Berklee College of Music

# Gravity Duo:
# An Audiovisual Experience

Submitted in Partial Fulfillment of the Degree of Master of Music Production Technology and Innovation (MPTI)

Supervisor: Pablo Munguia

**by Diego Demarco**

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**Abstract:**

The current project focuses on the creation of "Gravity Duo", an ensemble comprised of Phui Kuan Kok and Diego Demarco. One of the main features of this culminating experience is live performance combined with electronics and visuals. The musical setup consists of live vocals, vocoder, piano and guitar, and is supported by a custom-made library of visuals that interacts with the audio in real time. This report will provide an in-depth analysis of how the music, visuals and live show were developed from the ground up. This culminating experience has ended up being a success, and with high expectations for being performed in a variety of different venues in the coming years.

## 1. Introduction:

Gravity Duo is a brand which focuses on creating an audiovisual experience. In order to create this experience, there needs to be original music, visuals, and a medium to combine both, which makes them reactive to one another. Learning music production and how to create visuals through Berklee's MPTI masters program has enabled to successfully develop this project. By prototyping several times, a final working product has been achieved, one which is viable to perform and can be adjusted to fit into a broad number of different settings and venues.

## 2. Review of the State of the Art:

Certain artists have inspired separate aspects of this culminating experience. Odesza[1] has inspired the overall feel of the show -- chill music combined with mellow visuals, which for this Culminating Experience steers more towards ink drops and color shapes that will gently mould the music. The live performances of Daft Punk[2] have also served as an inspiration, where live instruments are modulated and looped in order to create an expanded live performance experience.

There have been many duos who have produced similar kinds of shows, such as Hardwell[3] and Armin Van Buuren[4]. However, not all have based the core of their music performance in

[1] Odesza, Homepage, accessed January 11th 2018, https://odesza.com
[2] Daft Punk, Homepage, accessed January 12nd 2018, https://daftpunk.com
[3] Hardwell, Homepage, accessed March 15th 2018, https://www.djhardwell.com/

the use of live instruments. This is rare in most electronic music shows mainly focussed on DJ sets or variants of such. Moreover, this live performance presents an added challenge since adding live instruments to an electronic track has to be done very tastefully in order for it to fit well together.

## 3. Description:

The music content consists of 8 original songs produced by both band members. The songs are a mixture of chill, ambient, pop and future bass music. The sound design has involved many sine-wave modulations in the verses to retain the feel of chillout music. Delays and reverbs are used to create very deep plucks that add to the relaxing feel of the track. On the other hand, richer harmonic waveforms such as saw-tooth were used in the drops to make them more energetic. The chords usually employ an LFO in the amplitude envelope to give it a rhythmic feel characteristic in future bass music. Volume automation is used on the reverbs and delays to make the rhythm even more drastic by muting the spaces where the chords are not playing. All the drums are custom made - either they are created with synthesis or with composite sample techniques. This allows to sculpt the perfect kick and snare for each song according to the spectral needs, making sure that it does not clash with other elements. The songs created for this project are called *Show me, Without you, I'm a Devil, Gone, Push and Pull, Summer Dance* and *Playground.*

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[4] Armin Van Buuren, Homepage, accessed March 17th 2018, http://www.arminvanbuuren.com/

The mixing and mastering for this Culminating Experience was not the most challenging process. The mixing was mainly a basic stereo panning and spectral positioning combined with some time-based effects such as reverb and delay. This proved to be enough to make all the songs works, since everything was premixed during the sound design and arrangement. As for the mastering, the process consisted of resonance hunting to turn down hurtful frequencies that made the song hard to listen to at high levels  and taming some peaks in the loudest part of the songs  to be able to turn the whole song up into a professional volume level, which in this case was -8 RMS and -0.1 peak level. The intention was to make it loud but not to overly limit it and make it sound distorted.

There have been two separate methodologies used for the visuals: live footage recording and 3D animation programming. The first visual library is ink drops and represents the first methodology. A fish tank with a capacity of  60L was used as a "canvas", and into which acrylic paint was shot with syringes. The lighting was critical -- three white lights were placed at the sides and underneath the tank to illuminate the water and make it easier for the camera to record. A black cloth was also required to make the shots appear to be set against a homogeneous background. Different colors of ink were shot into the tank in different ways, creating different shapes and textures. After the process of recording was completed, all tracks were sliced in Adobe Premier and modified through filters and time mapping on Adobe After Effects. It was also required to make the last and first frame the same in order to loop the sequence smoothly in the visual performance software, which in this case is Resolume Arena.

The second library is sparks and fireworks. This represents the second methodology mentioned in the previous paragraph. The raw 3D animations were all designed in Blender using particle systems emulations. Different angles and camera animations were programmed in order to create less static footage, since the animations were short due to the long rendering time required with the current available equipment. Adobe Premiere and Adobe After Effects were used to slow down the raw animations and apply interesting effects and color correction.

