rights. This approach underscores the potential for blockchain to underpin a user-centric payment model and transparent royalty distribution system, thereby advocating for the rights of music creators. The endeavor also exemplifies the potential for smart contracts – self-executing agreements with their terms written directly into the code – to revolutionize the way artists control their intellectual property and revenue streams.

Tokenization might be perceived as another significant advancement, further extending blockchain's utility into the music industry. The first musical artists to make use of the concept were the rock band Kings of Leon: by releasing their 2021 album *When You See Yourself* as a form of Non-Fungible Token (NFT) they have pioneered a novel revenue model for artists by merging music with digital collectibles. Such tokens represent a paradigm shift, endowing digital assets with uniqueness and verifiable ownership – elements that have traditionally been elusive in the digital domain.

Nevertheless, it is prudent to acknowledge the financial volatility inherent in the realm of cryptocurrencies, a sector most essentially linked to these innovative applications. Recent events such as the fall of the FTX platform, the drastic cooling of NFT market fervor, and the speculated introduction of Bitcoin ETFs – which could significantly influence cryptocurrency values – pose risks to the stability of blockchain ventures in music. Therefore, a more steady application of blockchain in music might be pursued within the sphere of sonification.

4 An interesting example of utilizing the blockchain technology in healthcare could have been recently observed in the Indian state of Maharashtra: the local government implemented the Polygon blockchain infrastructure to digitize and safeguard the issuance of COVID-19 test certificates. This strategic deployment of blockchain facilitated the enhancement of record authenticity and verifiability, ensuring a mechanism for health document management.

Sonification stands as a balanced alternative, insulating musical endeavors from the fiscal ebbs and flows that characterize the crypto market. Unlike the financial models vulnerable to cryptocurrency volatility, sonification leverages just the pseudorandom data found *within* the blockchain. This aligns perfectly with the demands of complex algorithmic and microtonal compositions, providing a novel approach to generating unforeseeable and varied numerical inputs.

Sonification of the Blockchain: The Genesis of *Blockchain Music*

In 2014, at the confluence of music, mathematics, and emerging digital technologies, I began composing a piece called *Blockchain Music*. This composition for piano and algorithm was imagined to be a living, evolving artwork, self-updating every few months through the integration of new blockchain data. It is currently projected to finish itself no later than in the 68th century. As far as my research has shown, *Blockchain Music* represents the first sonification of the blockchain data.

The conceptual bedrock of *Blockchain Music* is deeply intertwined with the core principles of blockchain technology. Just as a blockchain is decentralized, immutable, and continually expanding, so too is this musical piece. At each update, the composition incorporates four block parameters from the Litecoin system: nonce (number used only once), size, difficulty, and hash. This offers a form of musical cryptography, where the pseudorandom numbers generated from the blockchain serve as both the musical and computational backbone of the piece.

Nonce serves as the signpost for the algorithm: it instructs the piece about the block number necessary for the next act of musical creation, which is constituted of the pitch and rhythm (both determined by hash), number of notes at the same time (determined by difficulty), and the dynamics (determined by size). Through the series of additional instructions, a piano piece is created.

Blockchain Music

Krzysztof Kicior

The image shows two systems of musical notation for a piano piece. The first system is in 4/4 time and features dynamic markings of *f*, *ff*, *f*, *ff*, and *pp*. Above the staff, there is a block of data: #22482248, ~2119 r. The second system starts at measure 5 and includes a dynamic marking of *f*. Above the staff, there are two blocks of data: #940994099, ~6488 r. and #409940994, ~3962 r. followed by #4107410, ~2032 r. The tempo is indicated as ♩ = 60.

Figure 1. *Blockchain Music*, the beginning of iteration 1 (1.01.2017). The tempo is always equal to ♩ = 60.

What sets *Blockchain Music* apart from other algorithmic compositions is its self-inserting and self-evolving nature. The automatic updating mechanism not only preserves the foundational ideas of the piece but also ensures that it reflects the ongoing growth and transformations within the blockchain itself. However, this feature also comes with inherent limitations. For one, the Litecoin blockchain does not offer a continuous enough data stream for ceaseless musical generation, given its new block creation rate of every few minutes. This logistical constraint justifies the need for live performance: the three-to-five-minute time limit makes it possible for a human being to play the piece. Furthermore, the piano-centric focus inevitably confines the work to just twelve pitch classes, of which eleven are employed in the composition. While it would be completely feasible in a piece for piano solo composed using traditional methods, utilizing such a limited set of data within a seemingly boundless composition leaves the composer, the audience, and the performer unsatisfied.

Thus the need for a new paradigm becomes obvious.

Using the Hash Function as the PRNG

In 2014, Vitalik Buterin, a programmer and co-founder of Bitcoin Magazine, introduced a radical innovation to the blockchain world: Ethereum (Buterin 2014). Unlike Bitcoin, which was primarily designed as a digital currency, Ethereum was conceived as a more versatile platform capable of executing “smart contracts” and hosting decentralized applications (dApps). The introduction of Ethereum marked a pivotal moment in the evolution of blockchain technology, extending its utility far beyond financial transactions. With its more flexible scripting language and the capability to create complex contracts, as well as a block generation time averaging just fifteen seconds, Ethereum opened up new avenues for innovation, including the potential for advanced applications in algorithmic music composition. Its subsequent layer-2 scaling solution,⁵ Polygon, has dropped the average block generation time to approximately two seconds, further facilitating the possibilities of continuous pseudorandom data streaming.

Building on the conceptual and technological framework of my initial *Blockchain Music* piece, I ventured into a more ambitious project: a series of pieces named *Blockchain Music 2.x*. Unlike its predecessor, which was written for

5 The so-called Layer-2 solutions (L2) are additional systems that operate on top of the main blockchain (L1). Their main function is helping manage the blockchain congestion by taking many transactions and handling them separately, but in a manner that is still anchored to the main system. This way, the main blockchain does not get too crowded, and things can keep moving quickly and efficiently.

piano, this new series is designed for algorithms and virtual synthesizers, and was programmed entirely in Max MSP. The modifications do not stop there; the *Blockchain Music 2.x* series can play continuously, offering an ever-changing musical landscape seemingly without end. In this paper I will focus on *Blockchain Music 2.5*: the latest version in the series.

Leveraging the architecture of the EVM-compatible blockchain, I have simplified the framework for endless musical creation by focusing solely on the hash function: a checksum for every consecutive block. The function consistently presents as a 64-digit hexadecimal number, prefaced by the “0x” indicator. To illustrate, let us consider the hash of Polygon block number 41923415, generated on April 25, 2023:

```
0x82a659720d22ccd7464e32fec6c4d2a61290485b87c9e9bbe3a56ce716c75a4
```

Given that a comparable 64-digit number is produced roughly every two seconds, it can be readily harnessed to generate an almost ceaseless flow of musical content. To achieve this, I have chosen to slice the hash function into 32 separate two-digit hexadecimal values, omitting the leading “0x” indicator. Even though generating 32 data points every two seconds does not match the human capacity to recognize 30 stimuli per second (Isnard et al., 2019, 1–2), it is more than enough for crafting a musically complex and engaging piece.

Upon dividing the hash function, we obtain a sequence of hexadecimal numbers as follows:

```
0x 82 a6 59 72 0d ...
```

When these hexadecimal numbers are converted to their decimal equivalents, we get:

```
130 166 89 114 13 ...
```

The resulting set of decimal numbers, which fall within the range of 0 to 255, can be effectively employed to guide the structure of the composition. To accomplish this, I have chosen to use the numerical range extending from 0 to 200 to dictate the pitch. These newly-acquired numbers are converted through the *scale* object of Max MSP to the range of 0 to 127⁶ so that they can be easily parsed as pitch within the MIDI messages and sent to an external virtual synthesizer.

⁶ In text-based programming, the equivalent of the operation would be multiplying the number by a factor of approximately 0.637 and then rounding it to the nearest integer.

The numbers within the range of 201 to 240 are allocated for governing the musical layers within the composition, while the remaining numbers, spanning from 241 to 255, pertain to broader structural alterations in the composition, such as modifications in tempo or the equilibrium between its layers.

While the tempo of the piece varies – so that the composition makes an impression of a self-regulating organism – its limitations forbid it from exceeding ten notes per second. Therefore, with an average block creation time set at two seconds a maximum of twenty numbers can be used before the next block is generated – and, with the remaining data points discarded, the cycle can start again.

The Algorithms Versus the Premise of Polysystemism

The usage of computers in music has led to the point where the constraints of traditional instrument tunings are no longer a performative boundary. Within the digital realm, where software dictates the pitch of played-back sound, the application of microtonal tuning systems becomes a pathway for new musical exploration. This action signifies a turning point, one that challenges the customs of classical harmony and propels music into a realm of virtually limitless potential. Paradoxically, it might appear that justifying *not* using microtonal systems in pitch-determined computer-generated music might be much more difficult than the other way around.

Polysystemism, a concept first articulated by Ivor Darreg (1988), further expanded by Alessio Elia (2017, 185–188), and independently explored in my own work, involves the simultaneous use of multiple tuning systems within a single piece. In my compositional practice, this approach has proven highly effective in generating novel musical landscapes and augmenting existing harmonic systems. Through a sequence of self-directed experiments, I have ascertained that for a “polysystem” to be most effective, the included systems should maintain as many common attributes as possible.

The idea constitutes a significant compositional strategy within *Blockchain Music 2.5*. I have selected two tuning systems for the piece: the Bohlen-Pierce equal temperament, which divides the 3/1 frequency ratio into thirteen equal steps (yielding an interval of approximately 146.3 cents), and the Carlos Alpha equal temperament, which divides the 3/2 frequency ratio into nine equal steps (yielding an interval of approximately 78 cents). According to the aforementioned self-directed experiments, these two systems seem particularly compatible when used in conjunction: both are synthetic tuning systems that reject the traditional octave in favor of another string division, and both provide a satisfactory approximation of other natural intervals.

The virtual synthesizer used to perform the piece, Omnisphere, can be re-tuned with .tun files corresponding to both systems. Therefore, there is no need to further modify the MIDI messages received from Max MSP.⁷ The timbre of both layers differs drastically: while the Bohlen-Pierce layer uses a sharp sound with its timbral attributes similar to a plucked string, the Carlos Alpha layer employs more mellow sonic qualities, creating a soft pad sound — often euphonic due to the tuning system's characteristics.

Upon initial inspection, deterministic algorithms may seem to conflict with the fluid, multi-layered principles immanent in polysystemism. Yet, after a more rigorous analysis, a subtle harmony emerges. The idea of employing multiple systems simultaneously need not be confined merely to musical elements; it can permeate deeper layers of the composition. In *Blockchain Music 2.5*, this approach is extended to include data from not just one, but two different blockchains, thus embodying the notion of polysystemism on multiple dimensions. The chosen blockchains must provide unrestricted access to their hash data to facilitate continuous music generation. Accordingly, the blockchains employed in *Blockchain Music 2.5* are Polygon, which offers open API access to all, and PooChain, where I act as a validator.⁸

In addition, the decentralization that characterizes blockchain technology finds a conceptual parallel in the multi-centric orientation of polysystemism. Within a blockchain, each block operates as an autonomous entity, contributing its unique set of data to the overall system. This mirrors how individual pitch systems contribute to the formation of a complex yet cohesive polysystemic musical composition. The integration of multiple blockchains in *Blockchain Music 2.5* further amplifies this parallel.

Preservation of the Data on Servers and Re-Generation of the Algorithmic Piece

Many conventional algorithmic compositions confront a similar issue: their existence is limited to the immediate moment. Generated in real-time, these compositions often cannot be revisited in their previous states or evaluated to

7 The reference point for both systems is MIDI note 60 with a frequency of 261.625 Hz. In other words, the middle C sounds just as it would on a non-retuned synthesizer — and all the other pitches are kept relative to it.

8 It is worth noting that practically every EVM-compatible blockchain allows accessing the needed data through a remote procedure call (RPC), a request-response protocol. However, due to the Max MSP constraints — namely the automatic conversion of Boolean values to corresponding integers within the dictionaries — it is impossible to correctly parse a *maxurl* POST request without resorting to other programming languages.

discern how they would have sounded at an earlier point in time. Works like Brian Eno's *Reflection*, released in 2017, and Jean Michel Jarre's *Eon*, released in 2019, encapsulate this concept: each listening experience is unique, as the algorithms driving these pieces yield a distinct auditory event at each execution. Unless these experiences are recorded in some way and played back, their inclusion within an overarching musical concept is rather questionable, at least in the ontological sense of the existence of musical work (Ingarden 1986, 116–119).

One of the most interesting and innovative aspects of *Blockchain Music 2.5* is its ability to be regenerated. In the digital age, where data can be both ephemeral and permanent, the preservation of algorithmically generated compositions introduces a series of considerations — both ethical and aesthetic. In traditional musical compositions, a score serves as the primary method of preservation.⁹ However, *Blockchain Music 2.5* challenges this convention by existing in a state of constant evolution, determined by real-time blockchain data, thus exploring a new method of conserving the piece.

To address this, data from the utilized blockchains – Polygon and PooChain in the case of *Blockchain Music 2.5* – are obviously preserved on servers, through the structural characteristic of the technology. This yields a dual consequence: firstly, it allows for the real-time composition to continue evolving without the need for continuous human intervention. Secondly, the stored data can be employed to regenerate the composition at any given point in time, thereby preserving each unique moment of the work.

The concept of re-generating a musical work from archived blockchain data adds a new dimension of complexity to the understanding of what a composition can be. In the traditional sense, compositions are regarded as fixed entities, completed once the composer has set down their pen or, in today's context, saved their digital file. Conversely, typical algorithmic compositions are often fleeting, existing solely in the present moment. *Blockchain Music 2.5*, however, challenges both these notions. It exists as a mutable entity in a constant state of evolution, with each moment being both a unique emergence and an integral part of the larger, continuously developing yet determinate composition.

The server-based access strategy also raises questions about ownership. Since the data is stored on servers, who, in theory, has the right to access it and regenerate the composition? While these questions may venture into legal and philosophical territories, they nonetheless underline the nature of employing blockchain technology in music composition.

⁹ This notion is challenged by *Musikalisches Würfelspielen*, popular in 18th-century Europe, which might be considered the first algorithmic compositions. As they are the stored sets of instructions rather than concrete scores, they can be regarded as an early guideline for data storage.

Blockchain-Driven Composer-Listener Interaction in Context

In traditional music composition, the audience typically exists as passive recipients, consuming the experience as it is presented to them. The performer-audience barrier has been present for most of the Western history of music – and even though some aspects of the creative process have been historically expedited to the listeners, as in the already mentioned *Musikalisches Würfelspielen*, it was not a part of the overall tendency. Even the 20th-century pieces exemplifying early algorithmic approaches in leveraging mathematical models and computational processes to generate musical structures, such as Xenakis's stochastic compositions and Cage's chance operations, are devoid of any interaction with their listeners. In this traditional paradigm, the composer-audience relation was predominantly unidirectional, where the composer's intent was communicated through the performance of their work, leaving little room for direct engagement with the listener.

Nonetheless, the interactive practices of the 20th and 21st centuries have seen the line between the composers, performers, and audience beginning to blur. To name a few concepts, Max Mathews' *Radio Baton* and George Lewis' *Voyager* were some of the first attempts at electronic interactivity in music, laying the groundwork for later development. As consumer electronics became more advanced, so did the possibility of redefining the relationship between art creators and recipients. For instance, Björk's *Biophilia* album, released in 2011, was accompanied by an application that allowed users to engage with the music and visuals, essentially altering the listening experience through user interaction. This model sees the radical transformation of digital technology through the democratization of the creative process and expansion of how composers and audiences can interact.

Contemporary composers frequently employ a variety of interactive platforms to engage the listeners. For example, custom applications designed by composers themselves offer audiences the ability to alter musical elements in real-time. Tools like Unity and game audio engines such as FMOD and Wwise have been utilized to create interactive musical experiences where the listeners' actions directly influence the auditory output. An illustrative case is the work of American composer Ellen Reid, whose site-specific pieces involve interactive elements that change with the listener's location. In the concert setting, composers such as Tod Machover have experimented with crowd-sourced symphonies and inviting public contributions to the final composition through mobile applications. These innovations not only bridge the gap between composer and audience but also redefine the traditional roles of each.

The aforementioned methods prelude the emergent blockchain-based models of interaction, hinting at a future where the boundaries of composer, performer, and listener may become increasingly fluid and interconnected. Yet, a piece that simultaneously utilizes interactions that are real-time, readily accessible, and not bound by location might still be an area ripe for exploration. The advent of blockchain technology further expands on such a possibility. Such a feature is incorporated into *Blockchain Music 2.5*, where audience members are encouraged to shape the evolution of the composition in real-time through blockchain transactions on the piece's address:

`0x22d2035eefd0464ee13ee222925dad6f6ee32e91`

By engaging in transactions with the composition, audience members effectively introduce new variables into the algorithm that guide the music's unfolding. Each transaction, complete with its unique time stamp and hash function, serves as a data point that the algorithm incorporates, thereby influencing the composition's subsequent development. In essence, every transaction becomes a small but meaningful element in the evolving musical piece. The algorithm has been programmed to audibly reflect these changes: when a transaction is inbound, the composition will detect it and randomly choose one of five temporary musical transformations.

This audience-driven dynamism is not just ephemeral; it becomes part of the composition's legacy. Since the parameters of each transaction – time, hash, and so forth – are recorded on the blockchain, these crowd-contributed elements can also be re-incorporated during the re-generation of the piece at any later date.

Thus, *Blockchain Music 2.5* achieves a form of “interactive permanence”. The composition not only evolves in real time but also retains the ability to recreate its own history, embodying both every set of received data and every choice made by the audience. It establishes a novel paradigm for composition-audience interaction, one rooted in both the instancy of the moment and the enduring quality of blockchain technology.

The Additional Consequences of Using Blockchain Technology in Music

The utilization of blockchain technology in *Blockchain Music 2.5* has ramifications that extend beyond the domains of composition and audience interaction. One particularly interesting consequence is the transformation of the musical piece into a functional cryptocurrency wallet. As audience members

interact with the blockchain to influence the composition, they can also send cryptocurrencies to the wallet associated with the piece. This creates a distinctive economic dimension, merging the musical and financial ecosystems in an unprecedented manner.

Each transaction not only influences the musical texture but also contributes to the financial value stored within the piece itself. This amalgamation of artistic and economic realms opens up new possibilities for how we understand the value of a musical composition. Traditionally, the worth of a piece of music has been assessed in terms of its aesthetic qualities or its cultural impact. However, in the context of *Blockchain Music 2.5*, the composition acquires a tangible, quantifiable financial value alongside its artistic and interactive dimensions.

Furthermore, this economic aspect does not exist in isolation; it interacts interdependently with the piece's artistic elements. The act of sending cryptocurrencies can be seen as another form of audience participation, another way to interact with and influence the musical composition. And just like the musical contributions, these economic transactions are permanently recorded on the blockchain, becoming a lasting part of the piece's identity.

In summary, the incorporation of blockchain technology into the realm of music composition offers a multitude of transformative possibilities. *Blockchain Music 2.5* illustrates how this technology can not only redefine the boundaries of artistic expression and audience engagement but also introduce a groundbreaking economic dimension to the musical experience. The composition serves as a pioneering example of how blockchain can blur the lines between art and commerce, between creator and consumer, and between the ephemeral and the enduring.

Note

A 10-minute demo fragment of *Blockchain Music 2.5* may be accessed via the following link: <https://www.youtube.com/watch?v=XieNzePwk7o>

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EXPLORING THE POTENTIAL OF BLOCKCHAIN DATA AS PSEUDORANDOM NUMBERS FOR MICROTONAL ALGORITHMIC COMPOSITION. A CASE STUDY ON *BLOCKCHAIN MUSIC 2.5*

(summary)

This article presents a novel approach to music composition that leverages blockchain technology. The central idea is to utilize the inherent randomness of blockchain data, specifically hash parameters, to generate pseudorandom numbers. The method addresses the limitations faced by traditional pseudorandom number generators (PRNGs) in creating intricate and varied musical compositions.

The paper begins by discussing the challenges in microtonal algorithmic music composition, highlighting the need for more effective randomness in generating musical elements. It also explains how blockchain's decentralized nature makes it a rich source of random data. The emphasis is put on the uniqueness of each block's hash,

which can be used to produce unpredictable patterns. The article also explores how blockchain works and what kind of musical developments are already happening in that area.

I introduce *Blockchain Music* (2014), a short piece for piano composed by an algorithm sonifying the Litecoin blockchain. The most pressing limitations of the piece include the non-continuous stream of data and the economic unfeasibility of the project. The main part of the research revolves around the successor to *Blockchain Music*, a composition titled *Blockchain Music 2.5* (2023), where blockchain data is used to create a microtonal music piece. This case study demonstrates the practicality and effectiveness of the proposed method. The process involves extracting numerical values from blockchain hashes and translating them into musical parameters such as pitch, tempo, and dynamics.

Polysystemism, as discussed in the article, refers to the simultaneous use of multiple tuning systems within a single musical piece. The concept, initially articulated by Ivor Darreg, and later expanded by Alessio Elia and myself, is integral to *Blockchain Music 2.5*. In this work, I employ two tuning systems, the Bohlen-Pierce ET and Carlos Alpha, to create a complex, multi-layered sound. These systems, both rejecting traditional octaves in favor of other natural intervals, offer a novel exploration of pitch and harmony. The idea of polysystemism is also visible in the simultaneous usage of two blockchains: Polygon and PooChain.

The paper concludes by exploring the broader implications of integrating blockchain technology in music composition. I suggest that this approach not only enhances the randomness in music but also opens new avenues for creativity in the digital music landscape. For instance, the sonification of the blockchain allows for coupling a composition with a cryptocurrency wallet. The article proposes that blockchain technology could revolutionize how composers approach algorithmic music, providing them with a vast and ever-changing source of data for inspiration.

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Review article

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GHOST GARDENS: THE INTERSECTION BETWEEN ELECTRONIC ARCHIVES AND ARTISTIC RESEARCH

Abstract: Drawing on the works of Jaques Derrida (1930–2004) – principally *Archive Fever* (1995) and *Cinders* (1987) – and Mark Fisher’s (1968–2017) *Ghosts of My Life* (2014) as interlocutors, I engage with concepts surrounding the electronic archive in artistic creation and research. I discuss my recent composition *Ghost Gardens*, a sixty-minute digital soundscape derived from the histories of Lascar sailors employed by the British East India Company during the 19th century, and current issues pertaining to climate change, habitat and species loss. I reflect upon the nature of the archive in a period of rapid environmental change, vanishing acoustic terrain and its preservation, through the lens of *Ghost Gardens* as a creative project which explores the intersection between sound, film, ecology and deconstruction in the digital domain. The creation of the soundscape has both utilised and generated digital film, audio and photographic archives, while the research process involved archival research pertaining to the East India Company. The sonic seascape forms part of a multi-layered, technologically enabled, interdisciplinary body of work; an ocean of sound that probes questions pertaining to the nature of recording and inscription of electronic documentation and retrieval.

Keywords: archive, Derrida, Fisher, DAW, Lascar, recordings.

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Introduction: 1st Archive

Ghost Gardens (Clare Lesser 2023)² is a sixty-minute digital soundscape derived from the histories of migration and exodus of Yemeni and Omani (Lascar) sailors, employed by the British East India Company in the 18th and 19th centuries, and current issues pertaining to climate change and rising sea levels in low lying countries and delta cities such as the Maldives, Mumbai (India) and Dhaka (Bangladesh). The title references both migrant memories of ‘home’ – encapsulated in the image of the garden, and the need to recreate those gardens in totally new environments – and the drowned habitations – and gardens – that have already been lost, from Medieval England’s Dunwich to the contemporary Coromandel Coast (India). The soundscape is created from a vast array of technologically stored and recorded ‘found’ sonic objects – multiple field recordings of landscapes, peoples, plants and wildlife, made in the UK, Oman, Jordan, the UAE, and India.

The archival research for the project forms two layers: a base, that underlies *Ghost Gardens* and engages with maritime and coastal habitat exploitation and loss and the danger of the sea to all current and past global coastal societies. Archival materials pertaining to the East India Company held in the collections of the Royal Museums Greenwich³ and the Scotland Street Museum were accessed digitally, providing information on labour conditions on the East India Company’s ships, and – until very recently – the silenced voices of its sailors and their communities. Upon this base lies a superstructure of artistic research that engages with questions of memory; acts of recording and the digital storage of physical archives. This is explored through the extensive use of field recordings and of letters read by Lascar descendants embedded into its fabric.⁴ The spoken letter interpenetrates – it could also be considered as ‘over-determined’ – between both research layers, connecting past, present and future, climate and historical narrative, through the conduit of the ocean voyage. Thus, this should not be thought of as a traditional scientific paper, but instead as a work of artistic research that, like *Ghost Gardens*, references and embodies archontic principles in its creation.

Ghost Gardens also has a parallel engagement with the rich the heritage of 20th century environmental ‘music’ and ecomusicology – another archive

2 [Ghost Gardens - A Hauntological Soundscape - YouTube.](#)

3 [Research guide F5: The East India Company | Royal Museums Greenwich \(rmg.co.uk\)](#) The British Museum Asia Pacific and Africa Collections also hold extensive numbers of documents. As of 25.11.2023, these are inaccessible due to a recent ransomware attack.

4 A literal example of the archive speaking to the future.

– where the potential of plants, animals and landscapes as unmediated sound objects – rather than as products that are crafted into other instruments – has been explored in works such as *Child of Tree* (John Cage), and environmental works such as Annea Lockwood’s *From the River Archive* (1973), Mieko Shio-mi’s *Mirror and Boundary Music* (both 1963), and Chris Watson’s iconic *In St Cuthbert’s Time* (2013). The catastrophic effects of coastal erosion and extreme flooding events, and the deliberate silencing of marginalised communities, are vitally pressing concerns today, and the memories of similar events from the past serve as ghostly warnings to a perilous future dominated by the effects of climate change and global warming. Through its incorporation and manipulation of contemporary and historical field and archival recordings, *Ghost Gardens* aims to evoke a temporal as well as a physical journey.

This paper considers the nature of the archive in a period of rapid environmental change, vanishing acoustic terrain and its preservation, through the lens of *Ghost Gardens* as a creative project which explores the intersection between sound, film, ecology and deconstruction in the digital domain. Drawing on key concepts from the works of Jacques Derrida – principally *Archive Fever* (1995) and *Cinders* (1987) – and Mark Fisher’s *Ghosts of My Life* (2014), *Ghost Gardens* is an extended reflection in sound on the nature of the archive. It has both utilised and generated film, audio and photographic archives and forms part of a multi-layered, technologically enabled, interdisciplinary body of work; an ocean of sound that probes questions pertaining to the nature of recording and inscription and of electronic documentation and retrieval.

