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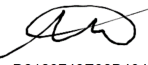
Lauryn Gayhardt

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SOVIA: Sonification of Visual Interactive Art

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SOVIA: Sonification of Visual Interactive Art

By Lauryn Gayhardt

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I would like to extend my sincerest and heartfelt appreciation to Professor Ackerman, who saw and continues to see possibilities in me and my education that I don't always see in myself. She has been instrumental in my personal and professional development by instilling confidence in me as a woman in technology. Her open constructive feedback, positive direction and unwavering support has encouraged me to look to many avenues of opportunity for future career and educational possibilities. I have learned to challenge and accept myself.

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SOVIA: Sonification of Visual Interactive Art

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2023

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Abstract

Therapeutic Computational Creativity is an emerging domain that challenges us to explore applications of Computational Creativity systems to mental health and wellness. This work presents SOVIA, an interactive system that endows Claude Monet's art with responsive auditory experiences. SOVIA uses computer vision trained on Monet's artwork to take the user "into the painting." When the user interacts with a digital version of Monet's landscapes, their mouse positions are mapped to sounds that artistically represent the objects that the user is currently exploring in the art. These interactive musical journeys have the potential to make classical art more captivating for modern audiences. We further assess the SOVIA's potential in a therapeutic context, conducting a user study followed by thematic analysis to ascertain SOVIA's value for mental well-being. Results show SOVIA's promise as an aid for mental wellness.

Parts of this thesis were published in the following papers:

Gayhardt, L., and Ackerman, M. 2021. SOVIA: Sonification of Visual Interactive Art. In Proceedings of the 12th International Conference on Computational Creativity (ICCC'21), 391–394. Association for Computational Creativity.

Gayhardt, L., Ackerman, M., and Cheatley L. 2023. Fostering Mental Well-Being through Creative Interaction: An Assessment of SOVIA. In Proceedings of the 14th International Conference on Computational Creativity (ICCC'23) Association for Computational Creativity.

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Introduction

In recent years, entertainment has been becoming progressively more interactive - from social media, art, and education, there is an effort to engage users beyond mere consumption. This opens up the challenge of how to endow classical art forms with new layers of interactivity to engage modern audiences, while retaining the essence of the original art.

Visual art uses color, light, texture, and stroke techniques to convey the mood, tone, and meaning of the artwork. Every layer of information aids in expressing the artist's intent. Adding music and sound to a painting can assist in creating more depth, strengthen existing themes, and convert a consumption-based experience to an interactive one.

In this work, we propose an interactive method for deepening engagement with visual art and focus on the wellness potential. We introduce SOVIA (Sonification of Visual Interactive Art), an interactive system that adds an auditory dimension to still art. Our initial version of SOVIA endows Claude Monet's landscape paintings with soft music and nature sounds, which respond to the user's mouse position. The aim to bring the user "into the art," letting them experience a self-directed musical journey into Monet's landscapes (SOVIA may be accessed here¹: <https://sovia.azurewebsites.net/> and a video demo can be found here: <https://youtu.be/XMMMMBeukhb4>).

Monet was a French impressionist artist (1840-1926) and the first to paint outside the studio. He aimed to capture "what is seen rather than what is known"(Seitz 2021). SOVIA's sounds added to his paintings amplify the idea that the viewer is experiencing a slice of life. Instead of trying to accurately reproduce the scene before him in detail, Monet aimed to record "on the spot the impression that relaxed, momentary vision might receive—what is seen rather than what is known, with all its vitality and movement" (Seitz 2021). To reflect this balance of the literal and metaphorical, SOVIA adds an auditory dimension that intermixes real sounds with musical elements.

Using machine learning enabled object detection, SOVIA recognizes objects in the paintings, which are subsequently mapped to sounds. When the user glides their mouse over a hill they will hear sounds of herding bells through the background music. If the user's mouse wanders over flowers, chimes will play, similar to what one may hear in a garden as a soft wind floats by. This mixture of music with realistic and associated sounds creates an experience that mimics realistic elements in the art, while reflecting the gentle artistic reinterpretation of those objects through sound.

The interactive process offered through SOVIA places most of the effort on the machine agent, while giving the user a simple and enjoyable experience that deepens engagement with Monet's landscapes. We hope that the process proposed here will inspire more researchers into how creative machine agents can be used to enliven classical art forms.