Designing coherent mappings for the visual triggering, effects and transitions accounts for a large part of the set. The visuals are audio-reactive through MIDI information that trigger with specific elements in the music. Taking the human element out of this process during the live performance calls for a very complex and intricate mapping system that remains constant throughout the entire set. Different effects such as scale, opacity, RGB delay and many others are triggered along with loops to make it more interactive. Smoothing transitions to be immediate or to slowly fade between each loop is also something programmed into the mapping. Automating between decks (banks of loops) is also important, since a long-duration show is expected to employ different loops without repeating the same ones over and over. All the kicks and snares of the songs are usually translated into MIDI information which triggers different effects, which means that these mappings need to also have a ramp and a range on which the effect will operate when it is triggered.

**4. Challenges:**

During the development of this Culminating Experience there were some expected challenges related to the three principal elements of this experience which are music, visuals and the development of the live show itself. It has been concluded that each one involves a great deal of effort in order to develop it in a way that is competitive to other similar audiovisual sets out there. The most difficult part of the music was the sound design. It was important for the project that the sound design had a personal touch so the audience could identify Gravity Duo though its music. Shimmery chords in the drops and ambient plucks in the verse are what give Gravity Duo its own music personality.

The visuals have proven to be a more complex process. Since the idea was to make them completely original, the footage had to be generated either by recording it or designing it. The ink drops took a great deal of experimentation with acrylic paint while the sparks and fireworks required learning a new software from its beginnings and at the same time applying the recently learnt knowledge to generate professional looking 3D animations. These by far have been the more challenging moments during this Culminating Experience, and consistency in learning and practicing almost every day is what has allowed this process to turn out successfully.

Performing has also proven to be a challenge. Being in front of an audience has been a new experience and to remain calm and confident and able to execute the set has taken a lot of practice and rehearsal time.

There have also been some unexpected challenges that result from working with a partner. Lack of agreement and having to search for the middle ground is the most difficult challenge to overcome. Trust is another one, since it is hard to let go of a project that someone else is going to modify.

## 5. Budget:

Several purchases were needed to successfully complete this project. Firstly, software such as Resolume Arena[5], Ableton Live 10[6], Adobe Full Package[7] and other sound design plugins such as Izotope Trash 2[8] have made creating the music and visuals possible. Blender[9] has also been required for the 3D design but no purchase was needed, as it is free.

Hardware was also something needed for the live performances. A versatile MIDI keyboard with knobs and faders was very important for controlling certain Ableton parameters in a live setting -- the choice was a M-Audio Oxygen 25 MK IV[10]. There was also the need to employ a controller to manage the live effects, and for this we chose NanoKontrol2[11].

[5] Resolume, Homepage, accessed February 16th 2018, https://resolume.com/
[6] Ableton Live, Homepage, accessed January 19th 2018, https://www.ableton.com/en/live/
[7] Adobe, Homepage, accessed February 13th 2018, https://www.adobe.com/es/
[8] Izotope, Product page, March 4th 2018, https://www.izotope.com/en/products/create-and-design/trash.html
[9] Blender, Homepage, accessed March 21th 2018, https://www.blender.org/
[10] M-Audio, Product page, accessed May 12th 2018, http://www.m-audio.com/products/view/oxygen-iv-25
[11] Korg, Product page, accessed May 4th 2018 http://www.korg.com/es/products/computergear/nanokontrol2/

Studio time was also required. The main use for this studio time was for mixing and mastering the songs in a controlled listening environment in order to achieve the most professional results possible. As for external locations, we had to rent some venues in order to perform and practice our live set in a real environment. We booked three locations: *Tosca Llar Club*[12] (where all MPTI students got a chance to perform), *Sporting Club Russafa*[13] (where some MPTI students showed their final projects) and *Sala E*[14] in the *Palau de las Artes Reina Sofia* (where we shot our final performance video for this project). A performance in the *Musaico Festival*[15] was also scheduled but it had to be cancelled due to rain.

Finally, a videographer and a photographer were needed in order to fully document and prepare content for the brand. We decided to hire *Alina Nadolu*[16] for a photoshoot, which had a portfolio with an aesthetic similar to that which Gravity Duo as a brand wanted to project. The videographer company *Noema Estudio*[17] was booked for the *Sala E* show in order to have live footage of the performance and document it for the current Culminating Experience presentation.

[12] Tosca LLar Club, Homepage, accessed May 14th, http://toscallarclub.es/
[13] Sporting Club Russafa, Homepage, accessed May 21th 2018, https://sportingclubrussafa.com/
[14] Palau Les Arts, Homepage, accessed May 23rd, https://www.lesarts.com/
[15] Musaico Fest, Homepage, accessed May 24th, https://www.musaicofest.com/
[16] Alina Nadolu, Facebook Page, accessed May 27th, https://www.facebook.com/alinanadoluphotography/
[17] Noema Estudio, Homepage, accessed May 28th, http://www.noemaestudio.com/