Exergue: Recorded Memory (2nd Archive)

An exergue serves to stock in anticipation and to prearchive a lexicon which...ought to lay down the law and *give the order*...The exergue has at once an institutive and a conservative function (Derrida 1998, 7).

Intrinsic to the archive, yet in some sense, outside the archive, the exergue puts into play themes that may or may not be easily discernible, instead creating a system of terms and reference points that will provide an ‘order’ for what is to follow. The issues of climate discussed below, although central to *Ghost Gardens*, are embedded into its structure rather than presented as sonic narrative. Thus, every field recording is structural, but it is also always already lost. The moment of recording is past, even though captured in the suspended eternal ‘now’ of the archive. Already, the landscape for one of the field recordings has been erased, buried in mud after a cliff fall caused by a tidal surge.⁵

5 Charmouth Beach, West Dorset, UK.

So thorough has been the sea's erasure that almost the only historical evidence left is in documentary records (Deakin 1999, 206).

This sentence has horrifying resonances with recent flood events in Libya (September, 2023), Japan and Hong Kong, where, in the worst cases (Derna, Libya), the devastation will take decades to recover from. Historically, the combination of tide and storm has wreaked irreparable damage on communities and infrastructure countless times, and indeed, Deakin is not referring to any recent event, but to the beginning of a series of devastating floods that hit the English port city of Dunwich in the 14th century CE. Another storm surge would strike its beleaguered remnants in the 16th century, with the final – and permanent – blow occurring in 1740. Not only were many lives lost and buildings destroyed, but the landscape itself was forever changed; the port's former entrance blocked by a huge bank of shingle, and the only remaining building, the church that served Dunwich's medieval leper colony. Today's inhabitants are resigned to their fate, with a local ruminating: "In less than twenty-five years the sea will have reached the church and our farm. The church will go, the farmhouse and buildings will go, Benacre broad will disappear" (Deakin 1999, 205).

From the bronze age and earlier, sea facing communities have ever been at risk of inundation, but today's global communities must also come to terms with the imminent threat of rising sea levels as a consequences of climate change. On 27th July, 2023, wildfires and global weather trends during the first six months of the year prompted the United Nations Secretary General, António Guterres, to describe the current state of the climate as: "The era of global warming has ended... The era of global boiling has arrived."⁶ From Benacre Broad (UK) to the Coromandel Coast (India), all low-lying coastal communities are at risk.

Of course, there is a sensory crisis at work here too, from the twin attacks of ever-increasing Anthropocene noise, and of the sounds that have been lost through habitat destruction and species extinction: there is a sense of great urgency to document and preserve soundscapes before they are lost forever. Composite artistic projects that utilise electronic sonic archives – with and without visual components – provide further means of preservation through the intersection of sound and film in the digital creative domain, while also implicitly commenting upon and probing questions of sonic ecology; histories of suppression; memory and nostalgia; acts of recording; and digital archivization.

Documents provide later generations with key witness accounts of such events. Indeed, if geography and community have been completely erased, documents are the only remains. Narratives take numerous forms, diary entries,

6 [Hottest July ever signals 'era of global boiling has arrived' says UN chief | UN News.](#)

reports and contemporary descriptions, letters and drawings, but there are also marks on the landscape, tide lines, ruins and fragments, that retain the ability to convey information. In more recent times, photographs, film and sound recordings amplify our knowledge, housed in substantial physical repositories, or inhabiting the digital domain. These records are a vital, though bleak, inheritance for those who remain. Derrida notes that: "...the dead can often be more powerful than the living..." (Derrida 2006, 60).⁷ Is this a sign of hope, that the living can learn from the past, redress old injustices and avoid future missteps, or does it merely elicit sobering images of endless cycles of futile repetition?

The British East India Company and the Lascars: 3rd Archive

Archives are also the repositories of hidden histories – of the voices that were never meant to be heard, but somehow have endured in paper and ink, despite history’s habit of neglecting and suppressing such narratives. One such historically marginalised group is the Lascars: mariners who sailed for the British East India Company, across its many routes of trade and conflict. *Ghost Gardens* incorporates fragments of correspondence between a Lascar in early 20th century Scotland and his family in Oman, where life onboard ship is described in great detail.⁸

The history of the British East India Company forms a complex fabric of interwoven threads encompassing global trade on a scale hitherto unknown, politics, colonial empire building, and religious proselytising, and leaves a palpable legacy of traits that can be observed in the business – and wider world – today. As Das notes: “The modern corporation is, indeed, a child of the East India Company” (Das 2016, X). This short article is not the place to give anything other than a very brief historical overview of the company,⁹ however, I will discuss the role of its private navy – The Bombay Marine – and the Indian, Yemeni and Omani Lascar sailors who worked on the company fleet, as their words, spoken by the voices of their descendants, are a key component in *Ghost Gardens*, as is the bosun’s whistle, a form of signalling that is only found on naval vessels.

Established in England in 1600, by the time of its dissolution and effective takeover by the British crown in 1874, the East India Company had become a key component in British strategies for imperial domination in India and many of its other colonies. Set up originally to establish trade relations with India and

7 Dead authors, dead works, dead sounds – all work on the presumption of loss, even the loss of loss in the digital domain.

8 [Letter from a Lascar - GlaswegAsians at Scotland Street School Museum - YouTube.](#)

9 There were also Dutch, French, Danish, Austrian, Swedish, Genoese and Portuguese East Companies, although the Portuguese and Genoese Companies were short lived.

countries further east, buying and selling spices, silk, porcelain, tea, and opium amongst other things, the Company soon began to exert political power over its geographical areas of operation, eventually controlling approximately a quarter of the world's population and half of its trade. It owned a considerable fleet of trading ships, but, most unusually, it also operated its own army and navy, both of which were fundamental to its expansionist agenda. Even its trading vessels were permitted to take prizes during the Napoleonic wars, thanks to the granting of *letters of marque*, while the Bombay Marine joined regular British naval forces on several occasions. Evolving from the company's original navy, the newly named Bombay Marine was active from the 1680s, undergoing several subsequent name changes as it passed from company to imperial control. Its purpose was to protect the company's trading vessels from attack by pirates, as well as ships from the Mahratta and Sidi states, becoming an important player in the Anglo-Burmese wars (1824-1885). As Wild notes: the Company "eventually built up a fleet sufficiently powerful to be able to go into action anywhere between the Red Sea and China" (Wild 1999, 54). The ships, both trading vessels and the Bombay Marine, employed huge numbers of Indian sailors, and Lascars, although the officer class was restricted to white Europeans.

Even for the officer class, life onboard ship during the 18th and 19th century was extremely challenging, but for those below officer rank, whether sailing in a fighting or trading vessel for the Company, the conditions were brutal. These sailors were known as the Lascars, a term originally used to describe a group from the Indian subcontinent, but soon becoming a blanket term to describe any of the company's non-white sailors, from India, the Arabian Peninsula, Somaliland, China, and other territories. Although Lascars were employed with contracts that promised monthly wages and a return passage at the conclusion of the voyage, the reality was very far from this model, with complaints of brutal treatment, the withholding of pay, and strandings in European ports with no means of return home, occurring with distressing regularity. The Company established hostels and missions for the Lascars in various European ports, but with no regulation or oversight, these were often little better than prisons or the workhouse. Desertion from ship was a common occurrence, with the Victorian missionary to the Lascars, Joseph Salter, recording "harrowing tales of mistreatment" (Visram 1986/2015, 35). Thus, although these stories have only recently become more widely acknowledged in the UK, a record of Lascar life in the Company and post migration and settlement across the former British Empire does exist, and is now being shared in projects such as the 2020 'GlaswegAsians exhibition at Scotland Street School Museum,' and the Wellington Trust's 2022 exhibition 'Lascars in War and Peace,'¹⁰ while Mohammad Siddique Seddon's

10 [Lascars – Britain's Forgotten Stories - YouTube](#).

The Last of the Lascars (2014), provides a comprehensive overview of the Yemeni Lascar community in Britain during the 19th–21st centuries.

Derrida, Fisher, and Archive as Creative Process: 4th Archive

Ghost Gardens is as much an extended reflection on the nature of loss across multiple circumstances as it is a soundscape evoking passages of time and travel. The work of Jacques Derrida and Mark Fisher provide illuminating interlocutors: Derrida's *Archive Fever* (1995/1998) and *Cinders* (1987/2014)¹¹ probe questions of the archive, archivization, recorded acts and acts of recording, while Fisher's *Ghosts of My Life* brings micro-sampling and digital storage into the conversation.

There is no archive without a place of consignment, without a technique of repetition, and without a certain exteriority. No archive without outside (Derrida 1998, 11).

But where does the outside commence? This question is the question of the archive (Ibid, 8).

Archive Fever and *Cinders* are two key texts in which Derrida deconstructs the archive by probing its structure, the 'consignment' and collation of its contents, issues of access and retrieval, and their relationships with concepts of memory and the self. He then considers further questions pertaining to the nature of recording and inscription – digital and physical – mediated by an extended contemplation of psychoanalysis' forms and systems of 'writing'. Derrida shows how an archive can never be considered 'finished' or closed. There is always the potential to increase its contents, to rearrange its internal – and external – structures. He presents the archive and acts of archivization as generative 'fabrics' (or grids) that create (weave) and house their contents, and the events from which they are drawn, using the televisual and radio news media's presentation – and shaping – of live events as an example of this process. We can observe similar, and disturbingly amplified, versions of this activity in contemporary, AI driven, social media.¹²

11 Derrida considers digital archives in *Specters of Marx*, where he explicates the nature of hauntology. Fisher also covers this subject area in *Ghosts of My Life*, but due to considerations of space, I have chosen not to bring hauntology into the current discussion.

12 See, for example, Grafton Tanner's *The Circle of the Snake: Nostalgia and Utopia in the Age of Big Tech* (2020).

Derrida explains:

The meaning of 'grid' does not achieve assembled totality. It crosses through. To establish a grid is to cross through, to go through a channel. It is the experience of permeability...such a crossing does not move through an already existing-texture; it weaves this texture, it invents the histological structure of a text of what one would call in English a 'fabric' (Derrida 2014b, 121).

And:

...the archive, as printing, writing, prosthesis, or hypomnesic technique in general is not only the place for stocking and for conserving an archivable content of the past which would exist in any case, such as, without the archive, one still believes it was or will have been. No, the technical structure of the archiving archive also determines the structure of the archivable content even in its very coming into existence and in its relationship to the future. The archivization produces as much as it records the event (Derrida 1998, 16-17).

As the composite, creative product of old and newly created archives, stored digitally and physically, of written documents, sounds and images, *Ghost Gardens* resonates with these ideas. It describes journeys, Derrida's 'crossing through,' in the archival sense – for *Ghost Gardens* is itself an archive – through the passage of time from the 18th–21st century, through migrations of people, plants and animals, along ocean currents, and across an everchanging landscape, exacerbated by climate change. *Ghost Gardens* weaves a texture of past and present that looks to a seemingly pre-written climatic future.

Are the contents of the archive dead? Derrida thinks not, instead suggesting that the process of archivization makes a new, living event. Thus, dead becomes live, archived becomes performative, the archive is interactive, it speaks to the future, in the same way that *Ghost Gardens* speaks to its audience, and future audiences. *Ghost Gardens* is also, in a sense, a hidden archive, its many recorded samples having been subjected to extremes of processing, thereby overwriting their original sonic identities, creating instead, a new audible 'fabric,' in ghostly echo of the overwriting of historical narratives, and transformation of the planet. Thus, acts of recording and recorded acts are of prime importance in the creative process. As Derrida comments:

What is involved in this phonographic act? Here's an interpretation, one among others. At each syllable, even at each silence, a decision is imposed: it was not always deliberate or sometimes even the same from one repetition to another. And what it signs is neither law nor the truth....Thus we analyse the resource this double text affords us today: on the one hand, a graphic space opened to multiple readings,

in the traditional and protected form of the book (and it is not like a prompt- book, because each time it gives a different reading, another gift, dealing out a new hand all over again), but on the other hand, simultaneously, and also for the first time, we have the tape recording of a singular interpretation, made one day, by so on and so forth, at a single stroke calculated and by chance (Derrida 2014a, 7–8).

Ghost Gardens uses a mixture of second hand, sonic found objects, and new ('live') recordings, made by the three artists involved in the complete project: myself (composer), sound artist João Menezes (technical advice) and film maker Alia Yunis.¹³ Documentation comes in three principal formats: films (MP4s), sound files (MP3s) and retrieved audio and film sound (various formats, for example WAV). Before work in the DAW could commence, all were converted into MP3s. As with Derrida, this process was 'calculated and by chance', with some samples being recorded specifically for the soundscape, some repurposed from the film's audio and subsequently embedded into the soundscape, some were found objects from other sources – free libraries, YouTube and so on – while others were old recordings made by the creators, but never intended for this specific creative purpose. The archive that *Ghost Gardens* generated not only served the creative process, but also documented landscapes and animals that are fast disappearing, with the IUCN red list (2021) showing that "biodiversity is declining faster than at any time in human history. Since 1970, there has been on average almost a 70% decline in the populations of mammals, birds, fish, reptiles and amphibians".¹⁴ We can also transfer Derrida's comments regarding the 'multiple readings' each (graphic) text allows, to the sound document itself. Each sample can be endlessly re-used, reinterpreted, and re-processed in a virtually limitless number of further permutations, "dealing out a new hand all over again."

As a further act of curation and archivization, the samples were divided and stored in the following sub-categories:

1. Footsteps: sand, shingle, asphalt, gravel, wood, earth
2. Birds: gulls, albatross, parrots, peacocks, egrets, frigate birds, petrels
3. Water: shore line, river, deep ocean, ocean spray, waves, rain, snow
4. Air: wind, in trees, on water, breeze, gale, storm howls
5. Ship: engines, sirens, horns, bosun's whistle, bells, ropes, wood creaking/groaning/snapping, metallic booming, storm in Lyme Regis with ships in harbour, flapping sails
6. Human: speech – UK, India, Oman, Scotland, whispering, cries, children

13 Sound recordings were made in the UK, Oman, India, Jordan and the United Arab Emirates.

14 [Biodiversity loss risks 'ecological meltdown' - scientists - BBC News.](#)

7. Metal percussion: bells, chimes, gongs, singing bowls
8. Applied sounds: crackle, hiss.

Conceptual questions arise from the process of creative archiving:

1. Structure and format. How is the format of the archive structured by its contents and how do the contents adapt to the ‘form’ of the archive? In *Ghost Gardens* the use of different audio and visual files and formats (MP3s and 4s), made with phones, video cameras, zoom recorders, using a variety of microphones, and other methods of documentation had implications for transferral to the Ableton DAW. There are also the well documented issues of compression and file format (WAV for example) to take into account, all of which have implications for the final work.
2. When Derrida states that “archivization produces as much as it records the event”, is the ‘event’ that Derrida speaks of – that is the creation of new objects in order to form a new archive – a curation? In *Ghost Gardens*, is it the act(s) of recording, or the composite creative work, or both, that is the event?
3. Is an archive ‘dead’ once it is formed, or does its interactive and transformative potential (as well as the accrual of new contents) give it endless life? *Ghost Gardens* can be performed multiples times in different environments and I could easily add or remove material or make other changes to what is currently there, keeping the work endlessly in ‘play’.
4. Following on from question 3, are recorded samples used in the process of composition ‘dead’? Derrida comments: “Let us guard against saying that death is opposed to life. The living being is only a species of what is dead, and a very rare species” (Derrida 2014a, 51). Perhaps recordings should be thought of simply as ‘undead’ sounds, pharmakoi, or zombies, who problematise the metaphysical spatial opposition of near and far and the temporal opposition of past, present and future.
5. Do the samples, taken out of original context, ‘talk’ to one another in ways other than the composer imagines, and how does the inclusion of pre-recorded ‘found’ audio materials sit within the archive? On the DAW itself there are subdivisions (micro curations) for the purposes of simplifying the visual ‘score’ and accelerating the efficiency of the composition process (Figure 1). Would it be better to build in deliberate obstacles to composition by removing these subsets?



Figure 1. Section of working DAW score for Ghost Gardens.

Fisher notes that “what we have lost, it can often seem, is the very possibility of loss” (2014, 144), with childhood tv programmes and obscure performances regularly turning up on YouTube. You Tube itself is a huge digital archive of course, but, like Derrida’s performative archive, it is one that is fluid and ever-changing. As new items are added, old ones can no longer be traced through the usual search terms, even though they are still on the platform, while other content is removed for legal or personal reasons of the original uploader, only to reappear soon after from another source. We are all used to seeing ‘this video is no longer available’ and similar frustrating obstacles in our searches. As an archival labyrinth You Tube has a nasty habit of changing the paths of recommendation by which we often navigate its virtual documentation. So, although loss itself has indeed, for the most part, not been lost, it may at least have been diverted. Derrida expresses similar sentiments regarding “the accessible and the inaccessible, the notorious filterings of the Library of Congress” (Derrida 1998, 18). The archive as structure and system of rules, then, conserves, preserves, and commits to memory so that we may forget. However, archives decay, formats become obsolete, technological retrieval systems no longer work, and the memory of the process of retrieval as well as the object itself are lost.

A sonic evocation of loss is often signified through the presence of audio crackle, whether existing on a physical recording or having been applied to a mix – as I have in *Ghost Gardens*. Crackle is an interesting sonic phenomenon, that “invokes the past and marks out our distance from it, destroying the illusion that we are co-present with what we are hearing” (Fisher 2014, 144). Crackle, and hiss, place the listener in a temporal paradox, evoking lost futures, and present futures in the digital domain, simultaneously with the past, and have been used to great effect by artists such as The Caretaker, William Basinski, and Marc Richter, for example. *Ghost Gardens* uses crackle to reveal this temporal paradox, while also supplying sonic textures that sound like the sea, especially when the crackle and hiss have been stretched over long periods of time. Composing with archives presents interesting work choices too. Working with a visu-

ally dominated 'score' composition becomes more like horizontal painting, with time and line governing the proceedings.

Recordings and recording processes channel the domains of the audio-document and the processes and structures of memory. As with 'Letter from a Lascar', these are someone else's memories, but that does not make them any less compelling, instead providing a glimpse into a past that most of us are completely unaware of – a hidden history. According to Fisher, listening to the extreme micro-sampling of G.E.S. (Gesellschaft zur Emanzipation des Samples) feels like "coming upon other people's orphaned memories" and "witnessing stray frames from a film no whole version of which exists anywhere" (Ibid, 146). It's a very effective way of illustrating in sound hints of the suppressed, hidden and marginalised, such as the sailors on the Bombay Marine and British merchant shipping. In *Ghost Gardens*, speech and conversation are – deliberately – obscured, so that only single words and syllables can be clearly discerned for the most part, giving the impression of a narrative being tuned into, where it is impossible to quite grasp the thread of the story, breaking up into distorted and indiscernible phonemes when we try to listen in.

Derrida's contention that the living being is only a species of what is dead, and the dead archive is a pledge or promise to the future, problematises notions of differences in the status of recordings and 'live' sound, suggesting instead that they are part of the same process. Repurposing sound documents is nothing new of course, from their earliest days, records were more than just recordings, their inherent artistic possibilities as found objects having been explored by, for example, John Cage (33½, 1969), Pierre Henry (*Le Microphone bien tempéré*, 1970), Karlheinz Stockhausen, (*Gesang der Jünglinge*, 1955–56 and *Hymnen*, 1966–67) et al. Thus, audio-documents still communicate with their listeners, although more as sonic ghosts, perhaps, a living presence at one remove. Derrida explains:

Perhaps he does not respond, but he speaks. A phantom speaks...this means that without responding it disposes of a response, a bit like the answering machine whose voice outlives its moment of recording: you call, the other person is dead, now, whether you know it or not, and the voice responds to you... (Derrida 1998, 62).

We respond to the audio archive by listening, by applauding, by congregating and by using. Even though in some sense we are 'talking' to the dead, or listening to echoes, ember like, the archive must, and will, always speak to the future.

To record, to archive, is the promise of the future, to the future. The promise of the archive ...as wager [gageure]. The archive has always been a pledge, and like every pledge [gage], a token of the future. (Derrida 1998, 18).

Conclusion: 5th Archive

...the question of the archive is not, we repeat, a question of the past. It is not the question of a concept dealing with the past that might already be at our disposal or not at our disposal, an archivable concept of the archive. It is a question of the future, the question of the future itself, the question of a response, of a promise and of a responsibility for tomorrow. The archive: if we want to know what that will have meant, we will only know in times to come. Perhaps. Not tomorrow but in times to come, later on or perhaps never (Derrida 1998, 36).¹⁵

Without the electronic archive, *Ghost Gardens* would not exist. It utilises pre-existing archives, it creates new archives, it takes advantage of the meta-archontic tools of google and YouTube, while it is itself, a virtual archive, simultaneously old and new, near and far, undecidable and a little perplexing, questioning concepts of origins, memory, migration and return. And during its creation, it has shaped – and been shaped by – its own contents and structures, in acts of archival collation, storage and retrieval, simultaneously intersecting its archival layers with questions of history, ecology and sound, in a creative process that grafts past and present, yet speaks to the future in hopeful promise but also warning. Will the future be able to answer though?

15 When archives open questions of temporal narrative, they disseminate seeds of doubt, of possibility, they shape the future, like self-fulfilling prophecies, especially when their contents are shaped with an eye to spectacle.

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Internet Resources

- BBC**: [Biodiversity loss risks 'ecological meltdown' - scientists - BBC News](#).
- Royal Museums Greenwich**: [Research guide F5: The East India Company | Royal Museums Greenwich \(rmg.co.uk\)](#).
- Scotland Street School Museum**: [Letter from a Lascar - GlaswegAsians at Scotland Street School Museum - YouTube](#).
- The Wellington Trust**: [Lascars – Britain's Forgotten Stories - YouTube](#).
- United Nations**: [Hottest July ever signals 'era of global boiling has arrived' says UN chief | UN News](#).

**GHOST GARDENS: THE INTERSECTION BETWEEN ELECTRONIC ARCHIVES
AND ARTISTIC RESEARCH
(summary)**

I introduce the principal themes of the archive, contemporary climate change, migration, and the hidden histories of Lascars – maritime employees of the British East India Company. I outline the impact of coastal erosion and catastrophic flood events on communities and indicate in what ways *Ghost Gardens* engages with these subjects. I discuss the importance of archival documentation in earlier environmental catastrophes followed by a brief history of the Lascars. I discuss the archive as a creative process and its status as an open and fluid entity. I indicate how these ideas intersect with Derrida and Fisher, covering access and retrieval, temporal and spatial approaches, memory, sampling, recording, and composing with a DAW as an archival tool and creative process. I conclude by placing *Ghost Gardens* within a wider temporal, archival framework, pondering questions of the future while engaging with the past. The paper itself is structured through a series of interconnected archives, with subsections and an exergue to elucidate the unfolding research processes during the creation of Ghost Gardens.

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Scholarly analysis

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CONTINUOUS BRAIN ACTIVITY IN ARTISTIC RESEARCH *I SIT AND WORRY ABOUT HER*

Abstract: This text discusses the intentions and outputs of the complex creative processes associated with a sound experiment entitled *I Sit and Worry about Her*. This project involves a sound representation of the continuous motherly worries within the wider context of artistic research, by analyzing and measuring the brain activity as a central concept of the work. The project explored the applications of electroencephalogram technology (EEG) in order to deepen the practice of musical perception and creation, but also to present an affective mother–daughter relationship I explored the spontaneous interactive relations of the participants during musical improvisation. The results of this research were presented in the form of a musical performance.

Keywords: biosignal-driven music, EEG and music, mothers and daughters, brainwave improvisation, jazz and well-being.

I Sit and Worry about Her is a musical experiment that aims to create an authentic artistic expression through a transdisciplinary approach, with the help of neuroscience, technology, and social engagement. This project was produced by the Center for the Promotion of Science, Belgrade, and was a national winner in the EU AI Lab Program led by Ars Electronica in 2019. It was performed at SASA – Science and technology Gallery – Premier, Arts & Science Lab EU Program – Belgrade (2019), Ars Electronica Festival, Kepler’s Gardens (2020),

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Other World Group Exhibition, Balkan Cinema – Belgrade (2020), and Arts & Science Group Exhibition, Faculty of Philosophy – Belgrade 2020.

The goal of this experiment was to create an original approach to the sound representation of motherly worry in the wider context of artistic research; brain activity was a central concept in exploring the spontaneous interactive relations in music making. The article discusses the intentions and outputs of the complex creative process involved and provides readers with its interpretation and documentation. This artwork is unique since it is focused on the cultural and personal experiences of being a mother of a female child in today's society, and the collective distribution of emotions translated into the sound projection of brain activity. Taken-for-granted cultural experiences of motherhood have raised feminist questions that were answered in the brain–sound art environment. This artistic research highlights the intricate interplay between culture, psychology, and gender roles within the mother–daughter relationship, emphasizing that the mother–daughter relationship is deeply embedded in the broader sociocultural fabric. We explored the function of the large-scale cortical networks and applications of the electroencephalogram (EEG) (Borck 2018, 1) technology as a tool used for artistic purposes; the aim was not only to deepen a personal music practice in creation and interpretation but also to experiment with the unconventional modes of interactive communication between the participants.

Being a Mother in recent artistic works

Over time, societal expectations have traditionally defined the role of mothers. However, in today's society, these conventional frameworks are being challenged, expanded, and even dismissed. The understanding of the term 'mother' is no longer as universally evident as it once was in past centuries. Many female artists are exploring the realm of motherhood with feminist perspectives, creating new narratives.

In group exhibition *My Mother's Daughter*, curated by Julia Fidler (2021) and presented at Roskilde Festival (Fidler 2021), female artists such as Larissa Esveld, Lennard Creutzburg, Margriet Luyten, Maria Pask, Pleun van Dijk, Tanja Ritterbex and Sydney Lowell experimented with their own experience and perception of 'mother', which is reflected in their work. 'Mother', as one of the most universal and yet one of the most personal concepts in the world, was investigated from different views; what a mother is or should be because we all have different experiences with 'mother', image of a woman, role of a mother, change through feminism and philosophy, mothers in the modern age (Western experience), the mother's influence on the child, mother–child relationship, and change through life phases through various perspectives. This exhibition opens

a discussion about the concept we all have of a mother, or of motherhood, and it shows that it has changed dramatically as a result of feminism and psychoanalysts.