¹ To interact with SOVIA, click on the painting after it loads to start playing the sounds, then move your mouse around the painting and hear how the soundscape reacts to your exploration of the art. Refresh to get a new painting.

SOVIA and Mental Wellness: Therapeutic Computational Creativity (TCC) is an emerging field within Computational Creativity (CC) that overlaps human computer interaction, art therapy, and psychology. While TCC does not aim to replace classical therapists, it can offer benefits with therapeutic endeavors (Pease et al. 2022). Previous work in TCC focused on bereavement. One study explored current reminiscence practices and receptiveness to CC related tools with the bereaved (Cheatley, Moncur, and Pease 2019). The following year, a user study was used to analyze ALYSIA (Cheatley et al. 2020), a co-creative songwriting machine, to assess its utility in the bereavement process. Data from the study was analyzed using thematic analysis, a technique that allows researchers to identify patterns in data by discovering recurring themes, allowing them to examine common experiences and meaning throughout a group of participants (Braun and Clarke 2012). The study found that ALYSIA supports self-expression, as well as helps users reminisce and gain awareness of their feelings.

A core focus of this work is uncovering the possibilities of increasing well-being with SOVIA. In our analysis of SOVIA's potential for wellness, our focus here shifts outside of bereavement, interviewing people from the general population to assess the value of SOVIA in a broader mental wellness context. In this study, we utilize open-ended interviews with thematic analysis. After discussing SOVIA's method, we will go over the study's methodology, then detail the results and discovered themes, and conclude with a discussion of the findings and future work.

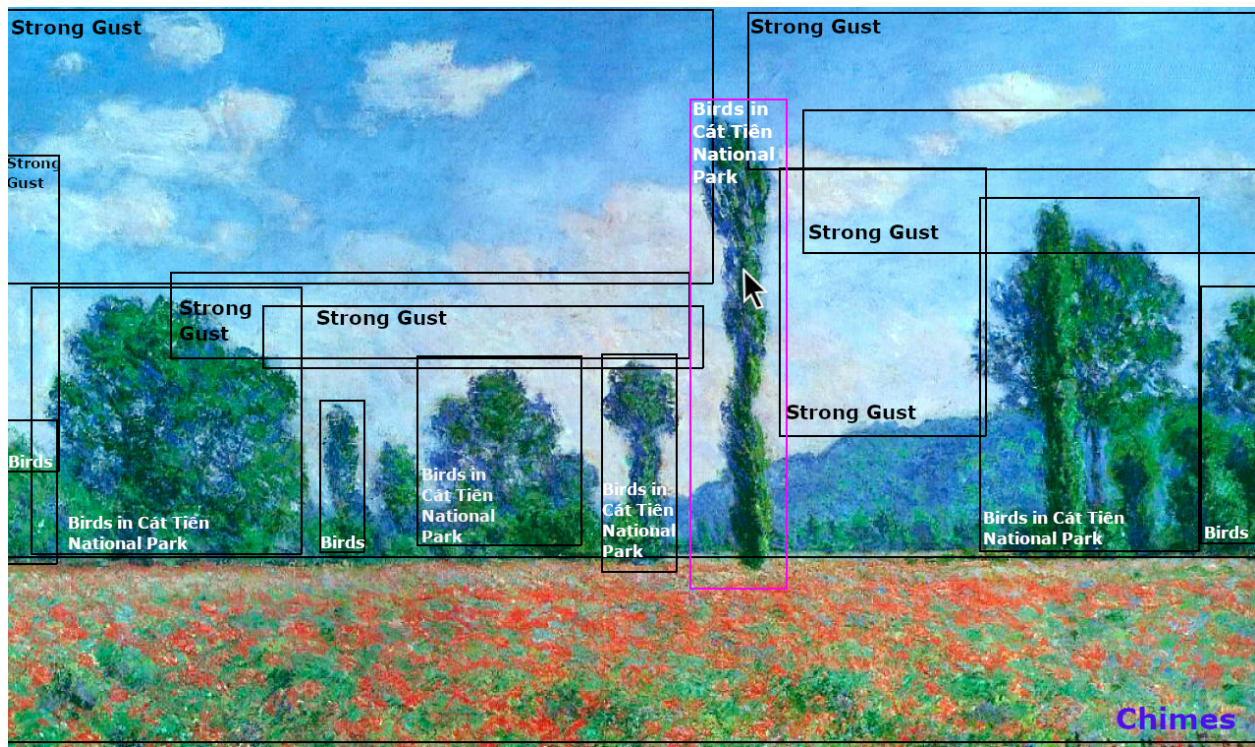


Figure 1: A visualization of the internal workings of SOVIA. The bounding boxes detected using computer vision are labeled and mapped to a set of sounds, one of which is played when the cursor enters the box. As the user explores the painting through mouse movements, sounds corresponding to the different bounding boxes are intermixed with the background music. Bounding boxes are not shown to the user.