| ITEM | PROPOSED | REAL | ACTUAL (RUNNING) | | |
| --- | --- | --- | --- | --- | --- |
| | | | INITIAL | AFTER 1 MONTH | FINAL |
| **MATERIALS (disposables)** | | | | | |
| Hard Drives | $140 | $0 | $0 | $0 | $140 |
| Pen Drives | $76 | $0 | $76 | $0 | $76 |
| **Subtotal** | **$216** | **$0** | **$76** | **$0** | **$216** |
| **EQUIPMENT** | | | | | |
| **HARDWARE** | | | | | |
| Korg Nano Kontrol 2 | $45 | $45 | $0 | $45 | $45 |
| M-Audio Oxygen 25 | $99.00 | $0 | $0 | $0 | $0 |
| Computer (purchase) | $3,260 | $0 | $0 | $0 | $0 |
| **SOFTWARE** | | | | | |
| Ableton Live 10 | $495 | $495 | $0 | $0 | $495 |
| Adobe Package | $190 | $190 | $190 | $0 | $190 |
| Resolume Arena | $400 | $400 | $0 | $0 | $400 |
| **Subtotal** | **$5,399** | **$1,940** | **$0** | **$45** | **$1,940** |
| **PERSONNEL** | | | | | |
| Engineers | $5,000 | $0 | $0 | $0 | $0 |
| Photographers | - | - | - | - | $40 |
| Videographers | - | - | - | - | $80 |
| **Subtotal** | **$5,000** | **$0** | **$0** | **$0** | **$120** |
| **OVERHEAD** | | | | | |
| Rent | $400 | $400 | $400 | $400 | $4000 |
| Utility | $50 | $50 | $50 | $50 | $50 |
| Phone | $10 | $10 | $10 | $10 | $10 |
| Food | $200 | $200 | $200 | $200 | $200 |
| **Subtotal** | **$660** | **$660** | **$660** | **$660** | **$660** |
| **FEES** | | | | | |
| Your fee | $500 | $500 | $500 | $500 | - |
| Your partner's fees | $500 | $500 | $500 | $500 | - |
| **Subtotal** | **$1,000** | **$1,000** | **$1,000** | **$1,000** | **$0** |

**6. Innovative Aspects:**

Although this Culminating Experience is not entirely new to the industry, it is a new personal experience in experimentation with audio and visual synchronization. Creating visuals from beginning to end is also innovative as a music producer, since it helps to support the story that the music is telling.

Moreover, adapting an electronic music piece for live instruments playing simultaneously with visuals triggering in sync with the music can be considered something challenging and certainly new for someone who has never performed live. It is true that there is a large number of duos whose concept of a live performance is very similar but the final goal is to create a customized experience that hopefully can be differentiated from the rest. In other words, what is innovative about this project is the audiovisual experience that has been created through the custom-made content, not the technical aspects themselves.

**7. New skills:**

During this Culminating Experience there has been the development of an on-stage persona that fits the image which Gravity Duo wants to project. Fluency with the equipment and song arrangement are a great part of developing a successful live performance. Designing a simple but effective setup was one of the most challenging aspects. The first design which we attempted gave no impression of there being any live performance at all, while the second attempt went to the other extreme and was nearly impossible to perform.

Designing 3D animations and formatting them into playable visual loops is another new skill that has progressively been developed with this project. Blender is a versatile 3D designing tool that allows to generate original raw content which can later be processed with Adobe After Effects in order to enhance the animation with filters and time mapping.

The latter new skill has much to do with organization. Since the musical performance takes up all the human resources, the visuals need to be automated to trigger in conjunction with the loops through MIDI information. Organizing and using mapping in creative ways to trigger different effects and transitions at the same time as the loops is essential, since different songs need to have the same mapping format in order to work correctly.

## 8. Future Ramifications and Plans:

There are plans for future developments in the set. Firstly, the objective is to expand the length by including more original songs. More visuals loops and effects will be added along with the new songs to keep it from becoming monotonous. Experimenting with light automation is also a goal for future sets. A synchronized audiovisual set with reactive audio lights can very much enhance a performance and make it more immersive.

It is also in mind to make the entire set easy to set up and travel with since the ultimate goal is to tour in festivals. Festival shows need to be impactful and simply performing music is not enough. This is why experimentation with drones is something that may be included in future sets. Incorporating 3D objects with these drones around the audience can prove to be a very interesting idea, especially if they can be made audio-reactive. Using holograms for the same purpose is also something worth exploring. This gives the means to totally change the crowd environment with each song, making it more immersive and impactful.

We realize that becoming a brand also involves there being legal aspects to consider. The decision for the future is to incorporate a manager and label behind Gravity Duo so that the time spent on creative aspects, i.e. music and visuals, can be maximized.

## 9. Conclusions:

Putting together the live set involved merging the music and the visuals in a way that would be comprehensible for an audience. The final set up, which might evolve in the future, is designed to give the audience a feel that there are live elements being played but without over complicating the performance to the point where it is very difficult to execute. The visuals are synced with the music through MIDI as a result of experimenting in several different matters, with the result that the tracks had to be played from the same computer which was triggering the visuals.

This Culminating Experience has concluded with a successful final product which is ready to be performed in either a large or small setting. The main assets that made this possible were time, patience and hard work, since the first prototypes of the set did not come out as expected, which in its own way helped to improve it and make it what it is today.

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