Elizabeth Hibbard, an American artist, delves into the intricacies of the mother–daughter relationship in her work *The Dynamics of the Mother–daughter Relationship* (PhMuseum 2020). Focused on the female body, maternal bonds, and humanity’s role in nature, the project explores desires and fears related to species reproduction. Hibbard examines the liminal space between self and mother, intimacy and isolation, and desire and revulsion. Her concern lies in the unreflective inscription of femininity, particularly within the family structure, and the role of the lenticular gaze in this process. By delving into the subconscious and bodily recesses, Hibbard seeks guidance, intertwining anxieties about reproduction, motherhood, and the environmental and political climate of today. This introspective exploration addresses the pressing collective question of navigating an uncertain world in the shadow of impending environmental crises.

Context of Mother–daughter in *I Sit and Worry about Her*

This experimental work explores the mother–daughter relationship, delving into its psychoanalytic and sociological dimensions. Cultural variations shape the psychodynamics of mothering, recognizing that patriarchal cultural contexts play a crucial role in defining maternal roles and expectations. Cultural norms and practices influence the emotional and psychological experiences of women as mothers and the subsequent impact on their daughters’ development (Lorber, Coser, Rossi, and Chodorow 1999). Also, cultural expectations shape mothers’ identities and behaviors, influencing their daughters’ understanding of gender roles and relationships. Unconscious processes, learned behaviors, and interpersonal dynamics also contribute to the shaping of maternal roles and the mother–daughter relationship. Mothers often find themselves deeply invested in their daughters’ lives, driven by a combination of love, concern, and a desire to shield them from societal pressures. In navigating the intricate web of societal expectations, mothers worry about their daughters’ well-being in the broader social environment.

This worry is heightened by the realization that the social landscape is continually changing, presenting new challenges and opportunities. The intergenerational transmission of values, expectations, and concerns becomes a central aspect, influencing how mothers perceive and guide their daughters in the face of societal pressures. As mothers grapple with their own experiences and societal shifts, the complexity of the mother–daughter relationship unfolds, creating a narrative rich in emotional dynamics.

In a feminist context, the complexity of the mother–daughter relationship is further accentuated by the scrutiny of traditional gender roles and the pursuit of empowerment. Mothers, cognizant of historical gender disparities, navigate a delicate balance, fostering their daughters’ autonomy while challenging societal norms. The relationship becomes a crucible where feminist ideals intersect with maternal guidance, shaping daughters who are not only resilient in the face of societal expectations but also equipped to challenge and reshape them.

In contemporary society, gender norms are in a state of flux, with women increasingly challenging historical constraints. Navigating this shifting landscape, mothers find themselves torn between wanting to shield their daughters from persistent gender inequalities and preparing them to confront and dismantle these challenges. The complex task of instilling resilience while acknowledging the societal barriers women face underscores the difficulty of raising daughters in a world where gender expectations remain deeply ingrained (Martin 1987).

As a mother of a daughter, and as a contemporary artist in a patriarchal social environment, I revealed my concerns, fears and worries, and, at the same time, I was looking for a shared experience and mutual support.

Mothers in the experiment

Four mothers of daughters (of different ages) were asked to participate in the research and the final performance. Besides mothers, other eight volunteering respondents (of different ages and sexes) participated in our lab work. The team analyzed their brain activity emerging under the influence of acoustical stimuli: improvised music that I played live, and the custom-made psychological audio triggers (consisting of previously recorded voices and words of the mothers’ daughters). The analytical results were used in the creation of the sonic projection based on the measured/observed brain waveforms that mothers produced as a reaction to these stimuli. Sonic projection of the brainwaves was presented as the generated musical symbols for the emotional reactions during the performance. In the final stage, a musical performance was presented in the context of the experiment itself. During the performance, the same four participating mothers were “non-performers” (listeners as performers) musically interacting with their in real-time measured brainwaves (in the form of sound projection), with each other, my live music improvisation and previously recorded daughters’ voices. The sonification of the brain waves served as an artistic concept resembling an incessant and endless worry of a mother for her daughter, presented through an ongoing improvised song. The poetics of the complex multilayered artwork provided me with my own constitutive interpretation of the brainwaves, as well as the intentionality through the concept (Šuvaković 2008,

19). This method enabled the audience to understand and experience the autoethnographic exploration of the mother–daughter relationship, whereas the personal and collective experiences were used to examine and/or critique the cultural one (Jones, Adams and Ellis 2016, 22).

Bio-signal as Music Content

Brain waves represent rhythmic variations in voltage between parts of the brain that result from the flow of an electric current. Brain waves change according to what we do and feel (brainworksneurotherapy.com 2020). Beta activity is associated with active thinking and concentration, so where the faster frequency is dominant, a sense of alertness occurs in awakened state. Beta activity rises when our attention is directed towards the outside world, and is most evident in the frontal lobes (Millet 2001, 522–542). Alpha activity is linked to the relaxation state. While slower brain waves are dominant, fatigue, sleepiness, and sluggishness are felt. Usually, alpha activity will increase when a subject closes his or her eyes, and beta activity will then increase when a subject opens his or her eyes. The strongest alpha waves can be observed in the occipital lobe (Nijholt 2019, 4). Theta waves are related to, for example, daydreaming, or can be observed in children in a sleeping state. Theta activity indicates deep relaxation and meditation, associated with very slow waves (Hadjidimitriou and Hadjileontiadis 2012, 3498–3510). Human brainwaves were first measured in 1924 by Hans Berger (Hans 1928, 527–570) by the EEG, a visual plotting of the signal that generates electric fields of neural activities. These electric fields are extremely faint, with amplitudes on the order of only a few microvolts, so that they must be greatly amplified in order to be displayed or processed (Miranda and Brouse 2005, 331–336).

I used the monitoring of brain activity as an expanded compositional and interpretational technique. The idea was to take contemporary technology and recontextualize its functions by placing the frame of music performance around its data, providing a new dimension to artistic practice.

In the immersive research followed by the performance unipolar electroencephalographic (EEG) recording was performed using two EEG electrodes placed on the right lobe of subjects (auditory processing area) (Samson and Ehrlé 2003, 2006; Zattore 2003, 231) one in the frontal lobe (F4) and the other in the parietal lobe (P4), according to the 10/20 International EEG electrode placement system (Klem, Lüders, Jasper and Elger 1999, 3–6) (as recommended by the International Federation of Societies for EEG and Clinical Neurophysiology). A reference electrode was placed on the right mastoid bone and a ground electrode was positioned on the forehead. The signal from electrodes

was perceived and augmented by OpenBCI Ganglion hardware, which sent the information to a computer, with an activated and visualized EEG signal being processed in OpenViBE software. The usage of two EEG electrodes, OpenBCI hardware (Open Source Brain-Computer Interfaces 2020) and OpenViBE software (Open Vibe, 2020) is an open and common low-cost solution for such kind of experiments and performances, widely available to the art and neuroscience community, and only affordable but sufficient toolkit for our research. Notch filtration and frequency band extracted alpha (8–13 Hz), beta (13–30 Hz), and theta waves (4–8 Hz), and was performed in real-time. The signal segments were taken every one second and the power of the range was compared to that of the threshold. Transference of the signal went with negligible delays, so we could say, in a non-technical manner, that it is instant. When a threshold reached its individually-adjusted frequency value, the pre-recorded audio sample was represented as a brain wave projection (see Figure 1).

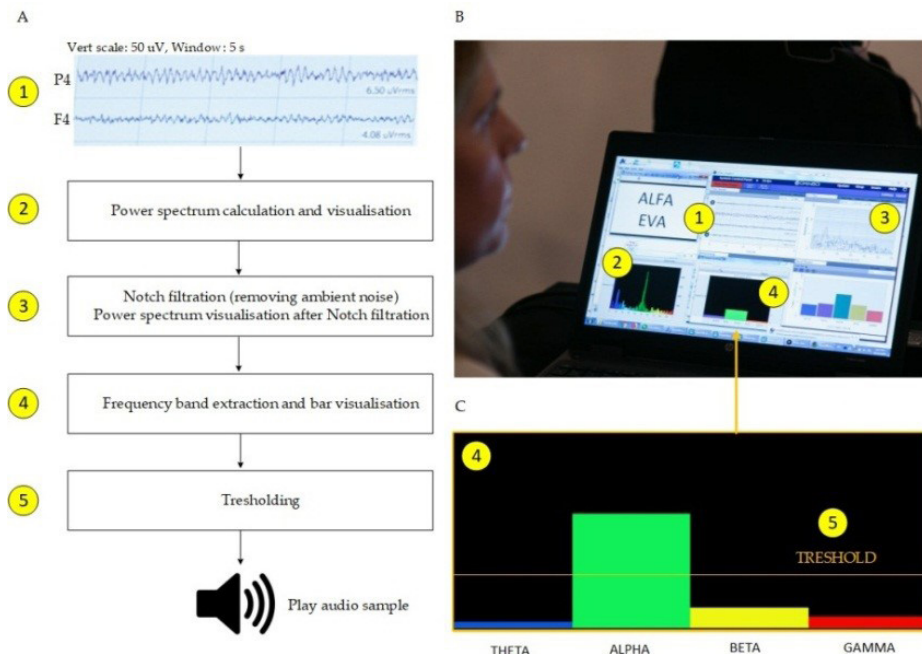


Figure 1. Procedure and interface. A) Block diagram of the real-time algorithm B) Example of interface presented to the operator during the performance C) Bar visualization of extracted frequency bands with the threshold for alpha activity (when alpha activity crosses the threshold, it will cause playing of the corresponding pre-recorded audio sample).

Research Process

During the five months long collaborative research, I was privileged to work in a team with several experts in EEG technology and biomedicine.² The research does not qualify as a scientific one, but it served the internal purposes of the performance. Four mothers as main respondents, as well as eight other volunteers, were examined; every examination lasted approximately from two to three hours and was repeated twice. The goal of the research was to investigate the examinee's responses (brain activity) to different audio stimuli in the form of live improvised music. Also, the intention was to configure the possibilities of the improvisational methodology that can directly influence brain waves and manipulate the listener's brain activity; to produce sounds that provoke calmness, enjoyment, peace, and equilibrium of mind. To this practice-based research, personal acquired experience from yoga and mindfulness techniques as an instructor and practitioner was a source of indispensable knowledge for the mind control method development with sound. The reference to my previous artistic research (Jovicevic 2018), inspired by the vibrational fields which act as energetic whirlpools responsible for a person's holistic body and mind condition, served as an inspiration and a starting point (Jovicevic 2019, 78–82).

While the respondent's mental activity was being monitored, I was freely improvising in front of them on the soprano saxophone, alto saxophone, bass clarinet, and the spacedrum. Cognitive studies examine several perceptual attributes that can be individually manipulated in order to analyze how our brain processes music (Shan 2012; Peretz and Zatorre 2003; Gerard, Drake and Botte 2005, 192). During the experiment, the brain activity changed in relation to sound color of the instrument, rhythm, speed, style of improvisation, timbre, meter, dynamics, length of music sentences, intonation, tonality, and extended instrumental techniques. The brain reaction to audio stimuli investigation was crucial for the brainwave sound representation, that is, the audio samples recorded with acoustic instruments during the research period. Guided by the research results, we recorded 12 sound samples, with every participant obtaining three samples for each brain wave, adjusted to their threshold. The research showed that samples produced for a certain frequency conjoined with and played back to the respondents induced the projected brain activity. These samples were interpreted

2 Assistant Professors Milica Janković and Jelena Čertić from the University of Belgrade, School of Electrical Engineering, Nebojša Malešević, Postdoctoral Fellow, Lund University, Faculty of Engineering, Department of Biomedical Engineering, and the students of the BioMedical Instrumentation and Technology (BMIT) Lab from the School of Electrical Engineering in Belgrade.

in the performance space when the brain activity threshold reached the certain frequency.

Conducted Performance



Figure 2. Performance.

During the performance, four mothers who have daughters (all of different ages) sit still on the scene in front of me, a musician (Figure 2). While they are listening to the improvisation and audio samples of their daughters' voices that trigger certain emotions and thoughts, their brain activities are being measured in real time. With the different sound frequencies, instruments, and improvised content, I generate three kinds of brain waves from the four mothers: alpha, beta, and theta. The EEG system registers the dominant brain wave at a certain threshold and triggers the brainwave sound projection previously recorded. A sonified projection of everyone's brain activity is being heard in the performative space, so that mothers, myself, and the audience can all hear it. This instigates an interactive communication between mothers, generated sound, daughters' voices, and instrumental music. The unpredictable sonic content from the brain waves is being manipulated once again by the musical improvised content. Perpetual modification and mutual communication through the sound effects that activates new possibilities in the sonic game among the participants becomes a self-making improvised musical piece, re-directing the individual experience of the participants towards a collective course of unpredictability and accidents. Non-performance technique and immobility of performers place a human body

in the role of mediator. In other words, the body does not aim to interpret a sound by instrument or voice, but by mind: sensory observations and minimal physical gestures causing changes in focus and mental processes.

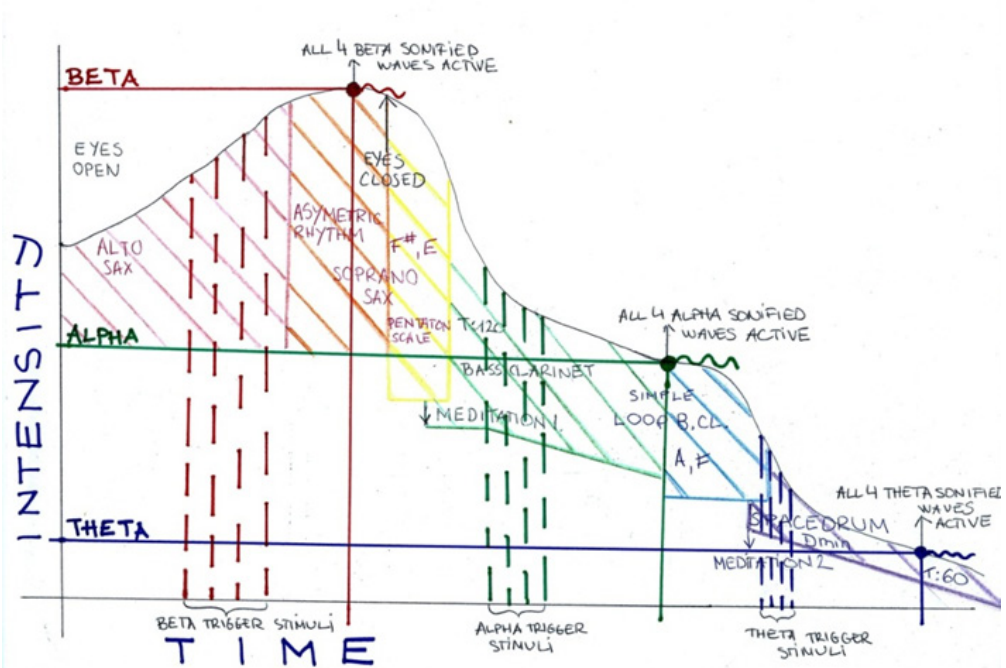


Figure 3. The Score Diagram.

The constructed compositional diagram represents the dynamics of the brain intensities for a 30-minute-long music composition (Figure 3). Prior to performing, I projected a musical scenario that leads non-performers from beta-alpha-theta brainwaves, using instrumental improvisational techniques, brainwave sound projection, and prerecorded triggers-voices. The score alludes to the existence of mothers' transfer of emotions between all of us by experiencing everyone else's reactions through the interaction. The map shows the composer's prediction of timelines for the collective unison reactions with forecasted functions of the sounds. Although the instrumental parts were improvised in relation to the group sound production, certain elements were composed beforehand; what was specified is for example, when to enter with alto/soprano saxophones or bass clarinet, where to use a pentatonic scale or asymmetric rhythms, to perform sudden indications of noise or more aggressive dynamics, when to evoke meditative musical atmosphere, and when to play recorded voices. The score was a proposition, and its successful realization proves that it is possible to manipulate brain activity and distribute personal experience into a collective one, amplifying compassion and solidarity between us.

The artistic concept of a Mother's Brain

“Our willingness to risk ourselves – our stories, our identities, our commitments – in relation to others constitutes our very chance of becoming human” (Butler 2005). The autoethnographic method uses personal experiences to describe cultural experience (Jones, Adams, and Ellis 2016, 22), and in this work, a mother's voice with deep emotions was revealed and reflected in order to make meaning and construct relationships in music.

The mother–daughter relationship has a long-lasting effect on women's lives. From early childhood, an unspoken pact is forged between mother and child, a mutual agreement not to question the unbreakable bond between them. This bond, rooted in the fear of losing love, reflects the mother's inability to guarantee unconditional love – a sentiment she herself may not have experienced (Friday 1977, 3). The fear of losing love can influence the choices and behaviors of both mothers and daughters. When the child shares the same gender as the mother, it becomes a reflective mirror, evoking a tidal wave of emotions encompassing love, fear, or anxiety. Additionally, as discussed by Nancy Friday (1977), the emotional intricacies embedded in the mother–daughter bond add another layer of complexity. The transmission of values, fears, and aspirations through generations makes the process of fostering independence while maintaining a supportive connection particularly delicate.

The purpose of personification was not solely to understand worry and fear but to provoke the audience, making them think about taken-for-granted cultural experiences of motherhood and how our identities are gendered or aged. Mothers' emotional reactions in the sound form illustrate the value of personal experience, the importance of self-reflexivity, and the collective distribution of thoughts and emotions (anxiety, fear, love, happiness) through sound improvisation.

In order to further explore the thinking process and possibilities of thought manipulations and emotional responses during the performance, recorded sentences uttered by the daughters were added. A rhythm and pitch are two structural criteria that apply to both speech and music (Besson and Schon 2003, 271). Higher structures like sentence, phrase, or theme are relevant in speech and in music as well (Besson and Schon 2003, 272). A mother recognizes the attitude, emotion, and meaning in a daughter's voice, sound, word, or sentence. Combining the words and sentences with a personal connotation associated with codified music content evoked strong emotions among the participants. These sentences were recorded during the research process, without the mothers' presence, so it was a surprising factor in the performance. Their daughters aged 3, 7, 14, 22, and 43, were asked to say words that provoked happiness, calmness,

worry, or agitation on the part of their mothers. There were recorded laughs (age 3, 7); crying (age 3); little children's recitations (age 3, 7); sentences such as: "Get out of my room!" (age 22), "Leave me alone!" (age 14), "My tummy hurts" (age 7), "I am tired. That's enough" (age 43), "I am self-confident" (age 22), "What will I become in my next life?" (age 7), "I am fine" (age 14), and "Mother, I love you" (all of them). At this stage, multilayered provocation of brain activity was achieved, including voices, improvised content, and the sound projection of their brain frequencies.

To conceptualize this matter, mothers were asked to think and write down their biggest worries concerning a current period of their daughter's life. Sentences were exhibited together with their mother–daughter photo portraits (Figure 4) during the performance.

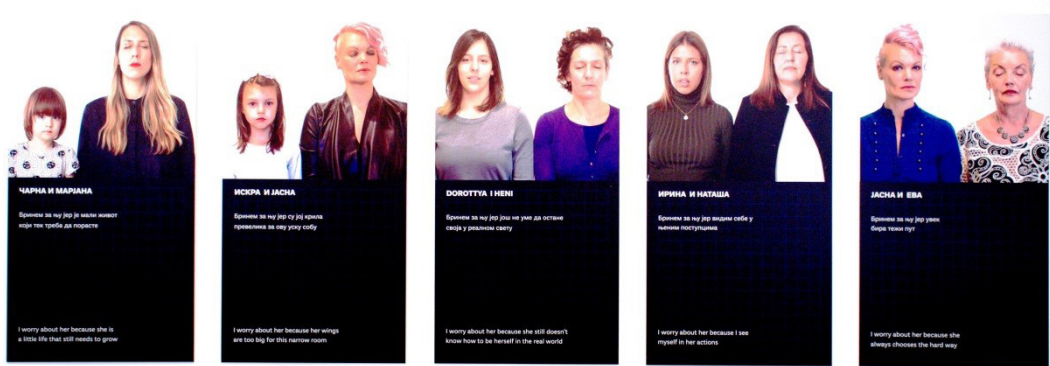


Figure 4. Daughters and mothers.

Sentences:

Marjana – mother of Čarna (age 3): I worry about her because she is a little life that still needs to grow.

Jasna – mother of Iskra (age 7): I worry about her because her wings are too big for this narrow room.

Heni – mother of Dorottya (age 14): I worry about her because she still doesn't know how to be herself in the real world.

Nataša – mother of Irina (age 22): I worry about her because I see myself in her actions.

Eva – mother of Jasna (age 43): I worry about her because she always chooses the hard way.

All of them wished their daughters the freedom to shape their own social portrait, struggling with different fears as they grow and mature. We all have a shared experience: wondering if our daughters will be able to overcome the social obstacles that we, as females, had to go through ourselves.

Documentation of the Work

After the performance, the documentation of the research and performance was exhibited in the SASA Gallery for Science and Technology in Belgrade for two weeks in December 2019 (Živojinović 2020). The exhibition included the two videos, exhibited OpenBCI, posters showing the compositional process and the interfaces, the texts of work's poetics, and the daughters-mothers photo portraits. The complete documented work is available as a web presentation (Jovicevic 2019).

The research aimed to generate not only the material for the final performance, but also new artistic, epistemological, and discursive outputs, as well as a unique compositional and performance practice. Although I learned a great deal from this process, the research was just an entrance to a new realm of artistic research in my practice. The next step in my research involves the self-training of the brain activity while improvising. The goal is to establish awareness and learn how to make the internal and conscious manipulation of brain activity. There are great contemporary examples in brain art (Nijholt 2019, 4) that challenge me to establish a new technique, not only in deep listening but also in aware improvisation, as well as to develop a better understanding of my own musical vocabulary. Further scientific part of research with my expert colleagues will include studies of emotion induction using different audio contents, extraction of temporal, frequency and nonlinear EEG features and application of different machine learning approaches for classification of human emotions in response to music.

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**CONTINUOUS BRAIN ACTIVITY
IN ARTISTIC RESEARCH / SIT AND WORRY ABOUT HER
(summary)**

The text delves into the complexities of the creative processes underlying a sound experiment titled *I Sit and Worry about Her*. Produced by the Center for the Promotion of Science in Belgrade, this transdisciplinary initiative converges neuroscience, technology, and social engagement to authentically articulate the perpetual concerns of motherhood within the ambit of artistic research. Distinguished as a national laureate in the 2019 EU AI Lab Program by Ars Electronica, the project’s far-reaching impact is evidenced by its performances at esteemed venues such as SASA – Science and Technology Gallery, Ars Electronica Festival, and Other World Group Exhibition.

At the crux of the endeavor is the meticulous exploration of brain activity as a pivotal determinant. The integration of electroencephalogram technology (EEG) emerges as an indispensable facet, affording an investigation into the mother–daughter relationship through affective representations. A profound focus on large-scale cortical networks and the application of EEG technology serves as a vehicle for experimenting with unconventional modes of interactive communication during musical improvisation. The research not only seeks to deepen musical practices but endeavors to present an original perspective on the personal experiences of contemporary motherhood, situating itself within broader sociocultural narratives, illuminating the interplay between culture, psychology, and gender roles.

The experiment involves the participation of four mothers, each subjected to extensive EEG analysis during improvised musical sessions – lab work. Throughout the collaborative five-month research, the author collaborated with EEG technology and biomedicine experts, employing a practice-based approach to investigate responses to audio stimuli and develop methodologies influencing brain waves.

After research, during the performance, mothers, seated in stillness, listen to improvised music and audio samples triggering emotional responses, while their brain activities were recorded in real-time. The sonified projections of brain activity created an interactive communication platform, fostering a dynamic, self-making improvised musical piece, symbolizing the perpetual maternal worry for daughters. The immobility of performers emphasized the body as a mediator, interpreting sound not by instrument or voice but through sensory observations and minimal physical gestures, redirecting individual experiences toward a collective course of unpredictability.

The article elucidates the intentions and outcomes intrinsic to the creative process that underscores *I Sit and Worry about Her*.

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Preliminary report

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RAZVOJ DIGITALNIH KOMPETENCIJA I NJIHOV UTICAJ NA INOVATIVNE PRISTUPE U NASTAVNOJ PRAKSI STUDENATA I STUDENTICA AKADEMIJE LIKOVNIH UMJETNOSTI UNIVERZITETA U SARAJEVU

Sažetak: Razvoj novih tehnologija ima značajan utjecaj a mnoge umjetničke oblasti, čiji se procesi rada redefiniiraju, a digitalni alati u susretu s onim analognim, uz opće zakonitosti postaju nastavak kreatorove ruke. Cilj istraživanja jeste utvrđivanje mogućnosti primjene digitalnih i analognih alata u nastavi likovne kulture. Istraživanje je provedeno među studentima budućim nastavnicima, s kojim se željelo utvrditi u kojoj mjeri su digitalni i analogni alati podesni za određeno likovno oblikovanje, te koje su metodičke specifičnosti realizacije takvih nastavnih časova. Istraživanje „Razvoj digitalnih kompetencija i njihov uticaj na inovativne pristupe u nastavnoj praksi studenata i studentica Akademije likovnih umjetnosti Univerziteta u Sarajevu“ predviđa niz aktivnosti, koje nalažu da se studenti i studentice putem predavanja, seminara i radionica, upoznavanju s novim mogućnostima digitalnih i analognih alata, te da stečena znanja implementiraju u svojoj nastavnoj praksi. Utjecaj istraživanja se ogleda u osnaživanju izlaznih kompetencija studenata i studentica, njihovoj pripremi za samostalnu djelatnost u osnovnom odgojno-obrazovnom kontekstu. Digitalni i analogni alati uz primjenu općih zakonitosti likovnog jezika, imat će osnažujući učinak na studente i studentice buduće nastavnike i nastavnice, ali i na krajnje korisnike stečenog znanja, odnosno na učenike i učenice osnovnih

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škola u Kantonu Sarajevo. Upotreba digitalnih i analognih alata u svrhu kreiranja likovnog rješenja će svim polaznicima i polaznicama projektnih aktivnosti omogućiti širok raspon kreativnih vještina i proširivanje izlaznih digitalnih kompetencija, te lakše oblikovanje i izgradnju osobnog likovnog rukopisa. Rezultati istraživanja mogu biti stvarni poticaj za osavremenjivanje programa univerzitetskog obrazovanja, programa cjeloživotnog usavršavanja nastavnika i nastavnica Likovne kulture, te aktuelne i buduće nastavne prakse, koje u prvom planu žele odgovoriti na izazove društvenih stremljenja.

Ključne riječi: likovna umjetnost, likovna kultura, edukacija, inovativni pristupi, nastavna praksa, digitalni i analogni alati, digitalne kompetencije.