The sky boxes are mapped to sounds of a strong gust of wind, the tree boxes are mapped to bird sounds in Cát Tiên National Park Vietnam, while the flower box is mapped to sounds of chimes. The position of the cursor dictates the active box whose sound is played, visually represented here through highlighting in this image. The painting is of Poppy Field at Giverny (1890) by Claude Monet. Photo Credit: WikiArt

Related work

Related work has considered the conversion of art to music and vice versa, often focusing on creating novel works rather than enhancing existing art works. Other related work offered co-creative experiences which allow the user to concurrently create new music and art. We share several examples here.

MetaSynth (U & I Software 2021) lets users create music from images . It allows for pixels to be drawn or imported onto a digital canvas, and uses the RGB color data from pixels to affect and produce sound. It generates audio using the brightness of the pixels to control to amplitude, pitch bases on the pixel's Y-axis position, and the red and green color components to pan the audio to the left or right speaker channel (Pitman 2009). Metasynth differs from SOVIA in that it generates audio at the pixel level of an image vs detecting objects within an image that map to different sounds to be played.

PhotoSounder (Rouzic 2020) is a graphical and audio editing software and synthesizer that allows the user to make music from images. It is similar to MetaSynth, but gives the user greater control over sound mappings and runs on both Windows and Mac.

Pixelsynth (Jack 2016) is a browser based synthesizer inspired by the analog ANS Synthesizer that creates sounds from images and drawings. It uses the grayscale version of an image and turns it into a sine wave by having the white in the picture represent a note that is on, transparency representing velocity of the note and location for pitch(Arblaster 2016).

A system by Joana Teixeira and H. Sofia Pinto (Teixeira and Pinto 2017) takes an image as an input and generates music by relating visual features to musical ones. Conversely, a system by Lu'is Aleix, H. Sofia Pinto, and Nuno Correia (Aleixo, Pinto, and Correia 2021) taking in music which it uses to generate an abstract image.

SOVIA differs from the systems above because it is not transforming one art form into another, or offering a co creative experience that creates novel art and music, but rather amplifying a given artwork by adding a musical interactive experience.

Related Digital Art

Digital artists have also experimented with interactive integration of sounds and visuals through online installations. For example, Joe Hamiliton's Indirect Flight is an interactive web art that displays a layered collage of landscape images set to a realistic soundscape of wind aeroplanes and other urban noises by J.G Biberkopf. "As you pan across the terrain like Google Maps the

layers move at different speeds giving the illusion of depth, constantly changing what is hidden and exposed". (Hamilton 2015).

Rafaël Rozendaal's Sunrise/Sunset allows users to interact with circles that represent the rising and setting of the sun in New York City on the Whitney Museum of American Art website creating a piece of abstract art. "As visitors to whitney.org move the cursor over the black or white circle obscuring the web site, they cast spinning shadows or light over the page that obscure or expose its content" (Whitney Museum 2017).

Method

The initial version of SOVIA is written in Python, using Microsoft Azure's Custom Computer Vision Service for object detection and Pygame to handle tracking the mouse movements and playing the sounds. When a user's mouse enters the coordinates of a detected object it will select an associated sound and increase the volume of the sound to an audible level.

Computer Vision

We manually created the training data for the model. The training data consisted of 369 various sized Monet landscape paintings with the tags: flowers, snow, structure (building), grass, mountain, water, sky, and boat. The training set includes 55 tags for flowers, 53 for snow, 158 for building, 161 for grass, 57 for mountains, 212 for water, 57 for boat, and 318 for sky. The model was trained for five hours.

To evaluate the model's performance, we consider precision, which is the likelihood that a tag predicted by the model is correct; recall, the probability that the model found all the objects in a given image, and mean average precision(mAP). Our model has an 80% probability threshold with 62.2% precision, 71.2% recall and 64.8% mAP.