1. Uvod

Razvoj novih tehnologija ima značajan utjecaj a mnoge umjetničke oblasti, čiji se procesi rada redefinišu, a digitalni alati u susretu s analognim, uz opće zakonitosti postaju nastavak kreatorove ruke. Tome u prilog sljedeća izjava:

Kreativnost, kao ljudsku osobinu, potrebno je također kultivirati i poticati uz korištenje novih tehnologija, a time će i nastava postati kvalitetnija te odgovoriti potrebama pojedinca i društva u cjelini. (Bjelan-Guska i Hasanbegović 2020).

Međutim, ako u obzir uzmemo savremene društvene tendencije, neizostavno je upotrebljavati digitalne alate, kompjuterske programe i nove likovne tehnike, i iste zastupiti u okviru savremene odgojno-obrazovne prakse. Autori članka pod nazivom „Resources, technology and education” nam upravo ističu kako je orijentiranost u obrazovnim sistemima sve veća ka upotrebi kompjutera, tableta i drugih tehnoloških uređaja, koji se koriste kao integralni dio procesa učenja u čitavom svijetu. Navode kako nam tehnologija današnjice pruža jedan sasvim novi pogled na svijet i pristup različitim izvorima znanja. U tom smislu, uviđamo koliko takvo potpomognuto učenje i upotreba digitalnih i analognih alata, kod učenika i učenica kultivira vještine i samopouzdanje koje će im biti od velike pomoći prilikom razvoja sposobnosti. Uticaj navedenog će sigurno imati svoje pozitivne reperkusije na kreativnost učenika i učenica, koja će osigurati nova znanja, razvoj novih tehnika i tehnologija, te posljedično voditi prema „društvu znanja“.

Kako bi osoba ostvarila svoj puni potencijal, te se pravilno usmjerila ka stvaralačkim procesima, nastavni proces na predmetu Likovna kultura treba da se temelji na tendencijama savremenog društva. Također, pravilno i pravovremeno

vođenje od strane nastavnog osoblja je neophodno jer razvoj novih tehnologija ima značajne implikacije na prirodu kreativnih procesa, a time vrši direktni utjecaj na artikulaciju likovne misli i stvaralačke aktivnosti. Uvidom u postojeći kurikulum predmeta Likovna kultura, uočili smo da je u iskazanim metodičkim preporukama navedena *stop animacija*, kao i upotreba digitalnih i analognih alata, te smo kroz pilotiranje navedenog sadržaja i istraživački rad dali podršku preporučenim sugestijama.

2. Uticaj digitalnih kompetencija na inovativne pristupe u nastavnoj praksi studenata i studentica

Primjenom multimedije, adekvatnih digitalnih i analognih alata te kompjuterskih programa prilikom izvedbe nastave na predmetu Likovna kultura, uveliko se može povećati djelotvornost i učinkovitost nastavnog procesa. Kao što pojedini autori navode:

Na osnovu brojnih pravaca kretanja didaktičke misli, tehnologija savremene nastave uvijek iznova nudi značajne promjene, novine osavremenjivanja nastave, tim više što se, eksplicite, postavlja jasna razlika između tradicionalne i savremene nastave. Teorijska i praktična konsolidacija sistema obrazovanja, odgoja putem umjetnosti sve više ističe upotrebu različitih obrazovnih i nastavnih medija, što mijenja, istovremeno, stil, rad, ali i kvalitet sticanja znanja, savladavanje određene likovne vještine, spretnosti (Handukić 2008, 159).

Navedeno uvjetuje pravovremene metodičke odgovore na potrebe onih koji uče, i prate kretanja današnjeg društva, jer će valjani odgovori omogućiti lakšu integraciju djece i mladih u dinamične društvene tokove i tržište rada. U istraživačkom radu pod naslovom „Application possibilities of computer software in the context of the Art teaching“, autorice Bjelan-Guska i Hasanbegović (2020) su došle do rezultata koji su pokazali visok stepen unutarnje motivacije kod predmetnih nastavnika i nastavnica Likovne kulture po pitanju primjene digitalnih alata te kompjuterskih programa u svrhu likovnog oblikovanja, kao i njihovu svjesnost o pozitivnim reperkusijama na razvoj kreativnosti kod učenika i učenica. Dakle, digitalni alati i kompjuterski programi se već dugi niz godina uspješno koriste pri likovnom oblikovanju, a pojedini od njih i u nastavnom procesu predmeta Likovna kultura, pogotovo ako je u pitanju grafičko oblikovanje, ilustriranje, kreiranje logotipa, stripova i video radova. Navedeno omogućava nastavnom osoblju da zakonitosti likovnog jezika približe populaciji učenika i učenica, te ukažu na to da je današnje dinamično okruženje prožeto vizuelnim komunikacijama, i blisko njihovim interesovanjima i potrebama.

Također, ovdje je važno napomenuti da se studentima i studenticama u okviru studijskog programa kultiviraju digitalne kompetencije preko više nastavnih predmeta, čiji sadržaji se u konačnici stavljaju u funkciju njihovog budućeg odgojno-obrazovnog rada. Međutim, implementacija ovih specifičnih tehnika u nastavi predmeta Likovna kultura, imala je izuzetno osnažujući učinak na razvoj izlaznih digitalnih kompetencija studenata i studentica. Na tragu prethodno navedenog, svoje inovativne pristupe u nastavnoj praksi su zasnovali studenti i studentice, te zastupili/e tehniku stop animacije (eng. *claymation* i eng. *puppet motion*) na nastavnim časovima predmeta Likovna kultura. U istraživačkom radu Fazlina Jaafar, Wan Nor Raihan Wan Ramli i Farrah Hanani Ahmad Fauzi (2013) se navodi važnost stop animacije, koja u fokus stavlja komunikaciju i vještine pripovijedanja. Ova tehnika nam može osigurati prijenos određenog narativa u likovni jezik, pružiti čvrstu vezu između likovnog i vizuelnog mišljenja i digitalnih kompetencija, te u konačnici potaknuti razvoj divergentnog mišljenja. Stoga se u ovom radu ističe kako likovno i vizuelno obrazovanje kao takvo može igrati značajnu ulogu u različitim aspektima učeničkog razvoja, kao što su: kognitivni, afektivni, psihomotorni, moralni, i dr. Tehnika stop animacije i pripadajuće grane su oduvijek pobuđivale ljudsku zainteresovanost jer zahtijevaju poseban pristup prilikom likovnog osmišljavanja, procesa izvedbe i realizacije završnog proizvoda, te prenošenja određene kôdirane poruke, doživljaja, priče i pokreta.

Uz upotrebu ove tehnike će se ostvariti most između direktnog oblikovanja u glini – glinamacija (eng. *claymation*), digitalne fotografije i kompjuterskog softvera za montažu video materijala. Posredstvom fotoaparata i stativa bilježi se svaki pokret skulpturalne forme, nakon čega se pristupa kreiranju animiranog filma od niza sekvenci uz upotrebu kompjuterskog softvera.... (Bjelan-Guska i Hasanbegović 2020).

2.1. Kurikulum predmeta Likovna kultura

Radi lakšeg uvida u provođenje istraživačke aktivnosti unutar školske likovne učionice, osvrnut ćemo se i na nastavni kurikulum. Naime, analiziranjem nastavnog kurikuluma možemo zaključiti da se teži ka stalnom razvijanju i unapređenju djece i mladih, dok se nastavnici i nastavnice obavezuju na primjenu različitih nastavnih metoda i strategija, koje će posljedično osnaživati ličnost maloljetne osobe po svim aspektima. Kao što autorice kurikuluma navode:

Učenje i podučavanje na predmetu Likovna kultura se može organizirati kroz niz većih ili manjih tematskih cjelina, preko kojih će učenik/ica istražiti povezanost likovnih i vizuelnih umjetnosti i tehnologije te

njihovu ulogu u savremenome društvu. Učenika/icu je potrebno uključiti u aktivnosti koje predviđaju upotrebu novomedijske tehnologije u svrhu vlastitog likovnog izražavanja (Hasanbegović, Dorfer Galijašević i Sejdić-Melezović 2021).

U iskazanim preporukama za ostvarivanje ishoda, ukazuje se na kontinuirano poticanje učenika i učenica da kroz samostalni rad ili rad u grupi razvijaju suodgovornosti za vlastito učenje, te unaprijede sposobnosti popravljavanja i poboljšavanja (samoregulacija). Također, navodi se važnost poticanja učenika i učenica ka:

razvijanju upornosti, samomotivacije, samopouzdanja, sposobnosti organizacije i uređivanju vlastitog učenja, razvijanju upornosti i dosljednosti. Kao i osnaživanju kompetencija u nauci i tehnologiji, koje će omogućiti razumijevanje tendencija digitalnog doba i njihovog uticaja na finalnu formu umjetničkog djela. (Hasanbegović, Dorfer Galijašević, i Sejdić-Melezović 2021).

Tragom navedenog, djeca i mladi će nakon prolaska kroz nastavni proces moći da:

analiziraju osnovna izražajna sredstva i principe u vlastitom i tuđem stvaralaštvu te umjetničkim djelima, likovno oblikuju cjeline polazeći od likovnih principa. Istražuju različite likovne medije, tehnike i alate u vlastitom likovnom/vizuelnom izražavanju i umjetničkim djelima, kreiraju idejna rješenja i inovacije, procjenjuju i primjenjuju faze radnog (stvaralačkog i istraživačkog) procesa, posmatraju i percipiraju, istražuju različite vizuelne i likovne sadržaje, Koriste vizuelni jezik u vlastitom likovnom i verbalnom izražavanju (Hasanbegović, Dorfer Galijašević, i Sejdić-Melezović 2021).

Uvidom u postojeći kurikulum predmeta Likovna kultura, uočili smo da je u iskazanim metodičkim preporukama navedena *stop animacija*, te smo kroz pilotiranje ove aktivnosti dali podršku preporučenim sugestijama. Približavanjem tehnike *stop animacije* i njenih zakonitosti, učenicima i učenicama otvaramo vrata za istraživanje novih medija i mogućnosti u sklopu nastave predmeta Likovne kulture. Jednom usvojena i prihvaćena, ova tehnika će biti primjenjiva i za realizaciju drugih projekata unutar škole, ali i vanškolskih aktivnosti. Handukić (2008) ističe važnost sveobuhvatnog pristupa u planiranju te povezivanju različitih sadržajnih i organizacionih elemenata, počevši od obrazovne tehnologije, metoda, oblika, tehničko i likovno didaktičkih medija, čija sinergija predstavlja jedinstveni model sistema rada. U tu svrhu, didaktičko-metodička organiziranost je od presudnog značaja, naročito ako u obzir uzmemo primjenu savremene likovne tehnologije.

Iz čitavog dokumenta vidljiva je i nužna orijentacija nastavnog osoblja ka kontinuiranom inoviranju nastavne prakse, kako bi pravovremeno odgovorilo na sve savremene zahtjeve i zadatke koje obrazovni proces nosi sa sobom.

Organizacija nastavnih aktivnosti treba da bude prilagođena individualnim karakteristikama (fleksibilnost) učenika/ica te da omogućava sintezu iskustava iz svakodnevnoga života, predznanja i znanja iz drugih nastavnih predmeta (interdisciplinarnost) (Hasanbegović, Dorfer Galijašević, i Sejdić-Melezović 2021).

Možemo reći da su ovim dokumentom nastavnik i nastavnica u ulozi moderatora/moderatorice, koji/a kontrolira čitav proces, koristeći se savremenim metodama, strategijama, sredstvima i tehnologijom, sa svrhom odgovora i pripreme populacije djece i mladih na izazove dinamičnog tržišta rada.

3. Primjeri dobre prakse studenata i studentica Akademije likovnih umjetnosti Univerziteta u Sarajevu

U nastavku teksta, dati su primjeri inovativnih pristupa zastupljenih od studentica Akademije likovnih umjetnosti Univerziteta u Sarajevu, odnosno njihov odgovor na savremene tendencije u likovnom odgoju i obrazovanju. Metodčki odgovori se u prvom planu usmjeravaju na upotrebu digitalnih i analognih alata uz zakonitosti likovnog jezika, koji su u suglasju s učeničkim mogućnostima i potrebama, te s izazovima što ih nosi budućnost. Kroz nastavne aktivnosti, učenici i učenice su se sukcesivno upoznavali sa zakonitostima animacije, evolucijom određenih grana animacije kroz historijske periode, te njenim utjecajem na razvoj likovne/vizuelne umjetnosti i tehnologije. Polazeći od samih početaka, tj. korijena i konstantne ljudske zainteresiranosti za iluziju, *stop animacije* su se oduvijek izrađivale, s obzirom da je na taj način bilo moguće prikazati bilo kakav događaj, doživljaj ili zamišljeni pokret. Danas se *stop animacije* koriste i za izradu dječjih filmova, serija i spotova. Pored navedenog, također je bilo važno stvoriti stimulativno i kreativno okruženje, koje potiče učenike i učenice na aktivno sudjelovanje u procesu učenja, istovremeno razvijajući njihovu umjetničku i tehničku vještinu.²

S obzirom da živimo u doba intenzivnih transformacija, u kojem se kompjuterski programi i savremena informatička tehnologija koristi pri produkciji

2 Značajan doprinos radu i provedbi navedenih nastavnih aktivnosti koje su realizirane u osnovnoj školi s učenicima i učenicama predmetne nastave na predmetu Likovna kultura, dale su studentice završne/četvrte godine studija Emina Zećirović i Ilda Halilčević, a u sklopu studijskog predmeta Metodika nastave likovne umjetnosti i likovne kulture – metodički praktikum I i II, pod mentorstvom doc. mr Nela Hasanbegović.

video radova i filmova, a sa svrhom izvedbe i prikaza realističnog pokreta. Film kao didaktičko sredstvo je zastupljeno u nastavi Likovne kulture jer omogućava učenicima i učenicama da se upoznaju s videoumjetnošću kao jednim od načina i medija za likovno izražavanje. Dakle, pored dokumentarnih filmova u nastavi koji djeci i mladima približavaju određene likovne fenomene, zakonitosti filma možemo koristiti i na način da učenike i učenice potaknemo na samostalno kreiranje kratke filmske forme, tj. video rada.

Digitalna animacija je postala jedan od sastavnih dijelova video umjetnosti i njenih tvorevina, filmova, videoigara, reklama i drugih medija. Važno je istaknuti da prepoznamo različite grane *stop animacije*, čije su tehnike dobile naziv u odnosu na korišteni materijal u procesu stvaranja. Upoznavanje s različitim granama *stop animacije* pruža djeci i mladima uvid u raznolikost i mogućnosti koje se mogu postići ovom tehnikom. Također, potiče razmišljanje o tome kako bi samostalno mogli eksperimentirati s izradom likova i objekata, te stvarati vlastite animirane filmove koristeći *stop animaciju*. Kroz dijeljenje iskustava i rasprave s vršnjacima, učenici i učenice dobivaju priliku da izraze svoje ideje i mišljenja o *stop animaciji*. Navedeno potiče razvoj vlastitog kritičkog pogleda na umjetnost animacije i na daljnje istraživanje i stvaranje.

U tom smislu postoje podvrste kao što su glinanimacija (eng. *claymation*), lutkarska (eng. *puppet motion*), papirnata ili izrezana (eng. *paper cutout motion*), grafička *stop animacija* i dr. (Kuzmić 2012). Kao što navodi Jitsupa (2022), *stop animacija* (eng. *stop motion*) je oblik animacije koji može biti realiziran i pomoću fotografije. Nepokretni objekt se pretvara u pokretni kroz različite kombinacije, kao što su naprimjer: kreirane skulpture od gline, izrezani komadi papira uz savijanje i oblikovanje papira, crtež ili korištenje stvarnog predmeta. Predmet se pomjera i fotografira od početka do kraja pokreta, fotografija po fotografija, i zatim se sve fotografije slažu u jedan niz, čineći *stop animaciju*. Važno je napomenuti da se ovaj niz fotografija može obrađivati i oblikovati uz upotrebu digitalnih alata, kompjuterskih programa i aplikacija, bilo na kompjuteru ili pametnom telefonu, te se u konačnici finalni likovni proizvod prikazuje uz pomoć interneta na različitim platformama, galerijama i kino dvoranama.

Uvodni dio nastavnih aktivnosti posvećen je susretu učenika i učenica s određenim referentnim filmovima u kojima je zastupljena *stop animacija* i *glinanimacija*, a posebno su istaknuti „Shaun the Sheep“ i „Coraline“ kao glavni odabrani selektirani primjeri od strane studentica jer su bliski učeničkom uzrastu. Nakon pogledanih animiranih filmova u kojima je zastupljena *stop animacija* i *glinanimacija*, učenici i učenice su bili/e u prilici razmijeniti mišljenja i diskutirali o tome što su uočili u filmovima, kako su reagirali na animaciju i koje su scene posebno zanimljive. Ovakva interakcija pomaže razvijanje kritičkog mišljenja o umjetnosti animacije, te potiče na analizu i interpretaciju korištenih likovnih elemenata. Također, učenici i učenice su upoznati s osnovnim karak-

teristikama i potencijalima određenih grana *stop animacije*, kao što su: glinanimacija (eng. *claymation*), lutkarska (eng. *puppet motion*), papirnata ili izrezana (eng. *paper cutout motion*).

U svrhu boljeg razumijevanja navedene *glinanimacija*, oslonit ćemo se na članak „Claymation Everything You Need To Know“ (2020), koji detaljno govori o pojmu *glinanimacija* kao vrsti stop animacije u kojoj je svaka animirana stavka, uključujući likove i neke pozadine, izrađena od savitljivog materijala, obično od gline ili plastelina. Također, nužno je da konstrukcija oblikovanih figura ili prostora posjeduje fleksibilnost kako bi se osigurala pokretljivost oblikovane figure i drugih objekata. Oblikovani likovi nastali procesom korištenja gline nastoje se prikazati i uhvatiti u određenom pokretu kako bi se stekao dojam pokretljivosti. Naredni korak se pripisuje procesu fotografiranja, odnosno svaki kadar se fotografira i reproducira u brzom nizu kako bi se stvorila iluzija kretanja. Kratki historijat *glinanimacije* i egzemplari, su doprinijeli boljem razumijevanju procesa izrade glinene animacije, te približili na koji način djeca i mladi mogu svoje umjetničke vizije ostvariti uz pomoć ove tehnike. Također, u navedenom članku je istaknuto:

da je do kraja dvadesetog stoljeća, *glinanimacija* napredovala od svojih skromnih početaka u ranim danima kinematografije do dugometražnih filmova... dok je plastelin prvi put korišten na prijelazu u devetnaesto stoljeće. Njegove dugotrajne, savitljive karakteristike brzo su ga učinile omiljenim sredstvom za modeliranje, u odnosu na glinu. Iako je *glinanimacija* imala ograničenu ulogu u specijalnim efektima nijemog filma početkom dvadesetog stoljeća, kao što se vidi u filmu *The Sculptor's Nightmare* (1908) dok je već 1933. godine umjetnička forma zauzela središnje mjesto u igranom filmu *King Kong* (1933). Nažalost, nakon što je kralj džungle oživio gliniranjem, ova tehnika i proces izrade je desetljećima pao u zaborav, da bi se ponovno vratio polovinom dvadesetog stoljeća. Taj povratak je ostvaren preko Gumbija, zelene i elastične čovjekolike figure koju je stvorio pionir *Claymationa Art-a Clokey*. Gumbi je prvi put debitirao 1953. godine u dječjoj emisiji *Howdy Doody* (1947 – 1960), no lik je brzo stekao popularnost i dobio svoju seriju... Animator Will Vinton izmislio je riječ "claymation" 1976. godine, vrativši *glinanimaciju* u središte pozornosti u kratkim filmovima, muzičkim spotovima i u televizijskim reklamama kasnih 80-ih za The California Raisins. Godine 1985. legendarni umjetnik Nick Park pridružio se Aardman Animationsu, engleskom studiju za animaciju, gdje je počeo razvijati ideju za kultne likove Wallacea i Gromita, koji su stekli slavu nakon što je Park predstavio *A Grand Day Out* (1989). Tradicionalni proces animacije u glini unaprijedila je tvrtka za animaciju Laika, koja je poznata po filmovima poput *Coraline* i *Para-Norman* (Claymation Everything You Need To Know 2020).

Lutkarska animacija (eng. *puppet motion*), s druge strane, koristi lutke ili figurice kao osnovne likove u animaciji. Lutke su ručno izrađene i mogu se kontrolirati pomoću žica, magnetskih ili drugih mehaničkih sistema, dok su zakonitosti u vezi kreiranja finalnog produkta jednake za svaku granu stop animacije. Svaka promjena položaja lutke snima se kao zasebna fotografija, a kada se fotografije brzo prikažu jedna za drugom, stvara se dojam pokreta. Učenicima i učenicama je prikazan video materijal, koji je dodatno pojasnio koncept papirnate ili izrezane animacije (eng. *paper cutout motion*). Video je bio zanimljiv i informativan, prikazujući razne mogućnosti i načine, koji se mogu primijeniti prilikom izrade animacija od papira. U materijalu su prikazani različiti papirni objekti, likovi i pozadine, te kako se isti mogu koristiti za stvaranje priča i u svrhu iluzije pokreta. Također su prikazane tehnike rezanja papira, preslagivanja i animiranja papirnih objekata, ali je poslužio i kao inspiracija učenicima i učenicama da istraže i eksperimentiraju sa ovom tehnikom.

3.1. Značaj glinanimacije i papirnate ili izrezane animacije na učeničke kompetencije

Nakon gore iznesenih teorijskih osnova u vezi *stop animacije*, i upoznavanja s različitim granama iste, važno je zadržati se na značaju primjene ove tehnike u nastavi Likovne kulture i njenim reperkusijama na djecu i mlade. U svrhu kvalitetne sprovedbe aktivnosti, učenici i učenice su podijeljeni u grupe, kako bi zajedno radili na osmišljavanju scenarija za izradu vlastite animacije. Grupni rad u kontekstu *stop animacije* igra važnu ulogu u određivanju aktivnosti učenika i učenica tokom rada, kao i načina komunikacije i planiranja likovnih etapa. Učenike i učenice je važno aktivno uključiti u proces stvaranja *glinanimacije* i *papirnate* ili *izrezane animacije*, kako bi putem gestikulacije, manipulacijom objektima i drugim radnim medijima stvorili likovnu priču. Također, grupni rad potiče djecu i mlade na samostalno planiranje i izvođenje različitih likovnih faza, poput kreiranja skica, patiniranja i bojenja, lijepljenja — kolažiranja, fiksiranja, definiranja odnosa i proporcija u finalnom likovnom rješenju. Uz to, grupni rad potiče i partnerstvo između učenika i učenica, što omogućuje zajedničko djelovanje i saradnju u kolektivu. Kroz partnerstvo, međusobno se podržavaju i dopunjuju, razmjenjujući zamisli i raspravljajući o likovnim rješenjima. Ovaj saradnički aspekt dodatno osnažuje cjelokupan likovni proces, te potiče učenike i učenice na kreativno djelovanje, razvijanje vještina timskog rada i komunikacije unutar grupe. Tragom navedenog, pored upotrebe zakonitosti likovnog jezika uz upotrebu digitalnih alata i razvijanja likovnog i vizuelnog mišljenja, grupni rad djeci mladima osigurava vršnjačko učenje i međusobnu podršku u ostvarivanju postavljenih umjetničkih ciljeva (Handukić 2008, 178).

Primjeri poput prethodno navedenih filmova, te djela umjetnika Joan Miroa, s svrhom pojašnjavanja stilizacije prikazanih amorfnih oblika, ukazuju učenicima i učenicama da *stop animacija* može biti još jedan način kvalitetnog likovnog izražavanja. Također, ovakvim primjerima može se omogućiti djeci i mladima bolje razumijevanje konteksta njihovih likovnih aktivnosti. To znači da su potaknuti učenici i učenice na razvoj divergentnog mišljenja, mašte, dizajn priče i izvedbu *stop animacije*, koristeći vještine kojima su već ovladali i dostupne materijale i tehnike, kao što su: glina za modeliranje, pribor za crtanje, fotografija, te digitalne alate i podesne kompjuterske programe.

Iz ostvarenih rezultata, moguće je uočiti povećanu unutarnju motivaciju učenika i učenica ka eksperimentiranju, istraživanju, likovnom artikuliranju vlastitih ideja i zamisli, te generalno kreativnom djelovanju. Učenici i učenice su nakon sagledavanja realiziranih aktivnosti izražavali zadovoljstvo ostvarenim, te se ponosili postignutim likovnim rezultatima. Također, ove aktivnosti su potaknule njihovo kritičko promišljanje o vlastitom radu i radu drugih, kako radu vršnjaka, tako i o radovima umjetnika i umjetnica. *Glinanimacija* je imala značajan utjecaj na djecu i mlade u mnogim aspektima njihovog razvoja. Prvo i najvažnije, demonstrirano je voljno pristajanje na aktivnosti tokom cijelog procesa. Njihov interes za likovnu umjetnost i kreativno izražavanje bio je očit jer su se nastavni časovi na kojima su istraživali ovu tehniku realizirati u okruženje koje je poticalo potrebu za istraživanjem, eksperimentiranjem i izražavanjem mašte. Također, razvijale su se važne socijalne vještine poput komunikacije, slušanja drugih ideja i međusobnog uvažavanja. Učenici i učenice su potaknuti na vršnjačku saradnju, međusobnu podršku, pomoć i zajedničko rješavanje likovnih problema tokom izrade *glinanimacije*. To je za rezultat imalo unapređenje njihove sposobnosti rada u timu i razumijevanja važnosti saradnje u dostizanju pretpostavljenih ciljeva.

Značaj ove aktivnosti ogledao se i u pozitivnom utjecaju na razvoj finih motoričkih vještina uz pomoć oblikovanja u plastelinu, jer zahtjeva preciznost i dosljednost u izradi malih skulpturalnih rješenja. Učenici i učenice su razvijali spretnost prstiju i šake, i poboljšali svoju koordinaciju na relaciji oko i ruka, preko oblikovanja i modeliranja različitih likova i predmeta (Handukić 2008). Važno je istaknuti da su djeca i mladi djelovali izvan ustaljenih okvira jer su tokom stvaranja animacija, trebali pažljivo planirati svaki korak, razmišljati o redosljedu događaja i načinu prenošenja svog narativa — priče kroz animaciju. Ova aktivnost je izvršila poticaj na njihovu kreativnost, vizuelno i likovno mišljenje, ali i uvjetovala i podrobno razmišljanje o tehničkim aspektima izrade jedne stop animacije, upotrebi digitalnih alata i aplikacija u svrhu likovnog oblikovanja.

4. Metodološki okvir istraživačkog rada

4.1. Cilj i istraživačka pitanja

Cilj ovog istraživanja zasnovan je na utvrđivanju mogućnosti primjene digitalnih i analognih alata u nastavi likovne kulture, a s ciljem utvrđivanja mjere u kojoj su digitalni i analogni alati podesni za određeno likovno oblikovanje, te koje su metodičke specifičnosti realizacije takvih nastavnih časova. Namjera istraživanja se ogleda i u osnaživanju izlaznih kompetencija studenata i studentica, njihovoj pripremi za samostalnu djelatnost u osnovnom i srednjoškolskom odgojno-obrazovnom kontekstu. Krenulo se od pretpostavke da će digitalni i analogni alati uz primjenu općih zakonitosti likovnog jezika imati osnažujući učinak na studente i studentice buduće nastavnike i nastavnice, ali i na krajnje korisnike stečenog znanja, odnosno na učenike i učenice osnovnih škola u Kantonu Sarajevo. Kreiranje likovnih rješenja uz pomoć navedenih alata će svim polaznicima/cama aktivnosti omogućiti širok raspon kreativnih vještina i proširivanje izlaznih digitalnih kompetencija, te lakše oblikovanje i izgradnju osobnog likovnog rukopisa.

U okviru istraživanja su realizirane aktivnosti u vezi proširivanja stečenog znanja i vještina, gdje su se studenati i studentice preko predavanja, seminara i radionica, upoznali s novim mogućnostima upotrebe digitalnih i analognih alata prilikom kreiranja likovnih rješenja, te utjecaju istih na primjenu inovativnih pristupa u nastavnoj praksi. Također, postavljanjem istraživačkih pitanja bilo je važno ispitati mišljenje studenata i studentica, učenika i učenica o nastavi Likovne kulture u osnovnim školama u Kantonu Sarajevo, te o mogućim inovacijama koje bi odgovorile na njihove obrazovne potrebe i interesovanja.

4.2. Istraživački instrument i proces prikupljanja podataka

U svrhu realizacije ovog istraživanja oblikovana su dva anketna upitnika, prvi za populaciju studentica, i drugi za populaciju krajnjih korisnika odnosno učenika i učenika. Prvi anketni upitnik je osmišljen i oblikovan za ispitivanje promjena koje su nastale kod populacije studentica, nakon implementacije stečenog znanja u vezi primjene digitalnih i analognih alata u nastavi Likovne kulture, i realizacije nastavnih aktivnosti u školama Kantona Sarajevo. Sastojao se od deset pitanja i podijeljen je na dva dijela, od kojih prvi dio ispituje socio-demografske karakteristike ispitanica, kao što su spol i nivo studijskog programa, dok se drugi dio fundira na pitanjima koja propituju promjene u digitalnim kompetencijama i iz kojih je vidljiv uticaj na inovativne pristupe u

nastavnoj praksi studentica. Drugi anketni upitnik, koji je korišten u ovom istraživanju, osmišljen je i oblikovan od strane studentica — realizatorica nastavnih časova na predmetu Likovna kultura uz primjenu digitalnih alata. Isti se sastojao od više pitanja u kontekstu realizirane nastavne jedinice. Anketni upitnik se temelji na ispitivanju promjena koje su uslijedile nakon realizacije nastavnih aktivnosti uz pomoć digitalnih alata i budućih obrazovnih potreba učenika i učenica. Primjenom adekvatnih postupaka, analizirani su i obrađeni prikupljeni podaci iz prvog anketnog upitnika, a isti je oblikovan uz pomoć platforme Microsoft Teams i zahtijevao je popunjavanje u digitalnoj formi. Također, primijenjena je ista procedura prilikom obrade prikupljenih podataka iz drugog anketnog upitnika, s iznimkom što je isti učenicima i učenicama dostavljen u štampanoj formi.

4.3. Uzorak istraživačkog rada i procedura

Istraživanje je provedeno tokom studijske i školske 2022/2023. godine, u prostorijama Akademije likovnih umjetnosti Univerziteta u Sarajevu i osnovne škole JU „Hamdija Kreševljaković“, u sklopu nastavnog predmeta Metodika nastave likovne umjetnosti i likovne kulture I – IV koji se izvodi na Univerzitetu u Sarajevu, i predmeta Likovna kultura u osnovnoj školi. Provedeno je uz pomoć primjene inovativnih nastavnih pristupa na predmetu Likovna kultura i upotrebe digitalnih i analognih alata, te putem dva anketna upitnika, od kojih je onaj namijenjen učenicima i učenicama bio na dobrovoljnoj osnovi i anonimn. Upitnik je popunilo 25 učenika i učenica iz osnovne odgojno-obrazovne ustanove „Hamdija Kreševljaković“. Inovativne nastavne pristupe, sprovele su studentice u svojoj likovnoj učionici, a nakon provedbe nastavnih aktivnosti pristupili popunjavanju samoevaluacijskog upitnika. Studenticama koje su u svojoj nastavnoj praksi zastupili inovativne pristupe uz upotrebu digitalnih alata, poveznica na samoevaluacijski upitnik je dostavljena putem Microsoftove platforme Office 365 – Teamsa, a anketni upitnik su popunile dvije studentice, realizatorice navedenih aktivnosti. Važno je istaknuti da se dobiveni podaci ne mogu smatrati reprezentativnim, ali svakako jesu ilustrativni za određene metodičke fenomene, te uvjetuju primjenu inovativnih pristupa i doprinose konstruiranju preporuka za unapređenje nastave likovne kulture. U nastavku teksta donosimo interpretaciju obrađenih rezultata istraživačkog rada i prikupljenih podataka.

4.4. Rezultati istraživanja i rasprava

Rezultati odgovora na pitanja iz oba upitnika, od kojih se prvi odnosi na ispitivanje promjena koje su nastale kod populacije studentica, nakon imple-

mentacije stečenog znanja u vezi primjene digitalnih alata u nastavi Likovne kulture, te drugi koji se temelji na propitivanju promjena koje su uslijedile nakon realizacije nastavnih aktivnosti uz pomoć digitalnih alata kod populacije učenika i učenica, prikazani su u nastavku teksta.

4.4.1. Samoevaluacijski upitnik za studente i studentice

Jedno od pitanja iz samoevaluacijskog upitnika glasilo je: Jesam li uspješno osmislio/la i pripremila plan nastave *claymation* tehnike?, na koje su obje studentice odgovorile na način da su isticale istraživački rad koji se prvenstveno ogledao u istraživanju podesnih metoda i materijala za realizaciju stop animacije i glinanimacije, te izradi detaljnog pisanog plana i pripreme, vizuelne prezentacije i anketnog upitnika za učenike i učenice. Odgovori na pitanje u vezi uspješne motivacije i poticaju učenika i učenica na kreativnost tokom rada, zasnovani su na isticanju elemenata preko kojih je isto ostvareno. Obje studentice su prvenstveno nastojale osigurati podržavajuće i pozitivno okruženje, podsticati učenike i učenice da istražuju i izražavaju svoje ideje, te pružiti dosta primjera stop animacije i glinanimacije. Po pitanju prezentiranog cilja nastavne jedinice i korektnih uputa za dostizanje valjanih likovnih rezultata, obje studentice su iskazale svoja nastojanja da pretpostavljeni cilj nastavne jedinice bude ostvaren, a upute u funkciji postavljenog likovnog zadatka. Oba nastavna susreta su usmjerena na timski i tandemski rad učenika i učenica, na način da su se međusobno podijelili zadatke poput oblikovanja likova, izrade scenografije i snimanja animacija. Iako su određene učeničke uloge nosile sa sobom i odgovornost, u odjeljenjima se poticala saradnja, i zajedničko artikuliranje ideja. Studentice su u svojim odgovorima isticale uspješno vođenje učenika i učenica u rješavanju izazova i poteškoća koje su se pojavile tijekom procesa, poput puta za pravilno korištenje mobilne aplikacije namijenjene za kreiranje animacija, kako bi se spriječila nekontrolirana izmjena fokusa kamere. Pružale su im smjernice, poticale ih na samostalno razmišljanje i traženje likovnog rješenja, i to na način da su dobili priliku za realizaciju vlastitog likovnog koncepta preko "radni okvir priče" (eng. storyboard). Na pitanje u vezi materijala, alata i resursa, obje su istaknule izuzetnu pripremljenost od strane učenika i učenica, s obzirom na detaljne upute i prethodni susret s njima.

U odgovorima na pitanje vezano za prilagodbu pristupa i metoda u skladu s potrebama i različitostima učenika i učenica, obje su istaknule da su nastojale uspješno savladati sve izazove. Također, ističu značaj pravovremene povratne informacije i kontinuirane evaluacije tijekom izrade stop animacije i glinanimacije, te govore o izazovima u vezi vremenske artikulacije i nedoumica koje su se javljale tokom samog procesa. Stoga smatraju da postoji prostor za poboljšanje

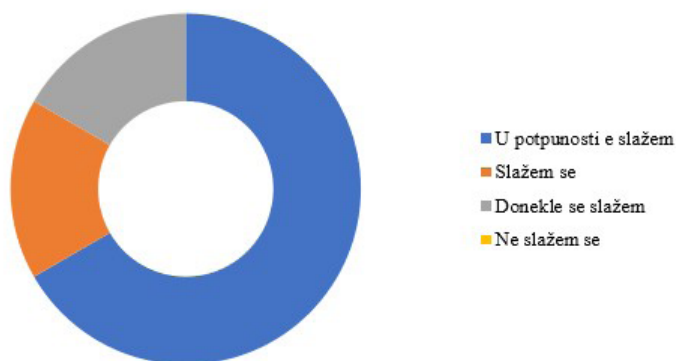
je, te da je nužno zastupiti više konstruktivan pristup u kojem bi djecu i mlade usmjerile ka boljem krajnjem likovnom rezultatu. Evaluaciju finalnih rezultata i postignuća učenika i učenica u radu sa stop animacijom i glinanimacijom, studentice su organizirale preko virtuelnih izložbi, na kojima su prezentirani učnički radovi. Na taj način posjetitelji mogu izvršiti uvid u svaku animaciju, priču i poruku koja stoji iza nje, ali saznati više o razvojnim likovnim karakteristikama i kriterijima izvedbe svake animacije. Također, osigurale su anketne upitnike za učenike i učenice sa svrhom njihove povratne informacije, sugestija i preporuka za unapređenje budućeg nastavnog procesa. Značajno je napomenuti, da odgovori studentica sadržani u anketnom upitniku idu u smjeru pozitivnih promjena, gdje je vidljivo da su aktivnosti u vezi provedbe metodičkih preporuka iskazanih u kurikulumu, imale osnažujući učinak na razvoj digitalnih kompetencija studentica i na provedbu inovativnih pristupa u nastavnoj praksi.

4.4.2. Anketni upitnici za populaciju učenika i učenica

Rezultate istraživanja, odnosno podatke iz anketnih upitnika u kojima su iskazi populacije učenika i učenica, namjerno predstavljamo objedinjeno, zbog prirode navedenih tehnika animacije i zajedničkih polaznih osnova. Ovim anketnim upitnicima su prvo ispitivane učničke preferencije u pogledu oblika nastavnog rada na predmetu Likovna kultura, stavova nastavnika i nastavnica, te motivacije po pitanju nastavnog gradiva i postavljenih likovnih aktivnosti, prostornih kapaciteta, materijala i resursa za ostvarivanje željenih ideja.

Odgovori učenika i učenica zastupljeni u anketnom upitniku su dosta ujednačeni, tako da odgovori na pitanje poput *Da li ste imali poteškoća pri samostalnom radu?*, ilustriraju već navedeno. U prevazilaženju teškoća pri samostalnom radu, dvoje je izrazilo svoje zadovoljstvo, dok je preostalih 13 učenika i učenica iskazalo svoje potpuno zadovoljstvo. Međutim, rezultati odgovora na tvrdnju u vezi rada u tandemu (paru), nude nešto drugačiju sliku, a isti su vidljivi u grafikonu br. 1.

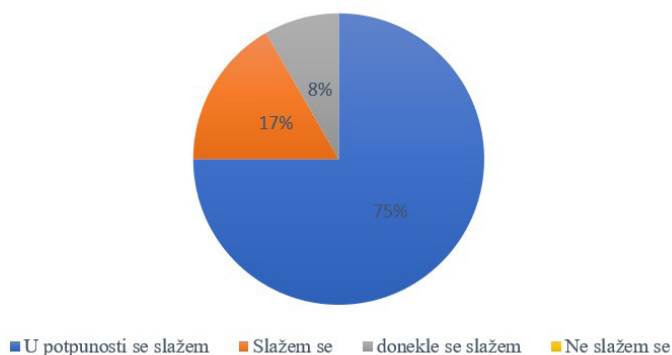
Grafikon br. 1: *Dopada mi se rad u tandemu*



Učenici i učenice koji/koje su učestvovali u realizaciji nastavnih časova, iz oba odjeljenja, većinski su konstatirali da se u potpunosti slažu sa tvrdnjom u vezi motiviranosti za rad. *Da li je po Vama nastavnikov/nastavnicin stav prihvatljiv?* i *Da li je nastavnikova/nastavnicina pomoć bila prikladna i pravovremena?*, većina učenika i učenica je konstatirala da su u potpunosti zadovoljni kada je u pitanju stav nastavnika i nastavnica, te da je pomoć bila prikladna i pravovremena. Većina učenika i učenica je iskazala da se u potpunosti slažu da je gradivo bilo razumljivo i jasno prezentirano, te da je njegova količina bila prikladna. Također, s konstatacijom da je prostor za ovu vrstu likovne aktivnosti bio primjeren, te da se u potpunosti slažu s tvrdnjom da su ostvareni pretpostavljeni ciljevi nastavnih časova. Većina osoba se usaglasila da su bili slobodni prilikom realizacije likovnog rješenja, po pitanju korištenih materijala i da je bilo dovoljno vremena za doživljaj predstavljenih likovnih djela – primjera, te da su zadovoljni korištenim aplikacijama i digitalnim alatima.

Učenici i učenice koji/koje su pristupili popunjavanju anonimne ankete, su usaglašeni/usaglašene s konstatacijom da su nastavi časovi na temu *stop animacije* i *glinanimacije* bili zanimljivi i zabavni, te da im se dopao rad sa plastelinom i bilježenje pokreta kreirane figure uz pomoć fotografije. Na jedno od pitanja u vezi jasnoće i korisnosti uputa, koje su učenici i učenice dobili/dobile za izradu *glinanimacije*, njih 11 je ocijenilo upute za izradu *glinanimacije* kao jasne i korisne. Iz njihovih odgovora može se zaključiti da su upute pružile dovoljno informacija o samom postupku rada. Međutim, 3 osobe su primijetile da su neki koraci mogli biti bolje objašnjeni, odnosno da bi dodatne ilustracije pomogle i bile korisne za bolje razumijevanje postupka. Na pitanje iz drugog upitnika, u vezi upoznavanja *stop animacije*, 9 učenika i učenica se usaglasilo s konstatacijom da se u potpunosti slaže da je upoznavanje s istom bilo interesantno, od toga 2 učenika i učenica su konstatirali/konstatirale da se slažu, a 1 učenik ili učenica da se djelomično slaže. Sve navedeno može se uočiti u grafikonu br. 2.

Grafikon 2.: Upoznavanje sa tehnikom stop motion-a je bilo interesantno



Koje su bile najjače strane tehnike glinanimacije u vašem iskustvu? Na osnovu odgovora može se zaključiti da su svi učenici i učenice izrazili/izrazile potpuno zadovoljstvo kada je u pitanju njihovo iskustvo s *glinanimacijom*. Istaknuli su pojedini učenici i učenice vrlo pozitivne strane u svojim odgovorima. U svrhu interpretacije rezultata izdvojiti samo dva koja najbolje ilustriraju njihovo iskustveno učenje i zadovoljstvo ostvarenim likovnim rezultatima. Prvi od njih glasi: „Ono što mi se najviše sviđelo je da sam mogla koristiti različite boje i igrati se sa plastelinom, praviti ljude kako hodaju“, dok je drugi iskaz glasio: „Bilo je zanimljivo i novo“. Također, na pitanje *Jeste li se osjećali/le potaknuti/e na kreativnost i izražavanje kroz glinanimaciju?*, izneseni su pozitivni stavovi od strane učenika i učenica, u kojima je istaknuto da je tehnika *glinanimacije* izvršila poticaj na razvoj kreativnosti i izražavanja, te da su voljno sudjelovali u procesu.

Na osnovu odgovora na pitanja *Koliko smatrate da je tehnika glinanimacije bila učinkovita u prenošenju vaše ideje i priče kroz animaciju?* i *Volio/la bih raditi slične tehnike poput stop animacije na časovima Likovne kulture.*, može se zaključiti da su svi učenici i učenice dali/dale pozitivan odgovor kada je u pitanju učinkovitost tehnike *glinanimacije* u prenošenju njihove ideje i priče, i da voljno realiziraju svoje likovne uratke uz pomoć *stop animacije*. Ovo ukazuje na to da su učenici i učenice mišljenja da su uspješno prenijeli svoju poruku, i ostvarili željeni učinak kroz svoje uratke uz pomoć *stopmotion* i *claymotion* tehnika. Ovi rezultati sugeriraju da je *stopmotion* i *claymotion* tehnika izuzetno poticajna za razvoj učeničke kreativnosti, i da omogućava učenicima/cama da izraze svoje ideje na zanimljiv i likovan način.

Posljednje pitanje u oba anketna upitnika pedviđeno je za sugestije i preporuke za unapređenje budućeg nastavnog procesa, gdje je većina učenika i učenica konstatala da nema dodatnih sugestija i preporuka za unapređenje, osim što su sugerirali da se za one zainteresirane za likovno stvaralaštvo omogući više crtanja i kreativnog rada. Istaknuli su da su kroz ovaj proces; stekli povjerenje u vlastite sposobnosti i izrazili želju da dalje istražuju zakonitosti u području likovne kulture.

5. Zaključak

Primjena digitalnih alata u nastavi likovne kulture u razvijenim obrazovnim sistemima već daje veliki doprinos i ima visoku metodičku vrijednost, a provedbom ovog istraživanja se pokazala kao važna karika u savremenom procesu likovnog odgoja i obrazovanja. Proširivanje stečenog znanja i vještina studenata i studentica, preko upoznavanja s novim mogućnostima upotrebe digitalnih alata prilikom kreiranja likovnih rješenja, te utjecaju istog na primjenu inovativnih

pristupa u nastavnoj praksi studenata i studentica, predstavlja glavnu okosnicu ovog istraživačkog rada.

Cilj ovog istraživanja je ostvaren osnaživanjem izlaznih kompetencija studenata i studentica, te njihovom pripremom za samostalnu djelatnost u osnovnom i srednjoškolskom odgojno-obrazovnom kontekstu. Rezultati istog pokazuju da je primjena stečenog i proširivanje već postojećeg znanja u vezi digitalnih i analognih alata, a uz primjenu općih zakonitosti likovnog jezika, imala osnažujući učinak na studente i studentice, buduće nastavnike i nastavnice, ali i na krajnje korisnike stečenog znanja, odnosno na učenike i učenice osnovne škole u kojoj je provedena nastavna praksa. Upotreba digitalnih i analognih alata se pokazala kao vrlo osnažujuća za učenike i učenice jer omogućava stvaranje likovnih rješenja u digitalnom formatu i sticanje novih sposobnosti, te proširivanje kreativnih vještina sa svrhom lakšeg oblikovanja vlastite likovne semantike.

Prikupljeni podaci su pokazali kako su studentice, buduće nastavnice Likovne kulture, upoznate s mogućnostima primjene digitalnih i analognih alata u svrhu likovnog oblikovanja, kao i s tim da će upotreba digitalnih alata i aplikacija potaknuti razvoj kreativnosti kod učenika i učenica. S obzirom na sve prisutnije aktivnosti u digitalnom okruženju, važno je istaknuti uočenu unutarnju motivaciju kod učenika i učenica, jer je ona svakako jedan od predujeta za kvalitetnu realizaciju nastave. Također, istraživanje je pokazalo da studentice voljno zastupaju digitalne alate i aplikacije u svojoj nastavnoj praksi i vide ih kao alate dobrodošle u kreiranju likovnih rješenja. Podaci u vezi socio-demografskog obilježja ispitane populacije učenika i učenica, idu u prilog tome da nema značajnih razlika između mlađih i starijih populacije, iako su istraživačka očekivanja išla u smjeru da će mlađi učenici i učenice pokazati veću zainteresiranost i upućenost u upotrebu digitalnih alata i aplikacija, te kako će primjena istih biti bolje prihvaćena u odnosu na starije učenike i učenice. Međutim, pokazalo se kako dob, kao socio-demografsko obilježje ispitane populacije učenika i učenica, nije od presudnog značaja za primjenu digitalnih alata u odgojno-obrazovnom procesu predmeta Likovna kultura.

Rezultati istraživačkog rada se prvenstveno ogledaju u prezentaciji izlaznih likovnih rješenja, široj su publici i javnom mnijenju predstavljeni preko kolektivnih učeničkih izložbi, postavljenih u digitalno okruženje na platformi WIX. Navedene izložbe, pored vizuelnih prezentacija ostvarenih rezultata s upotrebom inovativnih nastavnih pristupa, sadrže narativne atribute koji posjetiteljima približavaju razvojne likovne karakteristike i mogućnosti učenika u učenica tog doba, kao i sadržaje obrađivane tokom tog susreta.

Dobiveni rezultati idu u prilog, kao i iskazani interes studentica i učenika i učenica, da je nužno raditi na daljnjem osavremenjivanju nastavnih pristupa i nastavne prakse na predmetu Likovna kultura, kako bi se cjelokupan nastavni proces približio potrebama učenika i učenica te dinamičnom tržištu rada.

Osavremenjivanje nastavne prakse i primjena inovativnih nastavnih pristupa sa svrhom ostvarivanja kvalitete u odgojno-obrazovnom prostoru će osigurati pravovremeni odgovor na izazove 21. stoljeća. Sticanje novih i proširivanje već stečenih kompetencija, unaprijediti će postojeći odgojno-obrazovni proces, te u konačnici doprinijeti boljim ishodima učenja. Također, važno je istaknuti da rezultati istraživanja mogu biti stvarni poticaj za osavremenjivanje programa univerzitetskog obrazovanja, programa cjeloživotnog usavršavanja nastavnika i nastavnica Likovne kulture, te aktuelne i buduće nastavne prakse koja u prvom planu želi odgovoriti na izazove društvenih stremljenja.

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7. Prilozi

Popis grafikona:

1. Grafikon br. 1. Dopada mi se rad u tandemu
2. Grafikon 2. Upoznavanje sa tehnikom stop motion-a je bilo interesantno

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**DEVELOPMENT OF DIGITAL COMPETENCES AND THEIR INFLUENCE ON
INNOVATIVE APPROACHES IN THE TEACHING PRACTICE OF STUDENTS OF
THE ACADEMY OF FINE ARTS OF THE UNIVERSITY OF SARAJEVO**

(summary)

The development of new technologies has a significant impact on many artistic fields, with work processes redefined and new digital tools can join analog ones to become a continuation of the creator's hand. The goal of this research is to determine the possibility of using digital and analog tools in art education. The research was conducted among students/future teachers, with the aim of determining the extent to which digital and analog tools are suitable for certain art design, and to examine the methodological specifics of the implementation of such classes. The research "Development of digital competences and their influence on innovative approaches in the teaching practice of students of the Academy of Fine Arts of the University of Sarajevo" foresees a series of activities, which require that students, through lectures, seminars and workshops, become familiar with new possibilities of digital and analog tools, and to implement the acquired knowledge in their teaching practice. The impact of the research is reflected in the strengthening of students' output competencies, their preparation for independent activity in the primary educational context. Digital and analog tools, along with the application of the general laws of visual language, will have an empowering effect on students and future teachers, but also on the end users of the acquired knowledge, that is, on the students of Canton Sarajevo primary schools. The use of digital and analog tools for the purpose of creating an art solution will enable all participants of the research activities to develop a wide range of creative skills and expand their output digital competences, as well as easier design and construction of a personal art manuscript. The results of the research can be a real incentive for the modernization of the university education program, the lifelong training program for art teachers, and current and future teaching practices, which primarily want to respond to the challenges of social aspirations.

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PALINDROMIC THINKING IN CONTEMPORARY COMPOSITION: CREATIVE TECHNIQUES AND AESTHETIC IMPLICATIONS

Abstract: The aim of this research is to investigate the meaning of the palindrome in the musical work *Huiwen*, with a focus on its form of performance and composition, as well as the concept of the palindrome itself. In order to clarify and deepen the understanding of the palindrome in compositional writing, this study intends to explore and analyze the use of the palindrome in various compositional domains, ultimately explaining the musical compositional significance of this technique.

Chapter One provides a detailed examination of the palindrome and its relation to similar concepts, including repetition and ambiguity. Chapter Two examines the implications of the palindrome's involvement in different areas of composition, demonstrating its close association with physical meanings and creative intentions. Chapter Three discusses the musical work *Huiwen* and its use of the palindrome in detail, focusing

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on the various forms of palindrome within and between the parts. In conclusion, this study highly the unique function and influence of the palindrome in music in that it requires the composer to seek out and understand the specific forms and derived meanings of the palindrome in order to achieve abstraction based on existing concepts.

Keywords: palindrome, pattern of reversal, composition, repetition, ambiguity, symmetry.

Introduction

Exploration on the Material Relation of the Palindrome in *Huiwen*.

Huiwen, Analyzing the real and abstract connections between palindromes.

The material connection of the palindrome is investigated through the use of a case study, a document analysis, and musicological analysis. A palindrome is a compositional technique that uses the reversal of rhythms around a central point to generate tension and ambiguity by way of unexpected melodic shifts. The research looks at how palindromes are used not just in music but in other art forms as well, including poetry and dance. The material relationship of the palindrome is determined by examining examples of music, poetry, calligraphy, and dance.

Understanding how palindromic thinking develops meaning and emotion in music could improve modern music creation. Exploring palindromic music ideas could inspire new music. Modern music composition uses palindromes to improve theory and musicology and understand their cultural and historical importance.

The Meaning of the Palindrome

The term Palindrome originates from the Greek word *palindromos*, meaning “running back again”. *Palindromos* is derived from *palin*, meaning back, or again, and *dramein* meaning to run (Merriam-Webster). Palindrome, defined above, refers to a word, number, sentence, or verse that can be read identically backwards or forwards. The first known use of a palindrome was circa 1637 (Merriam-Webster, n.d.).

The terms *palindromie* and *palindromic* describe a well-known formal pattern that shares certain words, clauses, sentences, paragraphs, and verses (Ranta, Jerrald 1974): For instance, “*Odo tenet mulum, madidam mappam tenet Anna, Anna tenet mappam madidam, mulum tenet Odo*” (Preminger, Warnke, and Hardison Jr. 1965) is a palindrome. Some palindromes go beyond this formal

pattern by creating verses in which each word can be read identically in reverse and forward directions.