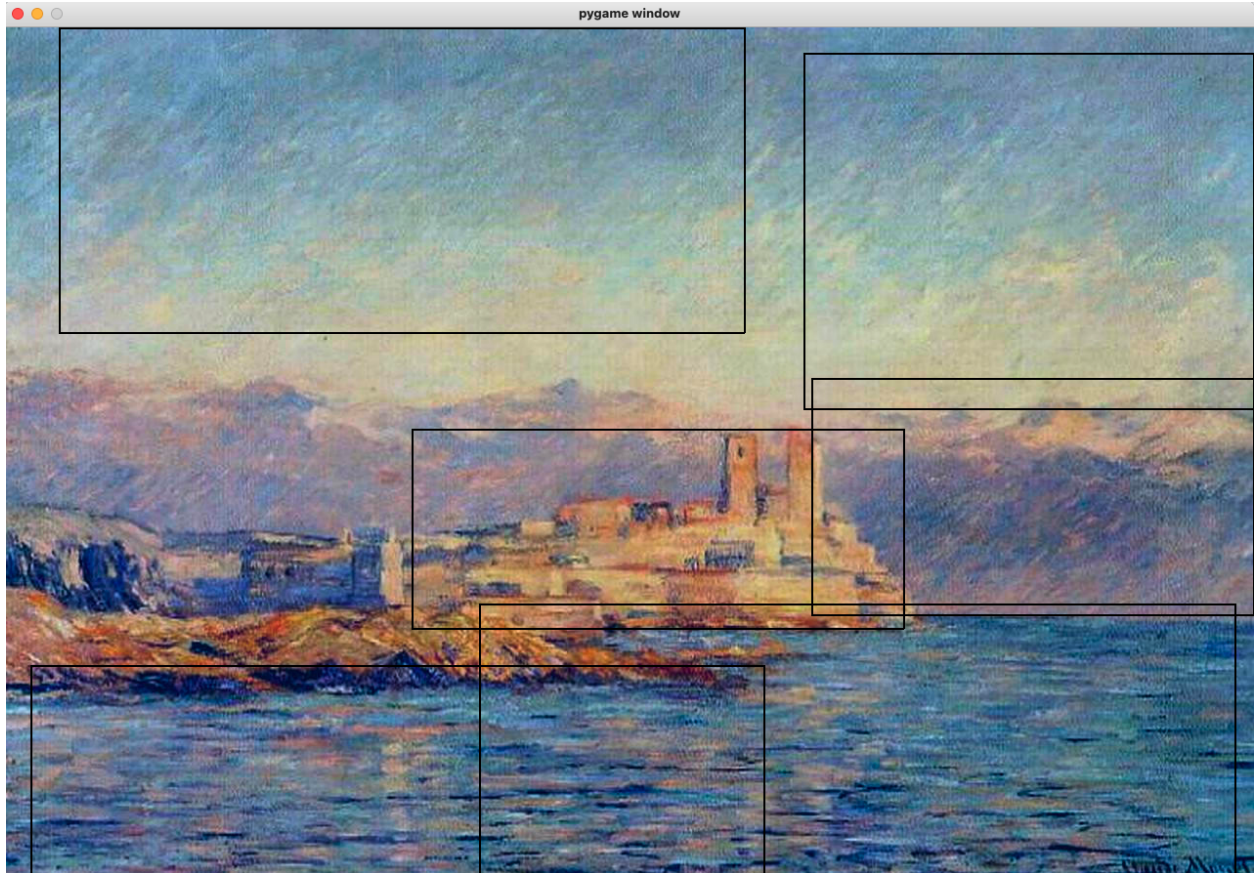


Figure 2: The Castle in Antibes (1888) by Claude Monet with bounding boxes on water, sky, and building objects. Photo Credit: WikiArt