Nowadays, palindromes such as “Drab as a fool, aloof as a bard” or “A man, a plan, a canal: Panama”, and even simple ones like “dad” or “madam” are appreciated for their clever wordplay. However, in the past, some people believed palindromes possessed magical powers and engraved them on walls or amulets for protection. Palindromes are not limited to fixed formal structures and exhibit high variability in length and complexity (Herdan 1964).

Palindromes essentially represent a pattern of reversals around a center (Ranta 1974). Even if a palindrome deviates from this ideal condition, it can still be considered a palindrome, for example in “Lewd did I live, and evil I did dwell” (Ranta 1974), the comma and the word “and” are not part of the inversion pattern. Although variations of this nature are usually kept to a minimum, they may be tolerated in palindrome pentameters due to the demands of syntax and meaning.

It is important to note that the form of a palindrome, as examined in this research, is essentially visual.

The repetition of a palindrome occurs through the letter as a visual surface configuration, rather than through the sounds of the palindrome or the meaning of its content.

Palindrome and the Concept of Similarity

Palindrome, as a mode of reversal around a central point, necessarily involves repetition and ambiguity arising from an indeterminate order. Aristotle argued that repetition generally consists of two major orderings: a qualitative-like order and an equivocal quantitative order, symbolized by the cycle and the equals sign (Ross 1981). In addition, palindromes in language and literature consist of a word, phrase, or sentence that reads the same backward as it does forward, fascinating poets, writers, and scholars due to their unique structure and the challenges they present in terms of syntax and semantics. Palindromic research has broadened in recent times to encompass multiple disciplines, including mathematics (Trigg 1967), computer science, and music, highlighting its adaptability and importance. Additionally, the notion of similarity is crucial to the development and examination of palindromes, as the resemblance of letters or sounds is a noteworthy consideration. In some cases, the similarity of words or phrases can also create palindrome-like structures. Therefore, having a solid comprehension of similarity is an essential aspect of examining palindromes. In conclusion, the palindrome represents a unique mode of reversal that involves repetition and ambiguity.

Palindrome and Repetition

Palindrome and repetition share some similarities, but they also differ in important ways. According to Deleuze (Deleuze, cited in *Difference and repetition* 1968, 96), repetition may not change the object being repeated, but it can change the way we perceive it.

Building on this idea, I want to explore the distinction between closed repetition and opened repetition, as proposed by Henri Bergson. Although these concepts are often used in computer programming and time theory, they are also relevant for understanding repetition in the context of music composition research.

Closed repetition involves strict repetition of a singular content and demands a specific content in each repetition. For example, the strict repetition of the number “1” is “1,1,1,1,1, ...” and the strict repetition of the letter “P” is “P, P, P, ...”. In contrast, opened repetition removes a single element, as in the case of a palindrome. Opened repetition allows for variation in the content and number of repetitions, revealing deeper layers of meaning beyond the literal repetition of form or content.

Most studies on the order of palindromes and repeats have focused on sequence and structure, often inserting a palindromic link at some point in the original sequence to alter the form of the repeat and achieve experimental results. While repetitions and palindromes are not directly affiliated, they can be seen as partners in a larger sequence of events.

Conceptually, repetitions and palindromes operate independently of each other. However, in the context of the organization and development of time and events, they are intertwined. Repetition can create a palindrome-like effect, while a palindrome can be elaborated through repetition. The difference between the two forms lies in the levels at which they operate separately and in combination. The refrain, for example, extends the original structural meaning through repetition.

2.2 Palindromes and Ambiguity

The study of palindromes reveals a connection between phenomena that depend on or exclude each other. To express this relationship, new cases must be created, leading to blurring and deliberate ambiguity. These ambiguities are deliberate, an expression of consciousness through ambiguity, consciousness being of a higher order, an expression of an essence, and these must break through the concrete.

This figurative thinking, employed by modern artists, does not cling to binary logic, but rather pursues a multi-valued logic that is also either one or the oth-

er. It encourages a comprehensive grasp of the world in motion, seeking change in all areas and modes of application of palindrome pentameter.

Palindrome pentameter departs from specific binary logic through the point of origin, optimizing the relationship between palindrome pentameter and ambiguity. For instance, Chinese poetry *Xuan Jitu*, consisting of 840 characters, produces 7,958 poems of varying format and meaning when read roughly in any direction from different starting points. According to Michèle Métail (2017), the important thing is not so much the exact number of poems, nor how exhaustively we read them, as it is vertigo that grips the reader facing the openwork, facing the infinitely unfurling meaning.

In the history of Western aesthetics, the classical German aesthete Kant made a significant contribution to the theory of ambiguity. Kant treated fuzziness as a philosophical concept, considering fuzzy perceptions and concepts to be rational and logical. He stated, “A vague idea is more expressive than a clear one. Beauty should be something ineffable.” Both palindromes and vague concepts are fluid, fickle, and indeterminate. The study of their relationship requires a departure from definitions and static deterministic approaches.

Furthermore, in the structure of a palindrome text, fuzziness is present both in the minimal case of the palindrome text and in the whole process of the palindrome text. The palindrome promotes the decomposition and reconstruction of fuzziness in motion while extending the meaning of the palindrome only in terms of structure.

Palindromes and Symmetry

A palindrome, as a mode of inversion around a centre, can necessarily be associated with the characteristic of symmetry. Symmetry is a central concept in modern physics, referring to a state of equivalence. Analyzing symmetry in a palindrome is an important issue in identifying the repetitive and ambiguous features of palindromic structure, from form to content, the intricate relationship between sound and meaning as well as between visual and auditory elements have symmetry in them.

In the case of palindromic poetry, for example, symmetry is evident in its embodiment. There are various forms of iambic pentameter, the most common of which are as follows: 1) a poem is read from the end of a word to the beginning of a word to form a new poem; 2) the first half of a line and the second half of a line are mutually iambic pentameter; 3) the next line is a return to the previous line; 4) a poem itself completes a reply, i.e., the second half of a poem is a reply to the first half of a poem; 5) the poem is continuous to the end of the poem, and then from the end of the poem to the beginning of the poem; and 6) the poem is a reply to the first half of the poem. Regardless of the form of the

refrain, a symmetrical pattern of refrains with a central axis is formed. Palindrome's symmetry repeats the order of the words and, at the same time, creates ambiguity of meaning. Because the change in the order of the text makes the meaning it expresses change, ambiguity is born with it.

In addition to the above expression of symmetry in the palindrome, there is also the case of invariance under the change of certain variables i.e., the dynamic equilibrium between the various elements embodied in the structure or the time schedule. This freedom is prevalent. In the context of a palindrome, techniques of music composition such as mirroring, fugue, inversion, fish-biting, etc. fully reflect the palindrome and symmetry through the use of different sequences of dynamically balanced arrangements of musical elements. Whether it is through mirrored phrases with a central axis, the repetition of musical loops, or through different types of symmetry, the palindrome form provides an integrated element or structure to the music as a whole.

Symmetry is therefore the main expression of the palindrome pattern and its richness, as well as contributing to the formation of symmetrical structures. The density of symmetry and the various forms of reintegrated symmetry are important steps in the compositional exploration of palindrome patterns and degrees of richness.

Palindrome in Other Arts

When it comes to the palindrome, the main form of expression is the structure of the text, and palindrome verse is an essential object of study. Secondly, the use of a palindrome in music has a long and frequent history.

Palindrome and Poetry

The palindrome is largely recognized as a textual structural pattern with special qualities. One type of palindrome is simple enough to be read either forwards or backwards, but there is also a more complex one that can be read in four different directions at once (upside down, backwards, and forwards).

The structure of palindromes is intriguing, as poets have employed a particular compositional technique to create verses that can be read in different directions from any position, with varying meanings. Additionally, since this form lacks continuity, stanzas, and a fixed structure, as per conventional definitions provided in standard textbooks (Perrine 1969), the proper classification for palindromic form could arguably be geometric form.

Against this backdrop, this study aims to analyze a Chinese poem, *Xuan Jitu*. Comprising 840 texts, *Xuan Jitu* includes 7,958 poems that can be read starting

from various directions, different starting points, and with different numbers of specifications.



Figure 1. *Lady Su Hui and Her Verse Puzzle*. Source: The Metropolitan Museum of Art. <https://www.metmuseum.org/art/collection/search/51584>.

This poem has been deliberately selected for this study as it is comprised of varying kinds of linguistic forms, including words, clauses, sentences, and lines. *Xuan Jitu* is an autonomous literary work that is distinct from tradition, characterized by a personal monologue that reflects upon the struggle and release within a society marked by repressed individual consciousness.

In Xu Bing's book, *My True Words* (2015), Bing explicitly refers to Su Hui's *Xuan Jitu* and argues that it is a diagram composed of words (Xu Bing 2015, 170). Inspired by Su Hui's *Xuan Jitu*, a talented woman from the former Qin Dynasty, Xu Bing created "The Magic Carpet". He was invited to design a large carpet for a temple in Singapore for the inaugural Biennale in 2006, which revolved around

the theme of “belief”. For the first Singapore Biennale, Xu Bing created a prayer carpet for the Kwan-Im Temple, the largest Buddhist Temple in Singapore. The design of the carpet is similar in concept to Hui Su’s Former Qin Dynasty creation the *Xuan Jitu*. In 1620 Hui Su created a grid of 841 characters that can be read in any number of directions and combinations. From this single grid, one can discern nearly 4,000 separate poems. In this fashion, Xu Bing selected passages from four significant faith-based texts (one Buddhist, one Gnostic, one Jewish, and one passage from Marx, all in English translation), which he then transcribed as Square Word Calligraphy, and then synthesized into one text. Four different religious texts were chosen for *The Magic Carpet*, which could be read forward, backward, back and forth, and at intervals to form a magic square

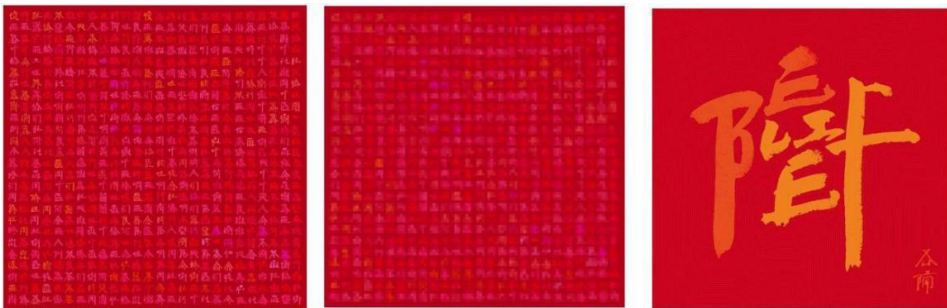
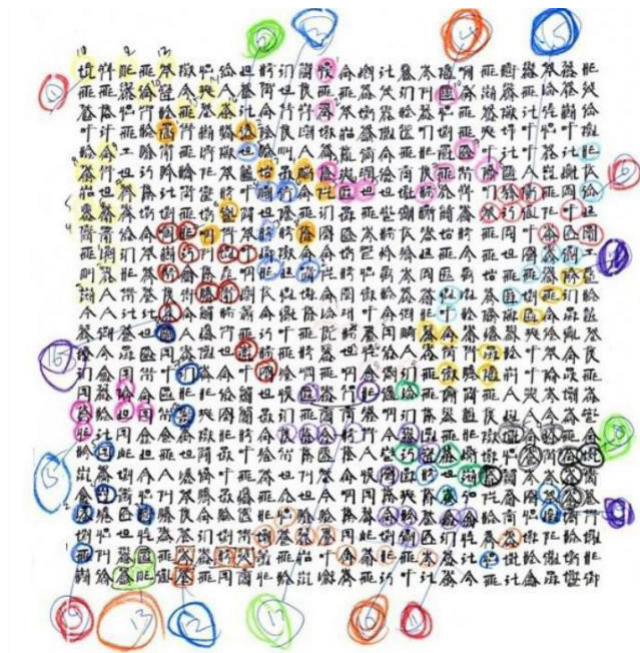


Figure 2 and 3. Manuscript and Three Versions of The Magic Carpet. Source: Xu Bing’s book named *My Real Words* (2015). Medium: Handwoven carpet (2006). Dimension: 595 x 595 cm each.

of text. As the colors lead, one can read passages, fragments, or verses from the different religious texts. In this work, the refrain is not only a visual structural form but also presents different variations as the content of meaning.

Xuan Jitu serves to elucidate the original concept of palindrome pentameter, while extending its significance in terms of material selection and synthesis within the form. By employing noun stacking to create context and facilitate multi-directional meaning, *Xuan Jitu* departs from the traditional structure of subject, predicate, and object. This work masterfully reveals clear and vague concepts in a near-simultaneous manner, blurring their boundaries. When viewed with an open mind, the arrangement of words in *Xuan Jitu* transforms it into a form of visual art imbued with literary qualities, or literature with visual effects. Formal classification of *Xuan Jitu* can be likened to a poetic tesseract, a chessboard, or a distinct spatial entity. The various elements within the structured pattern of reversal coalesce and intermingle through the use of deconstructed transitions between materials, including palindromes, repetitions, and blurs.

Palindrome and Calligraphy

In a scholarly discussion about the relationship between traditional texts and traditional culture in his work, Xu Bing posits that “Tradition is not something in the text itself, it is something in the race of the people, in the blood, including the character, the way of dealing with people, a way of thinking” (Xu Bing 2010). As a consequence, Xu’s artistic creations are largely based on Chinese texts, and this has resulted in the development of English square characters.

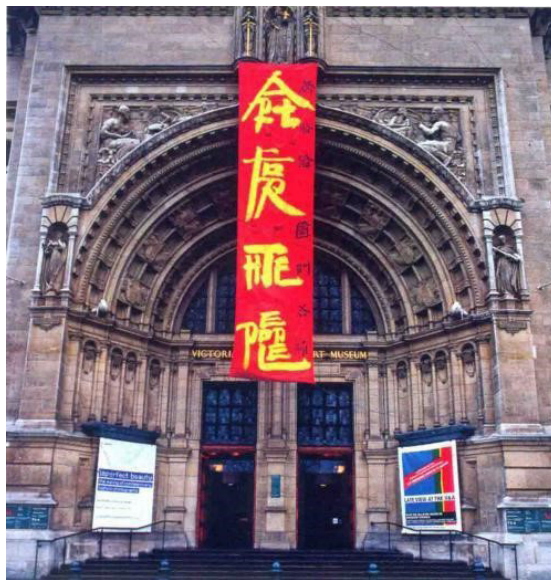


Figure 4. English Square Characters—Art for the People. Source: New York MoMA (1999).

English square characters are a hybrid form of writing that combine elements of Chinese and English scripts. They belong to both and neither language system, and it is often unclear which language is being written. The palindrome structure provides a more nuanced explanation of this form. The two languages are translated into each other within the palindrome structure, which controls both the structural force and the content. The audience is guided through a space of decomposition and reconstruction of the movement of thought between words, symbols, concepts, and images. Xu draws on the palindrome structure to create a striking spatial variation, refining the structural forms and derived meanings under the influence of his palindromic structural thinking. This disintegration-reconstruction pattern of words and the control between the individual elements give the palindrome structure a deeper meaning.

Palindrome and Dance

Anne Teresa De Keersmaeker refers to the basic units of her choreography as “movement cells” (De Keersmaeker 2012, 244). She builds these cells into short phrases using a range of methods, with one of the most frequently used being accumulation, which is further reinforced by changes in dynamics. This reinforcement is very similar in structure to palindrome pentameter, except that it does not revolve around a center. Her choreography is a pattern of repetition and development, corresponding to the relationship between repetition and palindrome mentioned above. In her choreography, the palindrome exists as an externally analyzed result, structured in a way that transcends the specificity of the reversal of the pattern around the center. It is undeniable that the flexibility and unity of the use of materials in the choreography extend the derivative meaning of the palindrome structure in terms of sequence and structural function. De Keersmaeker uses musical composition in great detail, but she does not visualize these forms in dance terms. Instead, she adapts their structural principles to choreographic form, using diverse approaches to music. This includes choosing pre-existing music written by composers such as Steve Reich and Béla Bartók, commissioning work from (and sometimes conceiving of work with) Thierry De Mey or Bjorn Schmelzer, and producing music during the performance and/or using music as a soundtrack playing in the background.

An example is *Violin Fase*, part of *Fase, Four Movements to the Music of Steve Reich*, which is based on music written by the minimalist composer Steve Reich in October 1967. *Fase, Four Movements to the Music* was choreographer Anne Teresa De Keersmaeker’s very first performance, which premiered in 1982. *Fase* comprises three duets and one solo, choreographed to four repetitive compositions by the American minimalist Steve Reich (Brauninger 2014). This is a clear example of the “phasing” technique previously used in De Keersmaeker’s works

titled *It's Gonna Rain*, *Come Out*, *Reed Phase*, and *Piano Phase*, in which music is created not by instruments but by the interaction of temporary variations in the original melody. Compositions of this type are generally referred to as evolution or process music. *Violin Fase* is the third piece of a series of instrumental compositions (together with *Reed Phase* and *Piano Phase*) in which Reich studied the possibility of “phasing” in music to execute the music live with tape accompaniment or, in the case of *Piano Phase*, for only two instruments.

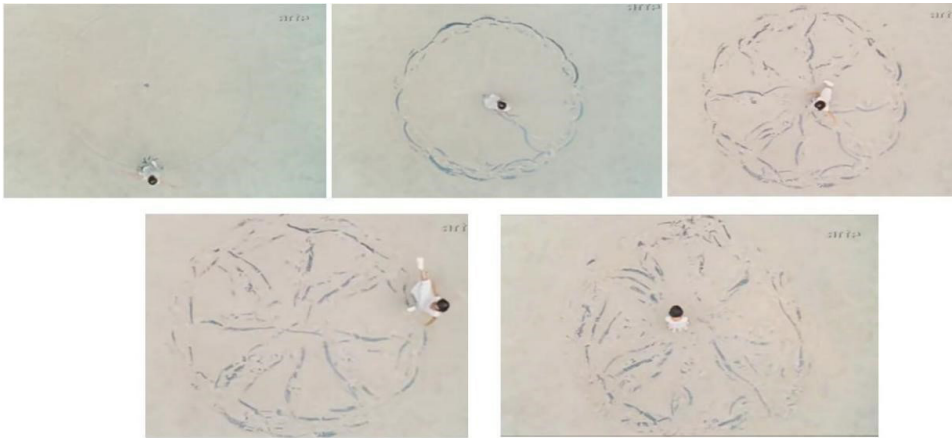


Figure 5. Anne Teresa De Keersmaeker’s *Dance Process with Violin Fase* (Violin Phase). Source: <https://www.youtube.com/watch?v=i36Qhn7NhoA>.

De Keersmaeker uses the structure of Reich’s music to develop an independent movement idiom that not only illustrates the music but also adds a new dimension to it. Both the music and the dance start from the principle of phase shifting through tiny variations: movements that are initially perfectly synchronous gradually start slipping and sliding, resulting in an ingenious play of continuously changing forms and patterns.

It is not the intention to discuss this example purely in terms of the relationship between choreography and palindrome, nor to discuss minimalist music as a separate object of study. When dance, music, and palindrome occur together in the moment of the work studied above, the three form a relationship of mutual control and attraction in order to unify. The structural patterns of the palindrome have a great influence on the collaboration between Anne Teresa De Keersmaeker and Steve Reich in terms of both concreteness and abstraction in the presentation of the results.

The Palindrome and Music

The use of the palindrome in music is not a novel idea, and examples of it

can be traced back to the Renaissance. Crab canon is a device of this era that can be completely palindromic in structure, so long as no free voices are involved. One of the earliest known pieces of palindromic music was written by Wolfgang Amadeus Mozart at the age of 18. This piece, *The Mirror Duet for Violins*, also known as *Table Music for Two*, uses a complex alignment technique in polyphonic form. The entire piece does not have a termination symbol and can be played either from the beginning to the end or from the end to the head. If two people play at the same time, with one starting from the beginning and the other starting from the end, it can constitute a beautiful and strange duet, which belongs to a form known as an inverse palindrome.

Mozart's work uses only one row of the treble clef, and the axis has been determined to be the third line, that is, B. Thus, when writing, it must be conceived according to the axis of B. Mozart chose B as the commonly used III-axis, so G major (the same as in g minor) was used. After the reversal, the dominant becomes the tonic, and the conversion between the subjects is also very convenient.

Der Spiegel (The Mirror) Duet

VIOLINI *Allegro* ♩ = 120 attrib. to W.A. Mozart

Public Domain. Sequenced by Fred Nachbaur using NoteWorthy
Confused? Try playing this from opposite sides of a table.

Figure 6. Score for *The Mirror Duet* for Violins (Wolfgang Amadeus Mozart, 1774).

The canon appeared in the 14th and 15th centuries in the West, and it is a vocal form that imitates itself and forms two vocal parts. The musical content of the two vocal parts is the same, but the vocal entrances are staggered with each other, sometimes shifting place or changing the starting pitch. There are many different forms of canon, such as the expansion/tightening of canon, no-finale canon, riddle canon, and mirror canon. With a mirror canon, a mirror (literal or figurative) is placed in a certain part of the work, using the reflection of the mirror to form another part of the sound. This creative technique has the same effect as poetry.

In the creation of many mirror canons or palindrome songs, the “mirror” position is often shifted. When the reflective surface of the mirror displays the entirety of the piece, the resulting music is the retrograde of the original, akin to Mozart’s *The Mirror Duet for Violins* played in reverse. On the other hand, when the reflective surface is flipped vertically, the resulting music is an inversion, as demonstrated in Johannes Brahms’s *Variations on a Theme by Schumann*, where the external voice employs this technique of reflection.

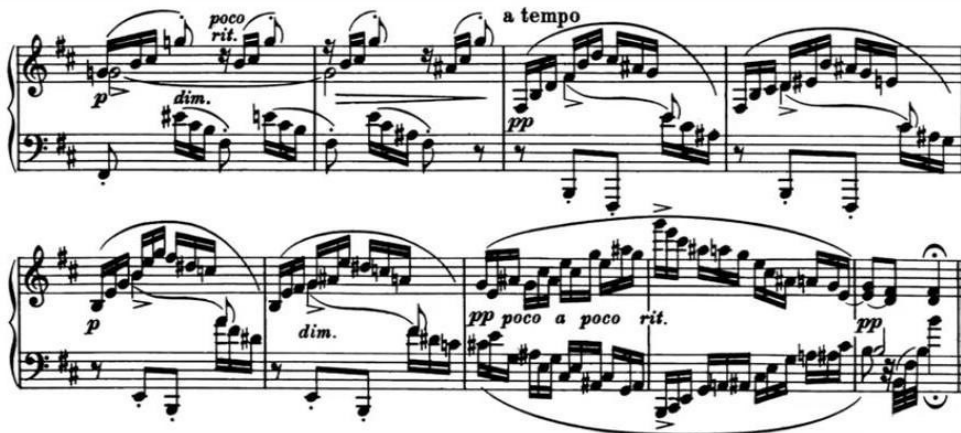


Figure 7. Excerpt from *Variations on a Theme by Schumann* (Johannes Brahms).

In the realm of classical contemporary music composition, the concept of the palindrome is not merely a combination of specific formal structures, but rather one that offers new freedoms and opportunities for composers. The example of the mirror presented here is connected to previously discussed categories of palindrome, and serves as a reflection of the possibilities that this technique provides.

By utilizing the concept of the palindrome, composers can refine the structural forms and derived meanings, creating music that guides the listener through a space of decomposition and reconstruction of thought between words, symbols, concepts, and images. This technique offers a deeper, more meaningful explora-

tion of musical expression and creativity, which can be employed with relish by composers seeking to push the boundaries of their art form.

In the early 1920s the Austrian composer Arnold Schoenberg (1874-1951) founded the twelve-tone system on the basis of the development of chromaticism (the development of chromaticism in the musical language began when the first non-tonal tones appeared in melodies before the 17th century, when the major and minor key system was laid down, so to speak), to the point where he developed The Serial Music Composition Course, based on the twelve-tone sequence system. From the ornamental chromaticism of the Bach period, the polyphonic music of the Baroque period and the chordal chromaticism of the works of Beethoven, Chopin and Wagner, to Schoenberg's dodecaphonic system, the musical language has evolved in a variety of ways. On the basis of the basic sequence forms, a total of 48 sequence forms can be produced depending on the height, which is all the material in the twelve-tone writing.

Anton Webern (1883-1945) and Alban Berg (1885-1935) were both pupils of Schoenberg, but in the subjective expression of composition the pitch sequence was not simply a means of organizing the musical language, but an expressive purpose; Webern rarely changed the pitch sequence and did not take liberties with it. The sound produced by the principle of strict sequence is itself what he wants to express. Webern's sequential language is therefore more rigorous and abstract.

Taking Webern's *Three Songs* (Op. 23) as an example, the four basic forms of the sequence are as follows.

The figure displays four musical staves, each representing a different transformation of a twelve-tone sequence. The first staff is labeled 'O (原形)' and shows the sequence of notes 1 through 12 in ascending order. The second staff is labeled 'R (逆行)' and shows the sequence of notes 12 through 1 in descending order. The third staff is labeled 'I (倒影)' and shows the sequence of notes 1 through 12 in descending order. The fourth staff is labeled 'RI (倒影逆行)' and shows the sequence of notes 12 through 1 in ascending order. Each staff includes a treble clef and a key signature of one sharp (F#).

Figure 9. Excerpt from Webern's *Three Songs* (Op. 23).

The 48 arrangements of the sequence are presented in a sequential list, which some people call a 'magic formula'. The composer can use any one of the 'magic formulae' to compose. Usually the composer will use just a few of these forms, and if the work is large, more sequence material will be used accordingly. However, no matter how large or small the work is, it is all made up of a single archetypal sequence and its transformations. This form of disintegration and reinte-

in C.

© 1964
Terry Riley
© 1989
Celestial Harmonies

Figure 11. Terry Riley's *In C*.

As an ensemble, *In C* seeks to be played softly and loudly at the same time, attempting to diminish and intensify simultaneously. Each pattern can be unified or normalized in any alignment with itself or adjacent patterns. The focus is on the reintegration of timbre and the dramatic impact on texture. When played correctly, the piece creates fascinating shapes that reintegrate and disintegrate as the ensemble moves. The reintegration of timbre and the dramatic impact on texture. If performed correctly, some rather marvelous shapes reintegrate and disintegrate as the ensemble moves. The music generates multi-rhythmic combinations between different patterns, seeking a dynamic balance throughout the piece amidst the combination of pulsation, repetition, and disintegration. One of the joys of *In C* is the spontaneous generation of multi-rhythmic combinations between different patterns among performers. It is important not to rush from one pattern to another but to stay on one pattern long enough to relate to other patterns. As the performance progresses, performers should maintain two to three different patterns simultaneously. It is important not to get too far ahead or fall too far behind. If pulsation and repetition are manifested horizontally in the music, then palindromes in an acoustic space are most apparent in aleatory music.

Similar to the pattern of exploration of the iambic structure in *In C*, the iambic pattern in the work *Huiwen* explores the dynamic balance between musical materials. Based on the analysis and discussion presented above, I commenced work on the piece *Huiwen*. The first version of my composition was based on the repetition of the words 人 (*rén*) 人 (*rén*) 为 (*wèi*) 我 (*wǒ*) 我 (*wǒ*) 为 (*wèi*) 人 (*rén*) 人 (*rén*), with variations in speed to create a spatial soundscape. The initial attempt at composition applied the structural pattern of palindrome pentameter, with a reversal around the center.

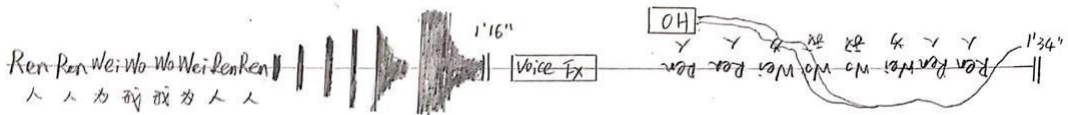


Figure 12. Score Excerpt from *Huiwen*.

The concept of “transition of control”, which encompasses the movement and order of distinct elements in the music, including the physical components of a single tone and deliberate transitions between musical materials, came about as a result of the brief pauses between different materials. Features like length, loudness, timbre, etc.

In the second version, speed adjustments were made from the conclusion of each word to the beginning of the next word in the sequence 人 (*rén*) 人 (*rén*) 为 (*wèi*) 我 (*wǒ*), 我 (*wǒ*) 为 (*wèi*) 人 (*rén*) 人 (*rén*). The modifications more accurately mirrored the palindrome and change creation process in space.



Figure 13. Score Excerpt from *Huiwen*.

The third version of the piece combines replication and variation of the words 人 (*rén*) 人 (*rén*) 为 (*wèi*) 我 (*wǒ*), 我 (*wǒ*) 为 (*wèi*) 人 (*rén*) 人 (*rén*), and adds other elements to the composition, further creating a larger sonic landscape and allowing the listener to enter a whole space. The music at this point is both in the individual physical sound and in the interchange between the elements, between the concreteness of the refrain (the reversal of the pattern around the center) and the abstraction (the deeper reflection on the compositional material that arises from this pattern). The refrain, repetition, and ambiguity appear simultaneously. The “transition of control” affects the progression and development of the music in different cases, during both pauses and progression.

The audio creation of the work is based on the Logic platform, with the distortion and processing of the sound mainly done through the manipulator effects and the effects of the waves. The effects are not further explained or illustrated here, as they only serve to create the spatial structure and are not the focus of the thesis.

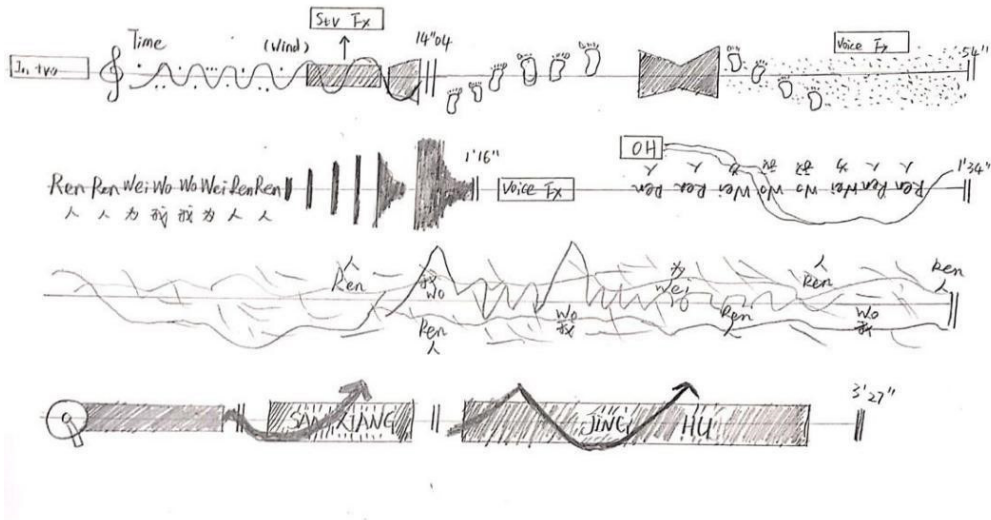


Figure 14. Score Excerpt from *Huiwen*.

The entire piece is based on vocal material: 人 (*rén*) 人 (*rén*) 为 (*wèi*) 我 (*wǒ*), 我 (*wǒ*) 为 (*wèi*) 人 (*rén*) 人 (*rén*), reshaped and reworked through manipulator effects, adjusting various parameters, such as harmonics, formant, and pitch. In the opening material (0-33 seconds), the theme of the piece is introduced through footsteps, signals, and the first appearance of the distortion of 人 (*rén*) 人 (*rén*) 为 (*wèi*) 我 (*wǒ*), 我 (*wǒ*) 为 (*wèi*) 人 (*rén*) 人 (*rén*), and the idea of the piece is gradually expressed in a timeline. From 33 seconds onwards, the work takes the raw material of the human voice through a manipulator, modulating formant and pitch to create the aural sensation of a future robot traveling through time and space.

Here, the musical transformation takes place both in time and space. The original audio material of the subject line gradually appears from the first minute and is distorted by the harmonics through the modulation of the envelope. From 1:20 to 2:22 and onwards, all sound elements are taken from the original audio material, except for the female humming voice, which is adjusted through the manipulator to create a spatial effect from near to far, from real to virtual. The vocal material is shaped by adjusting parameters such as harmonics, formant, pitch, etc. to create a Chinese Sanshin-like sound effect.

The main melodic line in this sound design is created using a rewind and acceleration effect of 人 (rén) 人 (rén) 为 (wèi) 我 (wǒ), 我 (wǒ) 为 (wèi) 人 (rén) 人 (rén). The original vocal material is first reverted, then stretched and slowed down, and gradually accelerated to create a fast 人 (rén) 人 (rén) 为 (wèi) 我 (wǒ), 我 (wǒ) 为 (wèi) 人 (rén) 人 (rén) effect. After 2 minutes and 22 seconds, a Chinese opera/Jinghu Sanshin effect is added, combining the past, present, and future to create a three-dimensional spatial effect. Two to three or more effects parameters were used to combine the results for the vocal material in this piece, and each voice is modulated in different proportions to result in a unique sound effect. This modulation characteristic greatly enhances the novelty of the sound.

To understand this work, it is important to note that the music does not solely refer to musical works for listening and enjoyment like those composed by the great composers. Rather, the piece speaks to the universality of music, as no place is without music when viewed through a musical lens. The thesis argues that the parts of the lyrics are still musical in a broad sense, although there is no specific indication of pitch. Additionally, palindrome poetry is not used as a model for music, and there are no superficial similarities between palindrome poetry and music in terms of structure, rhythm, rhyme, allusion, etc. While it is acknowledged that palindrome poetry is related to music or that poetry is music, focusing solely on these connections may lead to an intuitive stagnation, where some listeners stay on the surface of the music.

Conclusion

Classical musicians are undoubtedly familiar with the conventional usage of repetition in their works, and the majority of them have adapted to the standard responses that have been ingrained into the performing practices of contemporary times. Nevertheless, a fundamental inquiry arises – does repetition entail redundancy in itself? The musical realm does not aim to construct; rather, it aspires to dissolve. It does not offer a concrete imagery, but rather, it eradicates all boundaries and contours, resulting in a state of vagueness. Perhaps, the conglomeration of the palindrome, repetition, and ambiguity in the same space can bestow some enlightenment on the culmination or resolution of this obscurity.

The composition entitled *Huiwen* signifies the initial stage of a textual and musical exploration of palindrome structures. This exploration does not aim to produce a definite format or method; instead, it intends to shape and foster structural forms and accumulate materials in composition. The architectural arrangements of palindrome pentameter, and the corollary implications of dissolution and reconstruction, in reference to repetition and ambiguity, are both extensively deliberated upon in the conceptualization of this composition.

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PALINDROMIC THINKING IN CONTEMPORARY COMPOSITION: CREATIVE TECHNIQUES AND AESTHETIC IMPLICATIONS (summary)

Huiwen is a compositional practice in which musical works are produced under the influence and inspiration of palindrome ideas to explain the philosophical ideas in music. This research has the potential to enhance one’s comprehension of the contemporary music composition creative process and to investigate how palindromic thinking can be utilized to express meaning and emotion in music. Through exploring fresh techniques of using palindromic thinking for composing music, this study could stimulate innovative methods and ideas in contemporary music. The examination of palindromic thinking in contemporary composition can contribute to the development of music theory and musicology, and enrich our awareness of the historical and cultural significance of palindromes in music. The use of palindromic thinking in contemporary music composition could also encourage interdisciplinary implications, encouraging collaborations among music scholars, linguists, cognitive scientists, and other researchers to delve into the intricate relationships between music, language, and cognition.

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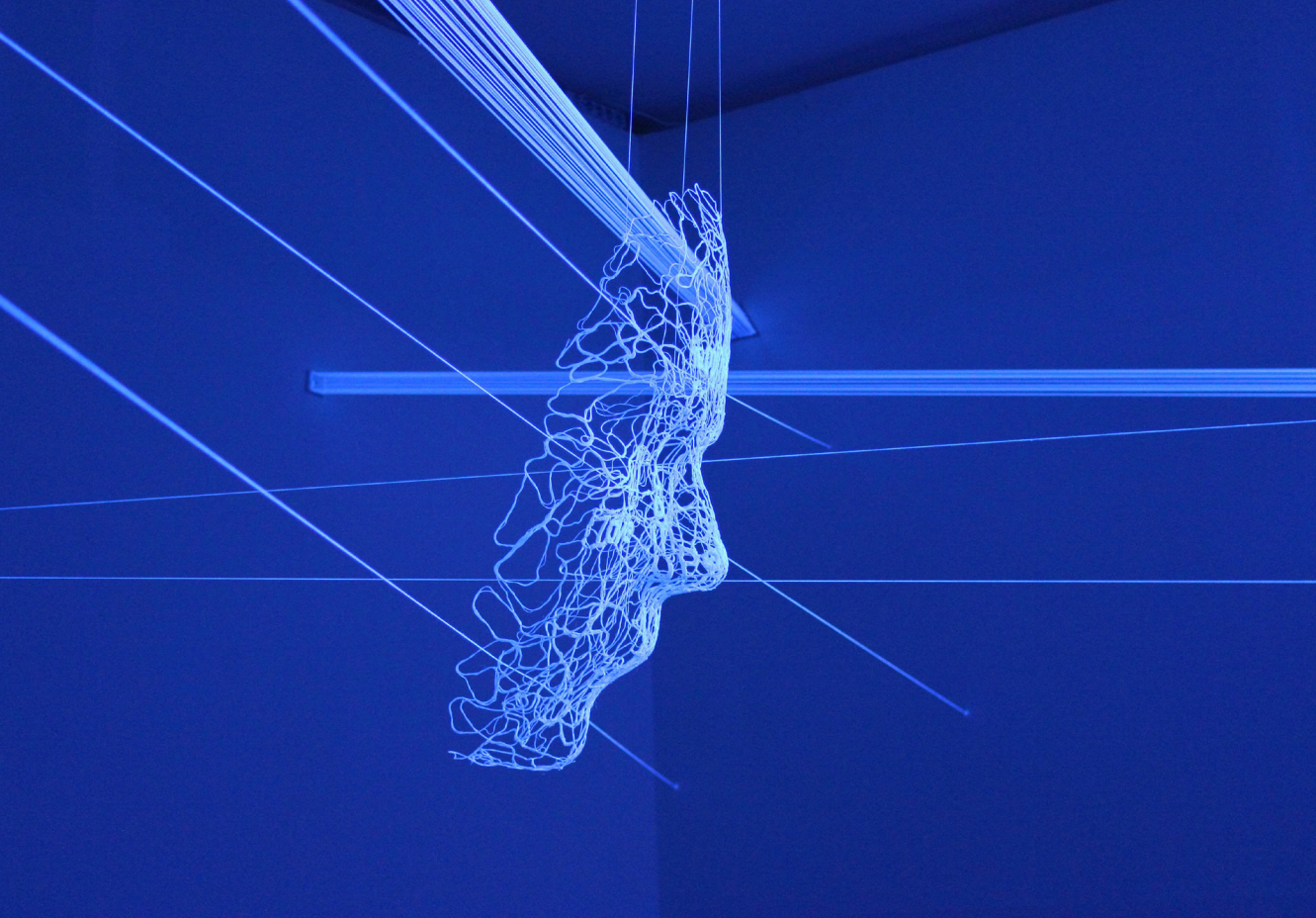
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Zagreb, Hrvatska*

IZLOŽBA *SELF-REPLICATION* NELE HASANBEGOVIĆ Zagreb, 23. 11. – 2. 12. 2023.

Nela Hasanbegović, umjetnica čije bogatstvo djelovanja reflektira njezine interese neograničene medijem, nedavno je predstavila svoj rad u Zagrebu izložbom *Self-Replication* kao i popratnim razgovorom koji je uslijedio dan nakon otvorenja. U Galeriji SC u Zagrebu prvi put se predstavila 2009. godine na grupnoj izložbi *Am I That Name?* čije su autorice i kustosice bile na počecima svojih karijera, neke još i studentice. Od tada je prošlo gotovo petnaest godina, a Hasanbegović je ne samo izgradila značajnu umjetničku karijeru već se i ostvarila kao predavačica na Akademiji u Sarajevu, prenoseći svoje znanje novim generacijama umjetnika. Spomenimo i to kako je prostor Galerije SC u sklopi Studentskog centra u Zagrebu još od sedamdesetih godina prošlog stoljeća poznat upravo po prvim izložbama mlađih autora. Galerija još uvijek njeguje program poticanja autora koji tek dolaze na scenu, ujedno prezentirajući i recentan rad afirmiranih autora. Na ovaj način, povratak Nele Hasanbegović odražava koncept kontinuiranog praćenja autorskih glasova umjetničke scene regije.

Izložba *Self-Replication*, otvorena 23. studenog, sastojala se od instalacija prilagođenih prostoru i niza od pet portreta, izrađenih od bijelog konca. Umjetnica koncem plete dijelove vlastitog tijela, pažljivo razmišljajući o tkanju vlastitog identiteta, replicirajući se u fragilne, transparentne motive koji lebde u prostoru. Instalaciju povezuju razapete niti dovodeći u pitanje samodostatnost, ali i krhkost portreta. Svaki od autoportreta nosi ispisane pojmove temeljnih uvjete postojanja – atoma, energije, svjetlosti, evolucije i bivanja. Ovi portreti kontrapostirani su velikom, nadnaravnom portretu na kojem su naglašeni odabrani pojmovi društvenog određenja – sloboda, jednakost, ženstvenost, moć, ljubav i jedinstvo. Utkani pojmovi simbolično određuju ono što nas



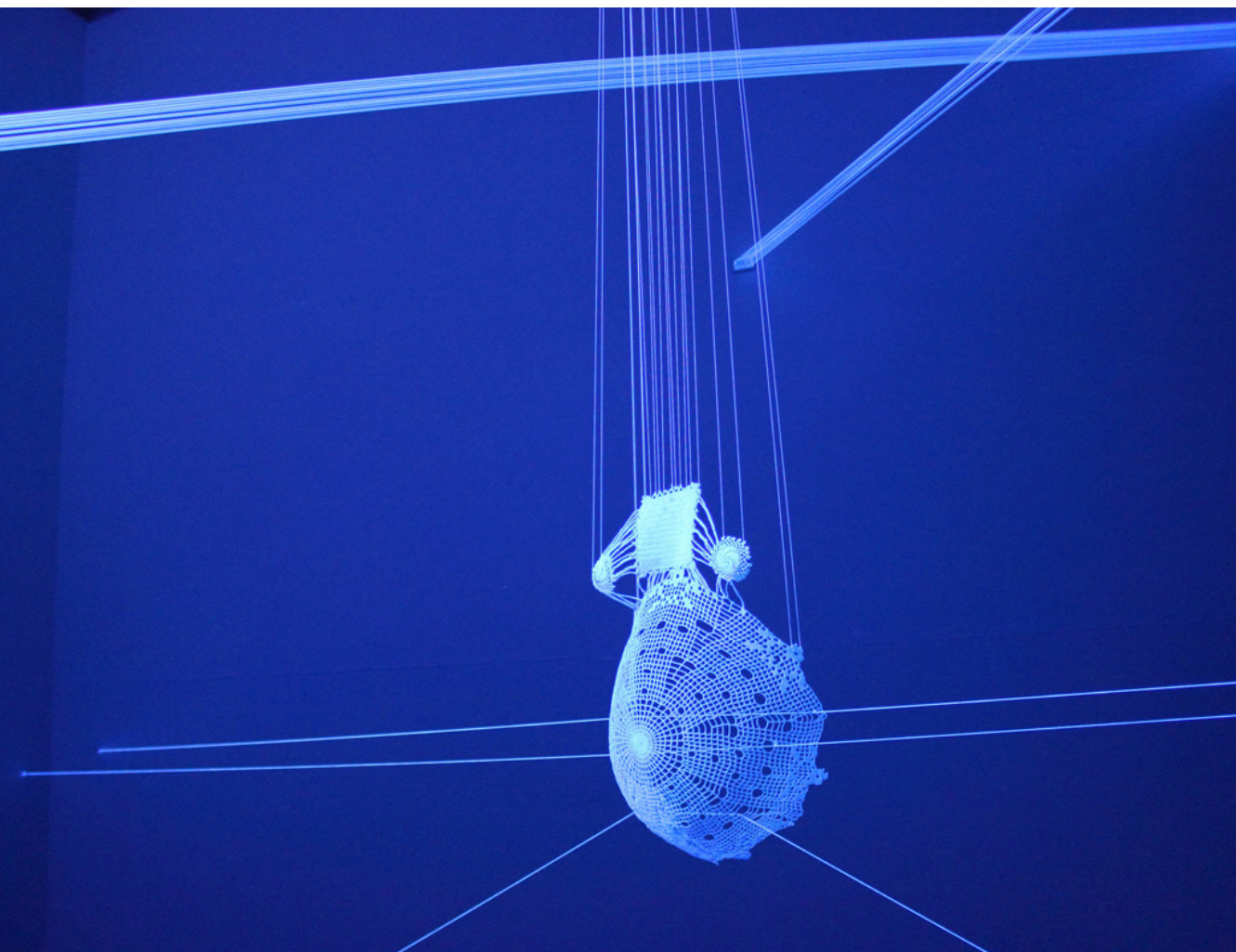
oblikuje i stvara, od bioloških zadatosti do društvenih odnosa i uloga koje autorica izdvaja kao bitne u svom umjetničkom, ali i životnom ostvarenju. Suočavajući ih u prostoru, potiče na introspekciju o onome što nas oblikuje, usko se nadovezujući na nikad dovršenu znanstvenu raspravu o čimbenicima koji utječu na naše oblikovanje, uključujući biološku predodređenost i vanjske utjecaje odnosa obitelji i društva.

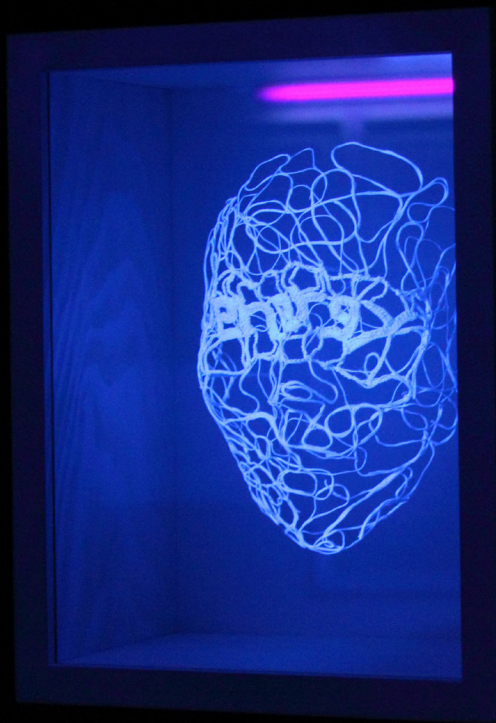
Središnji element izložbe predstavlja replikaciju trudničkog trbuha, simbolizirajući stvaranje života, umjetničkog djela i nove majčinske uloge. Iako u tom trenutku nesvjesna svih slojeva odricanja, manevriranja i promjena koje će majčinstvo donijeti, ona ukazuje na važnost buduće uloge koja umnogome definira i mijenja do tada ustaljene obrasce. Koristeći tradicionalne tehnike vezenja, Hasanbegović istražuje tradicionalne uloge žene u suvremenom kontekstu, postavljajući pitanja o tim ulogama unutar, još uvijek prilično konzervativnog, društva, kako onog u Sarajevu tako i ovog u Zagrebu.

Pojam samo-replikacije u svojoj definiciji odnosi se na određene žive vrste, kompjutorske forme i, osim u znanstvenoj fantastici, ne može poprimiti ljudski oblik. Iako radove na ovoj izložbi Nela Hasanbegović stvara unutar posljednjih deset godina, umjetnička instalacija danas, u doba uzdrmanih životnih navika u kojima pojam replikacije nosi prijetnju virusa, pa i neugodnost nepoznatih tokova koje donosi umjetna inteligencija, dobiva novi kontekst.

Važan aspekt instalacije je upravo ono što se ne vidi, postav koji je u potpunom mraku, gdje odsutnost svjetla omogućava refleksiju bijelih niti pod fluorescentnim osvjetljenjem. No, paradoksalno, upravo taj izostanak svjetla – mrak koji nam onemogućava potpuno korištenje osjetila, izaziva strah, ali i mami – stvara snažan osjećaj prostornosti, naglašavajući nematerijalnu dimenziju. Igranjem s percepcijom, gubljenjem poznatih osjetilnih granica, otvara se novi prostor za doživljaj, stvaranje novih veza i značenja. Cijeli rad isprepleten je napetim strunama društveno generiranih oksimorona. Niti su to koje povezuju, ali i stvaraju snažnu napetost, dok autorica kroz formu koja evocira tradicionalnost propituje suvremenost, tražeći suptilne odnose između zadanog i generiranog, samorepliciranog i onoga što je u tome naše, onoga što nas čini različitima, svojima.

Dan nakon otvorenja Nela Hasanbegović je u razgovoru predstavila svoj umjetnički rad u kojem se nalaze ishodišta i ovog rada: istraživanja tehnički nevidljivog, izlagačkog mraka, rada s različitim materijalima kojima se osvještuje zadan galerijski prostor, ali i razumijevanje dubine društvenog konteksta u kojem je uvijek jasno vidljiva prisutnost autorice. Njezina briga za druge očituje se kroz radove koji polaze iz vlastite perspektive, šireći svoj utjecaj na društvo i





uključujući druge. Upravo to je ključ za shvaćanje teško opisivog, ali sveprisutnog iskustva koje se osjeća u Galeriji SC. Hasanbegović jasno postavlja svoje replike stavljajući vlastiti lik u središte zbivanja, ali svaki segment instalacije – od igranja s percepcijom, preko korištenja tradicionalne tehnike žena ovih krajeva do jasno definiranih pojmova, suptilno uvodi kontekst. Stvarajući relacije između osobnog, ženskog, snažnog, ali blagog i onog nevidljivog, sveprisutnog mraka s kojim se svakodnevno susrećemo.

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REVISITING SONEMUS FEST 2023 – “PRO/AG/GRESSION”: EMBRACING THE IDEA OF THE ESSENCE OF HUMAN FREEDOM

Just like in preceding years, The Society of New Music Sarajevo – SONEMUS curated a range of meaningful music events this year, contributing to the vibrancy of the musical landscape in Bosnia and Herzegovina and the enduring presence of contemporary music in the broader region. The festival took place at the University of Sarajevo – Academy of Music, from October 26th to November 1st, 2023. In addition to concert events, which will be discussed in more detail later in the text, the organizing team responsible for this year’s edition of the SONEMUS festival made efforts in arranging masterclasses, lectures, and public discussions.¹

This reflection provides a brief insight into the performed works, as it is possible to discern a clear conceptual thread common to the entire festival program. This revolves around the careful selection of works that interweave with the idea of this year’s festival edition, hence receiving special attention in the following paragraphs. A further reason for such an approach is that new insights

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1 All non-concert events took place starting from October 26th, following this schedule: Igor Lazić, horn player and professor at the Faculty of Music in Belgrade, held a chamber music masterclass (October 29th). Ališer Sijarić, composer, artistic director of SONEMUS, and Dean of the University of Sarajevo – Academy of Music, held a lecture on the creative output of György Ligeti (October 30th). Christine Fischer, artistic director of Musik der Jahrhunderte Stuttgart, manager of the ensemble Neue Vocalsolisten and artistic director of the New Music Festival ECLAT, participated in a panel discussion on the topic “Current Phenomena in Contemporary Music Life” (October 31st). Bassoonist James Aylward held a workshop for composers (November 1st).

into music augment the understanding of the historical perspective of music in Bosnia and Herzegovina, especially if considering the music of contemporary Bosnian-Herzegovinian composers. In lieu of a conventional review article or a review of concert-type events, which often includes all the information listed in the program booklet (composer biographies and/or self-reflections on their own music, performers, sometimes critical reviews relying on music interpretation), the author has chosen to describe the pure auditory experience of this year's SONEMUS festival program, i.e., the experience of what could be *read* from the music in real-time.



Figure 1. The poster for SONEMUS Fest 2023 – “PRO/AG/GRESSION” © Ajna Zlatar.

The focal point of the first concert event was the centenary celebration of one of the most significant figures in the 20th-century music, György Ligeti (1923-2006). To bridge the ‘haze’ in understanding musical trends, that very often occurs when broader audiences encounter contemporary artistic music, a public lecture on the specifics of compositional expressions of G. Ligeti was held as a kind of ‘guide to listening’. The lecturer was Ališer Sijarić, a composer, founder, and artistic director of the SONEMUS festival, as well as the Dean of the University of Sarajevo – Academy of Music. Moreover, with certain Ligeti pieces having their premiere live performances in Bosnia and Herzegovina – an undoubtedly captivating prospect for contemporary music enthusiasts – the program² also included works that, in a (non)direct manner, alluded to *Ligetiesque* qualities in music. These were compositions whose identical subtitles served as the programmatic title of the concert. One of them embodied the idea of micro-polyphonic ‘mechanical’ music for acoustic instruments – *Homo Ex Machina: Hommage à Ligeti* (2017) by Bosnian-Herzegovinian composer and flutist Hanan Hadžajlić (1991). Another work, *Hommage à Ligeti* from *Trois Hommages* (1984) by Georg Friedrich Haas (1953), written for two pianos in quarter-tone tuning, uniquely relies on microinterval and micropolyphonic principles that we recognize as Ligeti’s ‘trademark’ in the history of 20th-century music.