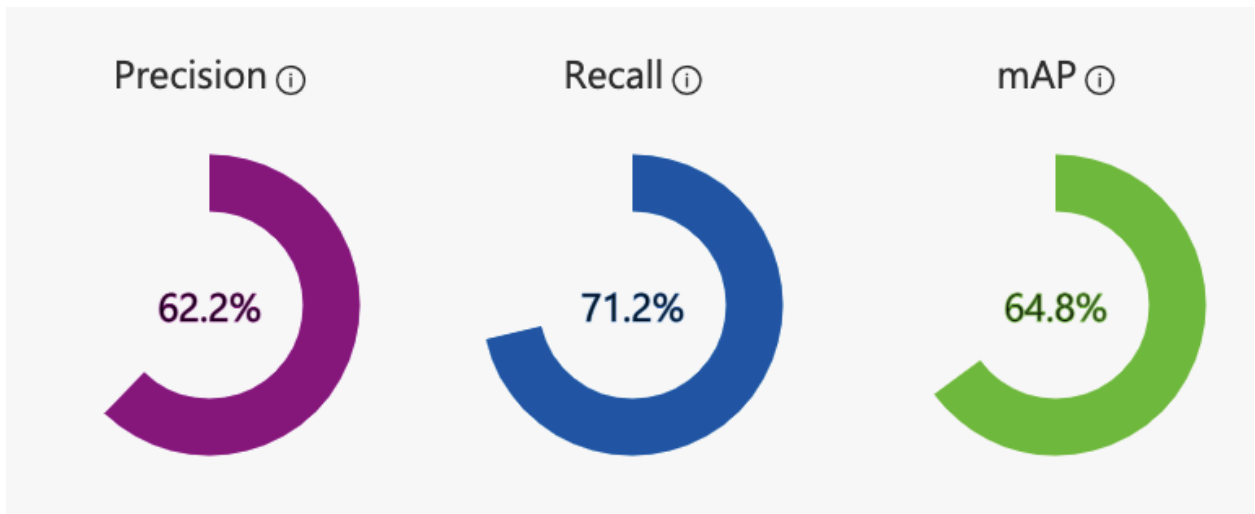


Figure 3: Our computer vision model with 80% probability threshold performance metrics. Photo Credit: Microsoft's Custom Vision Portal.

Sounds

The custom vision service uses normalized coordinates with left, top, width, and height to detect objects. In this project normalized coordinates are converted into pixel coordinates to compare the mouse location in Pygame. Each tag has corresponding sounds associated with it, some tags have one sound while others have many. When there is more than one sound associated with a tag the sound to be played is randomly selected. All tags are mapped to a Pygame sound channel, which starts at a volume of 0.

When the mouse location intercepts the boundary for a detected tagged box it increases the volume for the sound channel for that tag until it reaches a clearly audible volume which it will remain at until the mouse is moved outside the boundary box. When the mouse is moved outside the box the volume starts to decrease until it is 0 again. Increasing and decreasing the volume allows for sounds to continuously play, so when the mouse intercepts the bounty for a box, the sound does not start over again.

If there is more than one of a certain type of tag detected, the same sound is still played for that tag. For example, if an image has two tags of trees, one of the many tree sounds will be selected to be played for all tree tags. When the mouse intercepts one of the tree tag boxes, the volume for that sound will be increased.

Sounds and music are royalty free and were obtained from Zapsplat, Freesound, Mixkit, and Avosound. Please see Figure 4 for a list of object-sound mappings used in SOVIA. Some tag sounds were chosen for their literal representation of the tagged feature while others are more abstract. For example, Chimes were used for the flower tag to create the feeling that one is walking into a garden and hears chimes blowing in the wind. Chatting in Polish is used in the building to give the sense of a lively conversation taking place within the house. Goats are heard for the mountain tag because it is one of the many animal sounds that one may hear on a mountain top.

Tag	#	Sounds
Trees	10	Forest sounds with birds
Sky	5	Wind Sounds
Flower	1	Chimes
Grass	1	Cicadas with distant birds
Water	7	Sea, Stream, and underwater sounds
Mountain	2	Goats and herding bells
Snow	3	Footsteps in the snow

Boat	4	Boat swaying in water; creaking wood and paddling
Building	1	People chatting in Polish

Figure 4: SOVIA's object-sound mappings. The left column represents objects found in Monet's painting, the second column corresponds to the number of sounds that SOVIA offers for that object, and the final column describes the nature of the sounds given to the object.

Experimental Setup

The overarching goal of this study is to evaluate the potential uses of SOVIA for mental wellness. A web version of SOVIA was created to allow participants easy access to the system. This version of SOVIA was written in JavaScript with Node.js on the server side and uses Phaser to handle tracking the mouse movements and playing the sounds. The study took place over zoom where participants were introduced to SOVIA by verbal instructions and a live demonstration where they were shown how to navigate the system and how to discover new images. Afterwards, participants were asked to engage with SOVIA directly and to view at least three different paintings, but encouraged to look at as many as they wanted.

To allow the users their own (unbiased) experience of SOVIA, the researcher muted their audio and video while the participant was using the system. The researcher would not interrupt unless the participant had a question, was done using SOVIA, or 20 minutes had passed. Afterwards, a semi-structured interview was conducted with each participant to explore their reaction to and experience of SOVIA. The majority of questions asked were open-ended, for example, "How did SOVIA make you feel?" and "How would you describe your experience using SOVIA?" Questions that were not open ended had follow up questions so the participant could elaborate.

Recruitment and Participants

Participants were recruited through snowball sampling and the research participation tool at Santa Clara University's psychology department, SONA. The only requirements was that participants had to be over the age of 18, speak English fluently, and have access to a computer and the internet. The 11 participants were anonymized with the assignments of P1-P11. Eight identified as female and three as male, P5-P7. Three, P1-P3, of the participants were career professionals in the age group of 51-57. They had different levels of educational background: P1 had a Bachelor's, P2 had a Master's, and P3 had a PhD. While the others were college students working on their bachelor's degree of varying majors between the ages of 18-25.

Artistic Affinity

Participants were asked background information about their interest in art, to determine if this affected experience with SOVIA. Most of the participants had a regular appreciation for art; that is, they enjoy art, but do not go out of their way to view it, and might currently participate in art casually through doodling, coloring, etc. However, some participants were more enthusiastic about art. P7 makes art while working on game development, as in 3D modeling and textures for world development. While P10 is an active hobbyist who enjoys drawing, painting, and pointillism art. Additionally, P4 was the most passionate about art, as she enjoys going to view art physically (international museums) and is often aware of local art exhibitions. She is also an active hobbyist who enjoys painting, photography, and cinematography. P9 seemed the least interested in art out of everyone, and admitted that she didn't care for it growing up. However, she now appreciates it more through her interest in makeup art. No participants had an expert level of interest in art, that is, none studied art academically or did art professionally.

Ethics

This study was approved by Santa Clara University's Institutional Review Board before data collection took place.

Voluntary participation, informed consent, anonymity and confidentiality, potential for harm were the considerations addressed in the design of this study.

- Participants were given a participant information sheet which detailed what the study involved, their right to withdraw at any time, possible foreseeable risks or inconveniences, complaint procedures, and how their data will be stored and handled.
- Participants were asked to sign consent forms. They were instructed to sign only after reading the participant information sheet.
- All personal information obtained from the study was kept confidential and was stored in a two-factor authentication password protected One Drive.
- All data collected was anonymized and identifiable information and video recordings were deleted after 12 months.

Results

Five major themes were identified in the user interviews: Calm, surprise, emotional association, control, and curiosity. We detail each below. Verbatim statements were kept mostly untouched except for the omission of the filler word "like", as it makes the statements easier to read.

Calm

All of the participants felt a sense of calm, peace or relaxation when using SOVIA. One of the first reactions many participants had when asked how they felt was this feeling of calm, "I felt.. very serene and I felt very calm and each photo is kind of like a different experience."(P4) "I think it's very calm like the picture itself is very beautiful and simple calming but then you add music, on top of it and I kind of feel it comes to life, a little bit like you can kind of sense the mood of whatever's going on"(P11) "I would say relaxed... I guess, I could say happy because it, it was a cool experience and that I've never done before." (P9) "if you close your eyes, you can almost feel like you were in wherever the big painting was set in. It was just kind of peaceful."(P6)

Participants mentioned that they think SOVIA could be used as a de-stressor. One participant even had a real-time experience being soothed by using the system. P11 is a student who was stressed about school and upcoming finals and was thankful for using it, "Well actually I think that it kind of was nice, I mean it really did calm me down because, this is week 10 is very stressful.. It was... like just for a second it was just like okay chill... I feel kind of good right now."

When asked if they would use SOVIA again and when/why many mentioned that they could see themselves using it to break up events that can be tiring or induce stress. P3 said that they would see themselves using SOVIA in between meetings at work. P2, a speech and language therapist, works with preschoolers to 6th graders also mentioned that they could use it to break up work activities, "I think that's kind of a neat way to kind of to immerse yourself into it a little bit and...just gonna be a little relaxing break maybe at work between groups [of kids]". P4 voiced how she could see herself using it as a break or before a stressful event, "If I'm stressed out and I feel like also [I could use] it in between homework assignment is kind of like a break, or before a test to kind of get my nerves down or something like that."