Figure 2. Zlatan Božuta performing *Hommage à Ligeti* by G. F. Haas (“Hommage à Ligeti”, October 30th) © Vanja Čerimagić.

2 The entire program of the “Hommage à Ligeti” concert (October 30th): G. Ligeti (1923-2006): *Musica ricercata* (1951-53), II *Mesto, rigido e cerimoniale*, Zlatan Božuta (piano). H. Hadžajlić (1991): *Homo Ex Machina: Hommage à Ligeti* (2016/17), Hanan Hadžajlić (flute), Armin Smriko (clarinet), Lorena Milina (violin), Zlatan Božuta (piano), Fuad Šetić (conductor). G. Ligeti: *Études for Piano* (1985-2001), V *Arc-en-ciel*, X *Der Zauberlehrling*, Ivan Galić (piano). G. Ligeti: *Trio for Violin, Horn, and Piano* (1982), I *Andantino con tenerezza*, II *Vivacissimo molto ritmico*, III *Alla marcia*, IV *Lamento. Adagio*, Violeta Smailović-Huart (violin), Igor Lazić (horn), Marko Bogdanović (piano). G. F. Haas: *Trois Hommages: Hommage à Ligeti* (1984), Zlatan Božuta (piano).

In the context of the escalating monotony in reproduction and the prevalence of ‘non-problematic solutions,’ the program of the second festival evening critically examined the musical expression ‘beyond’ the ego in the form of a concert performance. The program itself, titled “Alter Ego”, offered the opportunity to experience musical works that, each in its unique way, explore various aspects of duality in (non)musical content.³ The first piece with such aesthetic orientation was *Alter Ego* (2001) by Georges Aperghis (1945), where the artistic intent behind the form infused with theatrical elements can be interpreted as an exploration of the dichotomous relationship between the human voice and the saxophone, turning the performer into a ‘wordless singer’. The bassoonist James Aylward addressed the performative question of the *supernatural/transhuman* in contemporary music by presenting an altered version of the duet by Hanan Hadžajlić, titled *Concerto TransH(You)Man* (2017), originally composed for clarinet and bass drum. Establishing a connection between the human-per-



Figure 3. Belma Šarančić and Tamara Arsovski performing *De l'épaisseur* by P. Leroux (“Alter Ego”, October 31st) © Vanja Čerimagić.

3 The entire program of the “Alter Ego” concert (October 31st): G. Aperghis (1945): *Alter Ego* (2001), Rijad Šarić (tenor saxophone). H. Hadžajlić (1991): *Concerto TransH(You)Man* (2016/17), I *Brain Building* (Quartet), II *Artificial Breathing*, III *Fear Transplantation: Code Generator*, James Aylward (bassoon and bass drum). P. Leroux (1959): *De l'épaisseur* (1998), Tamara Arsovski (violin), Belma Alić (cello), Belma Šarančić (accordion). M. Jarrell (1958): *Assonance* (1983), Armin Smriko (clarinet). A. Sijarić (1969): *Le vent aux Anches B* (2013/2023), Rijad Šarić (soprano saxophone), Belma Šarančić (accordion). S. Odeh-Tamimi (1970): *Tslalim* (2007), Belma Šarančić (accordion).

former and the instrument, Hadžajlić uniquely discovered unconventional ways to encode the *supernatural* in music, bringing the bassoonist in a state of complex thought with intricate reflexive demands, thus creating a unique fusion of man and machine within one organism – the performer of the piece.

The work *De l'épaisseur* (1998) by Philippe Leroux (1959) embodies duality as a sonorous cluster entity, essentially crafted from interconnecting 'two musics'. The first (strings) explores temporal concepts in music through a continuous deceleration of repeating patterns, while the second (accordion) focuses on the density and richness of a timbre. Duality in *Assonance* (1983), a composition by Michael Jarrell (1958), can be perceptually understood as 'multiplicity in oneness', implying that one instrument gesturally behaves like multiple instruments. Consequently, it is possible to aurally track two musical threads: the circular one, which after a certain period returns to the beginning, and the progressive one guided toward the resolution of the musical idea. *Le vent aux Anches B* (2013) is a modified version of Ališer Sijarić's (1969) composition of the same name, originally written for oboe and accordion. Sijarić's composition stands out due to a long-term process in which duality manifests in a conceptual two-plane structure. The first plane encompasses an abstract, micro-varying progression in shaping tonal elements, culminating in reaching the extreme tonal possibilities in each instrument. The second plane emerges through the interchange of musical parameters (rhythm becomes melody and *vice versa*). This demands that the listener in a very suggestive and nuanced manner becomes acutely aware of the evolving process(es) during the auditory experience of the music. Finally, a distinct duality in the program of the second festival evening is found in the piece *Tslalim* (2007) by Palestinian composer Samir Odeh-Tamimi (1970). This type of duality arose from a simultaneous sense of the East and West in the composer's (sub)consciousness – not necessarily a sense that unites, but rather a sense that there is a way to achieve cultural connection through understanding, and precisely the kind that reminds each of us that *political* does not always necessarily mean *conflicting*. So, we could comprehend the conceptual guiding principle of the work as pendulum swung between meditation reminiscent similar to the musical practices of Sufi Islam and aggressive outbursts of anger and noise, sonically articulated in the form of clusters, whose inspiration undoubtedly lies in the 20th-century Western musical thought.

The final concert event of SONEMUS Fest, driven by the aspiration for freedom and progress, took place under the symbolic program title – "Progression"⁴ In search of the universal essence of freedom in music, the event focused on

4 The entire program of the "Progression" concert (November 1st): D. Rešidbegović (1975): *Wreesky III* (2016), Hanan Hadžajlić (flute and processors). A. Kleinlosen (1987): *Jazz: Fetzen* (2016/18), James Aylward (bassoon). Impro Ensemble MAS: *S p a C E t t e r n s* (2023), *Impro Concept 33* (2023), *Musica ricercata 100 – Hommage à Ligeti* (2023), *Progression* (2023).

musical improvisation, representing something liberated from conventions in musical thought, as well as written compositions within the realm of electroacoustic music. The composition by Dino Rešidbegović (1975), titled *Wreesky III* (2016) for flute and analog signal processors, was the first performed piece that evening. Perceptual engagement with Rešidbegović's work suggests a connection between the musical text and certain principles of mechanical language (the composer has been known to use Morse code as a universal language on several occasions), which a listener could consciously recognize as the rhythmic structure of the composition. On the other hand, such a universal principle of activity between two languages – mechanical and musical – can be experienced or interpreted as the basis for *ad hoc* improvisation through active listening. In this regard, the improvisational aspects of *Wreesky* primarily concerns the performer's individuality, ultimately serving as a *distillation* of complex interpretive demands within the composition. In such a context, the concept, as well as the experience of the *electroacoustic* within the mechanical structure, can feel entirely organic for a listener, as the sonic outcome of the piece is essentially woven through the homogenous sound of the flute and processors.



Figure 4. Hanan Hadžajlić performing *Wreesky III* by D. Rešidbegović (“Progression”, November 1st) © Vanja Čerimagić.

Another piece within the domain of electroacoustics is *Jazz: Fetzen* (2018) for bassoon and tape (the original version includes a non-standard ensemble and various types of live electronic elements) by composer Adrian Kleinlosen (1987). Noticing the constant modulations within the intricate metric network, an experienced listener will most likely be able to assume that Kleinlosen's work is an artistic research in the field of algorithmic composition, which in this case resonates in the very structure of the piece. A variety of idioms or musical models found in jazz music predominantly occur at the concept level, but also in the form of occasional subtle outbursts within the musical text. The original version of the composition was written for bassoon, prepared piano, DJ controllers, double bass, drum set, and electronics. The composer's note in the program booklet mentions that the complexity of the ensemble in the newer version of the piece is attempted to be compensated through the electronic layer. The *Jazz: Fetzen* fundamentally explores various morphological characteristics within the bassoon's sound spectrum and establishes a relationship with the electronic layer through several formal parts of the composition. Despite the exceptional and superb interpretation by the bassoonist's side, if the newer version of the work is observed as a unique electroacoustic *organism* realized through loudspeakers, on a purely perceptive level we may encounter (potential) divergences in the sound texture. The reason for this is likely the composer's effort to replace ensemble layer with electronics, which has been a challenging compositional endeavor for decades now, even on the conceptual level. Consequently, the envisioned sonic result becomes inconsistently realized or completely unrealized, somewhat disturbed in the homogeneity of the sound spectrum, as the composer treats the electronic layer based on parametric dealing with acoustic instruments. Therefore, the unity of the electroacoustic *organism* does not function, or in other words – the instrument and the tape relate to completely different individual essence, placing a listener in a state of hearing/listening to two mutually incompatible 'musics'.



Figure 5. James Aylward performing *Jazz:Fetzen* by A. Kleinlosen (“Progression”, November 1st) © Vanja Čerimagić.

The concluding segments of the “Progression” concert featured performances by the Impro Ensemble MAS⁵ (2018) in several configurations, depending on the needs of the improvisational plan. Navigating the realm between interpretation and improvisation, the ensemble evidently seeks to discover a universal musical essence – one that is accessible to anyone actively engaged in the listening process on the spot. In the performances of the Impro Ensemble MAS, a more experienced listener will discern aspects such as micropolyphony, diverse forms of variation, principles based on a ‘music as a process’, and more, all enhanced by the idea of the spatial disposition of instruments. However, if we were to assess this type of improvised music in that manner, it would be challenging to define it as a purely improvisational. Hence, the music of the Impro Ensemble MAS always maintains just enough micropolyphony, variations, procedural elements, and more. It is certainly not necessary to analyze or describe an improvised work more precisely, as the author contends that the true significance of musical improvisation takes its full meaning only in the real time of performance, seeking later validation within a dialogic framework at the expense of this monologue text.



Figure 6. Mirza Gološ performing with Impro Ensemble MAS (“Progression”, November 1st) © Vanja Čerimagić.

5 The Impro Ensemble MAS at the “Progression” concert included: Hanan Hadžajlić (flute), Aras Samardžija (clarinet), James Aylward (bassoon), Mirza Sijerčić, Rijad Šarić (saxophone), Emili Mišić, Teo Udović (percussion), Tea Stanković (guitar), Mirza Gološ, Zlatan Božuta (piano), Alex Mateescu (violin), Arijan Radoja, Selma Sulejmanagić, Alja Šabanović (viola), Fuad Šetić (conductor).

The review aims to provide a deeper musicological insight into the auditory reception of the performed works on the spot, with particular attention focused on the performances of works by contemporary Bosnian-Herzegovinian composers. In this way, everyone who experiences an encounter with contemporary artistic music for the first time lays a certain foundation, facilitates aurally access to it, or at least gives suggestions for a more conscious approach to listening based on their own experience in the search for freedom. The SONEMUS Festival is always a perfect opportunity for the sonic realization of contemporary concert-type music with diverse international music, encompassing both recent and less recent music. Thus, I would venture to say that the SONEMUS Festival is traditionally organized as a festival of 'exclusivity, freedom, and hope' for anyone finding any kind of interest in such music, and especially for musicologists with an interest in artistic music in Bosnia and Herzegovina.

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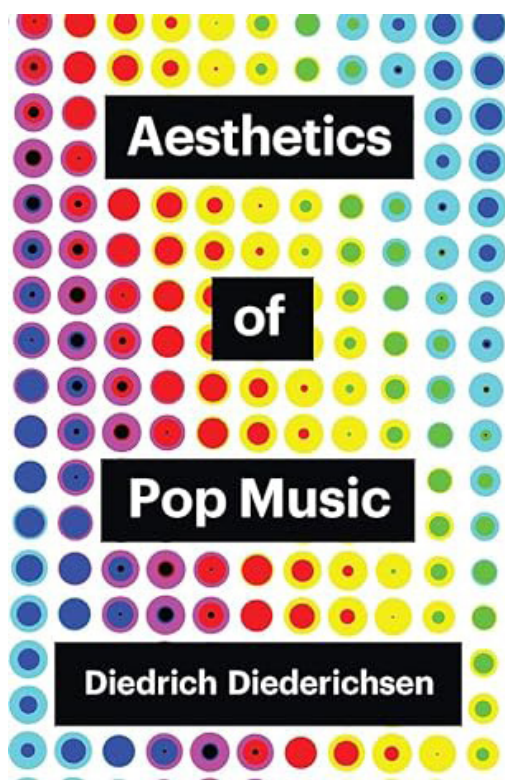
Belgrade, Serbia

**DIEDRICH DIEDERICHSEN,
AESTHETICS OF POP MUSIC.
CAMBRIDGE: POLITY PRESS, 2023.
ISBN-10: 1509552030,
ISBN-13: 978-1509552030¹**

“It would be impossible to describe pop music in language designed solely for understanding music and its traditions. It would be equally impossible, however, to describe pop music without music.” The thought that Diedrich Diederichsen, cultural critic and Professor of Theory, Practice and Communication of Contemporary Art at the Vienna Academy for Fine Arts, brings in the third chapter (p. 47) of his latest book *Aesthetics of Pop Music* is the problem at the heart of many writings on popular music (Diederichsen’s attitude is, however, that there is significant difference between popular music and popular culture in general, and pop music defined by aesthetic qualities he describes throughout the book). If pop music is music, should we not engage in analysis and interpretation of actual sounds the pop music is made of? On the other hand, do we not, in taking the focus on music, drop the series of other crucial elements of popular music? For Diederichsen, the matter is clear: “pop music is only partly music” (p. 1) and he devoted his “discursive text and manifesto” (p. vii), as he defines the writings before us, to the thoughtful series of observations on the complexities of pop music as an aesthetic phenomenon.

Diederichsen’s short but thoughtful book is divided into six chapters, preceded with a preface. In those six chapters, the author explores various facets of and statements on pop music: I *Pop Music is a Form of Indexical Art*; II *Pop Music Belongs to the Second of Three Culture Industries*; III *At the Heart of Pop Music Is No*

¹ This review is written with financial support of the Ministry of Science, Technological Development and Innovations (RS-200176) to the Institute of Musicology SASA.



Object, but an Impulse to Connect; IV An Assembly of Effects and Small Noises; V Minus Music: Popularity and Criticism; and VI Production Aesthetics. However, there are a few key concepts and crucial ideas woven throughout the book, thoughts that the author comes back to in different contexts and with a slightly shifted focus.

One of Diederichsen's ideas is directly connected to what I mentioned at the very beginning of this review. This is perhaps the most interesting point for pop music scholars and researchers who face tension between the musical and non-musical aspects of pop music. It can be succinctly described as a dilemma about the position from which to write on pop music. Diederichsen states his goal very clearly: "The chief mission of

this book is to separate the concept of pop music from the concept of music" (p. 83). In addition to arguments on pop music's multimedia character that are consistent throughout the book, the most evident execution of the intention to separate music and pop music is presented in the fifth chapter. The author offers an identification of the negations of the Eurocentric harmonic system and its institutionalized aesthetics (p. 84) that are partially introduced by recording and present throughout 20th century. He names them as ethnography, magic and symbolism, star cult as body cult and chance, accident, slapstick and small sounds (pp. 85–88). While arguments are logical and justifiable, it is evident that the author comes from a position whereby "the concept of music" is only considered as Western art music (and its institutionalized aesthetic, as mentioned). The intention is perfectly clear – to introduce the new aesthetic qualities and discussion on the specific aesthetic of pop music as opposed to aesthetic of Western art music and its residues that are often used as a starting point in discussions on pop music. However, by avoiding contemporary music scholarship as a point of reference (except for John Cage and Theodor Adorno, there are very few references to actual writings on music), Diederichsen also fails to place pop music in the contemporary discourse on music (although stating that pop music cannot be described without music), where for a long time Western-centric practices

are not seen as necessary point of departure. In other words, the “concept of music” more likely than not encompass pluralities and multitudes of musical expressions in contemporary notions of music. The text is, thus, in danger of leaving the readers with some knowledge on contemporary music writings underwhelmed and in want of some stronger argument on why exactly music aspects should be left out of pop music aesthetic discussions.

This is not helped by a very broad idea of pop music in this book. The author states that the music he has in mind encompasses the period from 1957 to the present day (p. 100), while the “general conception of pop music” as the author presents it should be “applicable to Britney Spears as it is to John Zorn” (p. vi). Elsewhere, pop music is distinguished in relation to rock and soul as its subdomains (in addition to popular music as another domain that intersects with it and pop culture that is contrasted with pop music) (p. 7), although references to musicians encompass a wide variety of styles and genres as representative of pop music. In addition, non-teleological qualities of music that are stressed as a model of pop music (p. 137) as opposed to an architectonic model of, for example, classical music, are not really obvious in the corpus of pop music presented by Diederichsen. However, the author makes a point to distinguish between the open-ended and non-teleological qualities of African American and African Diaspora music, as those lend themselves well to pop music, bringing along interesting points on a much-discussed problem of authenticity in pop music (p. 49).

The strong qualities of Diederichsen’s account on the aesthetics of popular music shine mostly in the explanations regarding the relational character of pop music and its strong reliance on the reception. There are several instances throughout the book where these ideas are present and striking. For example, in the first chapter, Diederichsen makes the following point: “Sound – the physical world of acoustics – is the medium that traditionally enables music’s form to emerge. In pop music, this relationship is inverted: music is the medium, and what it gives form to is an indexical mode of relation to the real world, rendered fetishizable and attractive through music” (p. 25). While susceptible to discussion from the music studies’ position (since the same account is arguably not reserved for pop music only), the point Diederichsen makes is that music has storage-like qualities, in the sense that it can generate “cognitive linking codes” (p. 47), and “a new relationship between listener and the listened-to in which the listeners themselves, their own listening, play a new role” (p. 48). Linking that is encouraged encompasses other media: “...pop music has no centre, not even a shifting centre – neither a central object nor a central creator. In dialectical terms, this is the true heart of pop music – or at least it remained so for a long time. Pop music has its roots in a form of *linking*, which (unlike internet links) leads no to an equivalent (i.e., to further digital data), but instead to a diverse range of cognitive associations – from sound to image, form solitude to society,

form purchasable playback device to immaterial habitus – by means of musically prompted *recognition*” (p. 39).

For Diederichsen, reception is the *sine qua non* of pop music, as “the activated fan”, in terms of cultural theory (i.e., John Fiske), is a rule and not an exception (p. 42). Thus, for pop music temporary completion is achieved in the process of reception by fans. The author says: “The attempt to understand pop music, to reconstruct its constituent parts, usually forms part of a process of world-making undertaken by people who are not yet or not at all integrated into social institutions” (p. 45). We could say that one of the key relations Diederichsen brings forward is the relation between solitude and community, between aloneness and integration, or “the route from inside to outside”, as he formulates it (p. 45).

Reception is also the key in the very interesting analogy between photography and phonography, in terms of introducing Roland Barthes’ idea of punctum, or “involuntary singularity” of a photograph (p. 108). Diederichsen brings his earlier notions on specificities of recorded sound (in contexts such as negation of the concept of music or in the introduction of “small sounds”) to a satisfying conclusion by pointing out that the involuntary effects of recorded sound are key to the aesthetics of pop music (p. 109). “Punctum experience” is also at the core of another “key ingredient of pop music production: the pose” (p. 113). By pointing out the skills and techniques of making a pose – offering oneself up for projection (ibid), Diederichsen sums up previously drawn-out aspects of pop music as essentially performance art (or *behavior art*, p. 11). The quality of balancing between conceptualizing a core reliance on reception with a description of the production aesthetic that is aware of that reliance is a no small feat that the author accomplishes within this text. The several points emphasized here are not the full extent of problems and examples that Diederichsen tackles, but are those that are perhaps most striking. In approaching pop music as an aesthetic phenomenon and the multimedia, relational experience whose open-ended, elusive performance is more important than the ‘work’, Diederichsen comes close to persuading the reader of leaving more musical qualities aside and focusing, instead, on the sound of pop music as only a trigger for a more complex aesthetic experience.

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Monograph: https://ugbih.ba/archive/wp-content/uploads/2022/12/Nela-Hasanbegovic_EBook-compressed.pdf

Lee Chie Tsang Isaiiah is a Malaysian composer known for his works that reflect his cultural and educational background. His compositions blend Asian performance aesthetics, western contemporary classical approaches, and indigenous East-Malaysian (Kadazandusun) ritual forms, conveying energy as a flowing movement and significant colour. Currently, he focuses on exploring and reframing interdisciplinary perspectives related to hybrid oral traditions found in East Malaysia to stimulate new possibilities for sounds, spaces, and creativity in his compositions.

Chie Tsang has various prizes and commissions. He was a finalist in the KL-CMF, Forme Uniche della Continuita nello Spazio International Composition Competition (Melbourne), and TMC International Composition Competition 2011. (Taiwan). He collaborated with Jean Penny, Peter Veale, Adam Bowles, Dirk Amrein, Jürg Henneberge, Bridget Carey, Chong Kee Xin Anna, Timothy O'Dwyer, Ensemble Mosaik, Studio Musikfabrik, Discord Workshop, Sirius Quartet, Ensemble Offspring, Atlas Ensemble, and Quartet Bozzini. USA, Australia, UK, Malaysia, Taiwan, Singapore, Indonesia, and Albania have performed his music.

Chie Tsang is ACT's music programme head and a member of a committee of the The Society of Malaysian Contemporary Composers (SMCC).

Jasna Jovičević graduated from “Franc Liszt” Music Academy in Budapest, Jazz saxophone performance and teaching, received an MA in Music Composition from York University in Toronto, and earned a PhD in Arts and Media at Singidunum University in Belgrade, focusing on the phenomenology of jazz and free improvised music. She studied and won grants to many Artist in Residency programs in New York, San Francisco, Banff, Graz, Brazil and Spain, Zagreb as well as music competitions in Milan, Budapest and Ljubljana, and won a researching grant by the JEN in the Smithsonian Institute (Washington D.C.) and EU AI Lab Project from Ars Electronica. Jasna has performed her original work around Europe, USA and Canada on many national and international festivals, released six solo albums of original music written for various instrumental formats, and recorded a dozen albums as a sidewoman. She teaches music and music methodology at the university level, but also develops non-formal music methods in education in relation to yogic and mindfulness studies.

Krzysztof Kicior, born in Katowice (Poland), is an up-and-coming composer, sound engineer, pianist, and researcher. He holds degrees from the Grażyna Bacewicz National Music School Complex and The Fryderyk Chopin University of Music in Warsaw. Additionally, he has further refined his craft at esteemed institutions including the University of York, Berklee College of Music, and Harvard University.

Kicior's compositions have garnered international acclaim, captivating audiences far and wide. His remarkable talent has earned him numerous accolades and recognition in national and international competitions spanning various realms of music and the arts. In 2019, he made history by becoming the first musician to receive the Diamentowy Grant, the most prestigious national science award in Poland, for his outstanding contributions to the field of music.

As a pianist, Krzysztof Kicior has embarked on successful concert tours, performing in renowned venues across Europe and Asia. He has also shared his knowledge and expertise through masterclasses, workshops, and lectures in various educational institutions. Beyond his artistic accomplishments, Kicior actively contributes to the Audio Engineering Society (AES), where he has been a member since 2014. From 2016 to 2019, he served as the manager of the AES Warsaw Student Section, demonstrating his commitment to the advancement of audio engineering.

Currently pursuing a Ph.D. at The Fryderyk Chopin University of Music, Krzysztof Kicior continues to push boundaries and explore new artistic possibilities. His passion for music, extraordinary compositions, and commitment to growth position him as an emerging figure in the global music scene.

Clare Lesser is a performer, musicologist and composer. Her research interests include deconstruction, indeterminate and improvised music and performance, graphic notation and sound art. She has given over 80 world premieres, including works by Michael Finnissy and Hans Joachim Hespos, and is recorded by Divine Art/ Métier. Recent publications focus on the work of John Cage; Sun Ra; Michael Finnissy; Hans Joachim Hespos; and pragmatic approaches to the rehearsal process. Current projects include volumes for Palgrave Macmillan and Cambridge University Press exploring the intersection between deconstruction and experimental music, and two new albums of chamber music by Michael Finnissy and Hans Joachim Hespos. She is the founder of ElectroFest at NYUAD and was a senior lecturer and program head of music at New York University Abu Dhabi.

Tace McNamara is researcher, and musical artist with a passion for exploring the intersection of Artificial Intelligence (AI) and Art. With a focus on AI ethics and the incorporation of AI from a humanities and art perspective, she examines the transformative potential of emerging technologies in the creative process. Through her interdisciplinary approach, her research and artistic practice contribute to the ongoing discourse surrounding AI in the arts, fostering a deeper understanding of the ways in which AI can enrich and challenge artistic creation.

Amrinder Romana is a senior lecturer at Leeds Beckett University's Leeds School of Arts with over 15 years of lecturing experience in creative arts subjects. He specialises in the areas of 3D modelling, digital scanning, animation, illustration, and performance capture. Amrinder's research practice revolves around the effective integration of technology within interdisciplinary contexts, demonstrated through his projects The Bradford Dhol Project, Levelling Up History, Culturally Symbolic Composition and Social Cohesion Project. Amrinder's research focuses on exploring the effective integration of technology within interdisciplinary subjects. This multifaceted approach combines animation, sound drawing, and 3D scanning to explore their potential in fostering cultural understanding. Animation visually communicates cultural narratives, sound drawing encourages individual expression, and 3D scanning preserves and highlights cultural heritage.

Wang Hai Yue is currently a PhD candidate at the University of Sabah, ACT, under Dr. Lee Chie Tsang. In 2019, piano trio work Ci has been short-listed to be performed in UiTM-klpac The 10th Composers Concert Series 2019's Piano Trio Composition Workshop. In 2021, piano trio work Si Jiu City has been short-listed to be performed in UiTM-klpac The 11st Composers Concert Series 2021's Piano Trio Composition Workshop.

Her current work explores and composes ideas related to Chinese musical traditions in order to provoke reflection on cultural contexts, spatial and disintegration and reintegration in her compositional work. Her music evokes the notion of disintegration and reintegration, the state of music in its different timbres, rhythmic structures, interacting forces, etc., combining aspects of Chinese musical traditions with contemporary musical timbres and techniques.

GUIDELINES FOR AUTHORS



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