P6 thought SOVIA could be used as "A tool to relieve anxiety... Kinda like get you in a better mindset to fix ... or get through whatever you're anxious about." P10 also mentioned that they could see SOVIA helping someone decompress if they are experiencing anxiety, "I felt that perhaps it's sort of like maybe an individual is going through a lot, and they have a lot on their mind. And so, something like this can kind of let them decompress ... focus more what they're seeing and what they're hearing. So I think it's kind of like when you have a panic attack or anxiety something like that, and then they tell you to list what you see or something in the room."(P10)

Some could see using SOVIA for meditation. P4 thought it could be used as a before bed meditation, while P5 saw it being useful for meditations to be present. "I think a different form of meditation but not really closing your eyes, but being present in the moment and just

having your headphones in and just listening ... to the day sounds like practicing breathing.” (P5)

Even those who felt that SOVIA wouldn't be their first choice for de-stressing, felt that it could be helpful under certain circumstances. “I don't know if it'd be the first thing that I go to for a de-stressor but I do think if needed, I could do that ... So maybe a before bed meditation type of thing.”(P9). P10 shared that their primary choice for calming down involves going outdoors, but that they could rely on SOVIA if going outside was not an option. “I think it's nice... if I want to distress, I guess, maybe I would use SOVIA if it's late at night I can't really go outside”.

Emotional Association

Using SOVIA reminded some participants of their lived experiences. Whether their experience was positive or negative affected their reception of certain sounds and visuals, and aided in recreating the feelings they had from that memory. For some users, it brought a sense of nostalgia, “I really like the birds chirping I feel like that's an association I have with like summer and good times, so that's how it made me feel like calm like at peace” (P8).

Other participants were reminded of an activity, “Some of the paintings just listening to the trees kind of reminds me of when I go on hikes. Or if I'm in my backyard and I just really need to de-stress....When I go on hikes it's when I have free time and it's basically moments and times when I don't really need to think about anything too deeply I can just let myself, be a little bit free now and I I don't have to be constantly thinking about worries my problems and so.” (P10) “I do meditation and, many of the the sounds I heard... from the art form really kind of remind me of my meditation” P5.

Not all associations were positive. P7 didn't like the sky sounds “The wind makes me a little bit uneasy... wind just doesn't make me very happy”. It reminds him of how he feels when in the wind “... whenever it's windy I get cold and stuff blows away and it's just hard to walk. And yeah something that's just like bad feelings that I've had in the past... it's like the worst thing ever”(P7).

Control

Many participants liked the sense of control they felt. They liked that they could choose the sounds they wanted to hear and when. For some, the aspect of control was a defining factor in their enjoyment of SOVIA. P7 details his experiences using SOVIA and where he chose to move their mouse. “I was able to go down into, the jungle area and then there was those birds... Then there was a little town and there's people talking ... [It was] very relaxing it was nice because, I could control what sounds I want I feel like I was like moving around in the picture, even though, it was just the mouse moving.”

P7 also mentioned earlier in the interview that when it comes to game development he likes to do all aspects from coding, art, and design because he enjoys the sense of control. P6

also liked that he could pick what he heard “I like [that] you can kind of choose which sounds you heard in the painting. You could be next to the river and hear the water, or you can go into the air and hear the wind”.

P4 liked the power she felt when using SOVIA and how she could create her own experience which enabled her to be creative, “feel like I could be creative as well, I felt like I had a lot of power and creating my own separate life. [It's like] I could kind of step back from reality for a second”. While P3 compared SOVIA to the Calm app² because it also uses nature sounds. However they preferred being able to control what they heard and they enjoyed that more.

Curiosity and Surprise

At first thought, P3 said she felt relaxed after using SOVIA. When asked if relaxing is the only way she would describe the experience P3 said “I would put calming, I would put engaging it's definitely kind of elicited curiosity.” P3 felt that it was more engaging because you are “connecting the sounds with the details and making you explore, so that you can hear new things... I felt like it made me notice the details of the painting more”. P1 also mentioned that it made them curious, “it was a calming effect, calming and curious I guess... it inspired me to touch different parts and and look at different parts of the painting and just curious like how does that, how does this work?”

As P11 reflected more on how SOVIA made her feel, she realized it actually made her very curious, “Like just really calm and relaxed and curious .. actually curious ... and some of the sounds weren't what I was expecting so it was really cool.” She later described, “... I hovered over her house and on the previous one, there was people talking and then in the next painting... one of them was silent there's no talking... It had more movement and wind, and all this stuff, so I think...it gets me curious like oh, what is going to happen next, what is this going to sound like that's not what I expected yeah.” (P11).

Participants said that they felt moments of surprise when using SOVIA. P10 thought the unexpected was interesting and provided a unique point of view. “I think it's sort of like an interesting thing perhaps that's not the sound I expected to come from. Whatever I hovered over I didn't expect to hear chimes for flowers, but I think that's an interesting thing and that could sort of be in itself kind of a means of art like you know you overlay certain sounds over something and that's someone's unique perspective that perhaps you didn't consider.” (P10).

Another participant also was surprised when they heard certain sounds “I just heard the voices I was kind of surprised because I was like Oh, I thought it was just like instrumental you know, but once I heard the voices that just like caught me off guard, but it wasn't really scary it's just like something surprising“(P8) Others expressed moments of excitement, “I was kind of excited to like see. Oooo what if I tap here, if I tap there.”(P2).

² The Calm app consists of a variety of meditations, music, soundscape, etc. designed to aid with sleep and relaxation.

Results Summary

The interviews revealed five themes among the participants: calm, emotional association, control, curiosity and surprise. Many participants said they could see themselves using SOVIA to break up times in their day that they may find stressful (such as work and homework), as well as for meditation. Participants liked that they could control what they heard and could traverse the painting themselves which added to the feeling of calm and empowered them to feel creative. Participants found some of the sounds to be unexpected which aroused their curiosity.

SOVIA made users want to explore the paintings more and allowed them to notice more details that they might have otherwise missed. Not only did SOVIA make participants feel serene but also reminded them of some of their lived experiences such as going hikes, experiences that they've had in summer months, and even negative experiences of being cold in the wind. The themes identified allowed participants to engage with the art more, reduce stress, and experience a sense of familiarity, wonder, and autonomy.

Discussion and Conclusions

Creative machine agents can add interaction to traditionally consumption-only visual art experiences. The interaction can result in a more immersive experience and invite viewers to more deeply engage in meaning formation.

SOVIA adds an auditory component to traditional visual art, particular the works of Monet. Adding acoustics that blend realistic and symbolically-related sounds with soft music pairs well with Monet's style - inviting viewers to a self-directing sonified experience of Monet's landscapes.

In this work, we examined the impact of SOVIA on human well-being through semi-structured interviews and thematic analysis. The overarching theme across all interviews is that using SOVIA gives rise to a sense of calm and relaxation. For some, using SOVIA reminded them of past experiences. A number of participants noticed they were curious, while others were surprised at moments, which fueled their curiosity.

Participants were asked to share potential applications of SOVIA. A plurality of them mentioned that they think it could be used in schools to help kids be more engaged with art. One participant, unprompted, revealed ``I'm a school counselor and I was thinking this could be an interesting application to do with students." (P1) Some felt that it could help people with disabilities, such as ADHD, stay engaged when looking at art. Most also voiced that it could be used to de-stress or make one calm, whether it is between school/meetings, before bedtime, or other scenarios.

SOVIA appears to be a system of connection and transition, whether it is used emotionally or socially. Participants felt a deeper connection to themselves and thought others would benefit from its usage prior to class or therapy. Using SOVIA before counseling could open the mind for lower conflict engagement before couples or adolescent therapy, or as an ice

breaker to meeting a new therapist. Use before yoga or massage could deepen the experience and render more medical benefit from those activities.

Given the themes detected, it will be interesting to evaluate the impact of using SOVIA with specific populations. Stroke survivors can experience anxiety, irritability, loss of memories, among other challenges³. They can also experience motor apraxia. SOVIA may have the potential to aid stroke survivors, by helping them restore a sense of balance when needed. It could also assist in recovering motor function of the left/right side of the brain since using SOVIA requires using a mouse or touch as the user navigates the artwork.

This was an early study of the efficacy of SOVIA in a therapeutic context. For future work, we would like to conduct a study on a larger number of participants, carried over a longer period of time, in order to assess the long term benefits of using SOVIA. The integration of standardized tests such as the Warwick Edinburgh Mental Wellbeing Scale (Tennant et al. 2007) and having participants provide daily journaling of their experiences will help gain deeper insights into the impact of SOVIA. We hope this study will help promote greater interest in the mental wellness potential of other creative machines.

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