

Berklee College of Music, Valencia Campus

**Distress:**

**Exploring Compositional Elements for Audio and  
Interactivity for Video**

A Thesis Submitted in Partial Fulfillment of the Degree of  
Master of Music in Music Production, Technology, and Innovation

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by

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-Andrea Almeida de Mendonça.

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# 1. INTRODUCTION

The basis of this project is to write and record an extended play (EP) in order to explore different tools and inspirational sources for composition. In addition, this project intends to offer listeners an audiovisual interactive experience for one of the tracks.

The objectives of this project are:

- to expand and refine composition skills, through the use of a contemporary mix of acoustic and electronic ingredients and the exploration of sound design techniques
- to increase network and international portfolio, through the collaboration with talented master candidates from different parts of the world that can bring and integrate different influences and ideas.
- to learn and work with new interactive video technology, which in all its different manifestations has been increasingly seen as the future of online video.

## 2. REVIEW OF THE STATE OF THE ART

### 2.1. Musical Influences

The term Post-rock was used for the first time in March 1994, by the journalist Simon Reynolds, in the British magazine Mojo review of Bark Psychosis's album "Hex". A few months later, Simon further developed the article for The Wire magazine, defining it as music that uses rock instrumentation for non-rock purposes and uses guitars as timbre and textures facilitators instead of riffs and power chords. This is a genuine post-rock because the guitar is no longer kinetic (a riff-machine) but atmospheric (a texture and timbre generator). Fed through effects pedals and "signal processing" devices, the guitar effectively becomes a kind of analog synthesizer."<sup>1</sup>

The genre is the result of a large amount of references, influenced by *Krautrock* (70's), Ambient, Dub, Electronic Music, Progressive Rock, Industrial Rock, New Age, Jazz, Tape Music, and Minimalist Classical Music. The songs lack the classical structures of composition and value the relationship of the instruments (guitar, bass, percussion, keyboard) with the digital elements, building sensations, environments, scenarios and texture. Synthesizers are a key instrument of Post-Rock, especially to create droning sounds, while drums and bass guitar form a steady background structure. Although vocal are not commonly used, they can also be a part of the instrumentation.<sup>2 3</sup>

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<sup>1</sup> Simon Reynolds, "Post-rock America", ReynoldsRetro, June 10, 2008, accessed November 2, 2016. <http://reynoldsretro.blogspot.com.es/2008/06/post-rock-america-directors-cut-wire.html>

<sup>2</sup> Giovanni Arceno, "24 álbuns para manjar mais que o suficiente sobre post-rock", papodehomem.com.br, October 3, 2015, accessed November 2, 2016. <https://papodehomem.com.br/24-albuns-pra-manjar-mais-que-o-suficiente-sobre-post-rock/>

The Post-rock is the main musical Influence of this work and will be the musical red thread throughout the EP. However each composition will also flirt with different genres featuring intermissions of Instrumental Rock or the intricate harmonic and rhythmic structures present in Brazilian music.

The following albums can be mentioned as main musical influences:

- “This Will Destroy You” by This Will Destroy You <sup>4</sup>
- “Departure Songs“ by Hammock <sup>5</sup>
- “Flying in a Blue Dream” by Joe Satriani <sup>6</sup>
- “Ioiô” by Nelson Faria <sup>7</sup>

## 2.2. Interactive Video Technology

According to Richard Schwier (1987) interactive video is “a program intentionally designed in segments, in which viewers responses to structured opportunities [...] influence the sequence, size and shape of the program”. <sup>8</sup>

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<sup>3</sup> Musicmap version 1.0, ”Post-Rock”, musicmap.info, accessed November 5, 2016.  
<http://musicmap.info/#>.

<sup>4</sup> This Will Destroy You, *This Will Destroy You*, Magic Bullet Records, 2008, mp3, Accessed November 4, 2016, <https://open.spotify.com/album/72vAmnfrNfzORX6gG7p8Jf>

<sup>5</sup> Hammock, *Departure Songs*, Hammock Music, 2012, mp3, Accessed November 4, 2016,  
<https://open.spotify.com/album/3o33sEH5ycPJV6RGq3hbJ6>

<sup>6</sup> Joe Satriani, *Flying in a Blue Dream*, Relativity Records, 1989, mp3, Accessed November 4, 2016,  
<https://open.spotify.com/album/4TZmVQz3aV8yxxcogVNFw6>

<sup>7</sup> Nelson Faria, *Ioiô*, Independent, 1993, mp3, Accessed November 4, 2016,  
<https://open.spotify.com/album/4q6oBTelFPom7R3d0ID52P>

In a more modern definition, we could state that interactive video is a digital multimedia format that supports user input (by mouse click, screen tap, screen tilt, camera tracking, etc.) in order to perform an action.

There are also several levels of interaction, from the simplest to the more complex. Recently, Charley Miller, Co-founder and Product Manager at *TouchCast*, an interactive video company, informally listed the different types of interactive videos on a *Quora Forum* post:

- **Hot Spots:** transparent area that's clickable, opens a link.
- **Choose Your Own Adventure:** one video loads another video, viewer controls path.
- **Annotations:** overlay that you can click to learn more about something in this video (*this word is used in many contexts in relation to interactive video and was used as a feature name by YouTube*).
- **Widgets:** similar to annotations but asks for viewer participation rather than just a clicking to open more information, a widget example is like voting in a poll.
- **Attachments:** video that houses a payload of files and other media for the viewers to access.
- **Remixing:** gives access to the viewer to take the original video and make their own version.
- **Live:** much of the above, but instead of asynchronous / video-on-demand, this is interactive video for video conferencing and webinars.<sup>9</sup>

We can also add **360° videos** to the list, also known as immersive videos (a form of virtual reality), they are shot using an omnidirectional camera or a collection of cameras. The footage is recorded simultaneously in every direction and during playback the viewer has complete control of the viewing angle.

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<sup>8</sup> Richard Schwier, *Interactive video* (New Jersey: Educational Technology Publications, 1987), 36.

<sup>9</sup> Charles Miller, "What are the best tools to create an interactive video?", quora.com, June 16 2016, accessed November, 16 2016. <https://www.quora.com/What-are-the-best-tools-to-create-an-interactive-video>

There are many interactive video creators: *TouchCast* and *HapYak* turn videos into a desktop; *Wirewax*, *Zentrick*, *Pulpix*, *The Mad Video* and *Vidzor* add in-video buttons that trigger popup annotations; while Interlude's *EkoStudio* and *Rapt Media* create multi-thread videos. It is also possible to use WebGL (Web Graphics Library), a Javascript API available for the HTML5 canvas element that offers support for 2D and 3D graphic rendering. It can be implemented in web applications with no need for browser plugins.

Examples of interaction applied specifically to music videos can be found bellow:

- “Like a Rolling Stone”: made with EkoStudio Interlude (former Treehouse Interlude) <sup>10</sup>
- “States of Matter”: unknown platform <sup>11</sup>
- “Just A Reflektor”: made with WebGL (Three.js) <sup>12</sup>
- “Words Hurt”: made with javascript <sup>13</sup>

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<sup>10</sup> Bob Dylan, “Like a Rolling Stone, 2013 interactive video, accessed November 16, 2016, <http://video.bobdylan.com/desktop.html>

<sup>11</sup> Sigur Rós, “States of Matter“, 2016 interactive video for Tate Modern art gallery, accessed November 16, 2016, <http://www.tate.org.uk/art/statesofmatter>

<sup>12</sup> Arcade Fire, “Just A Reflektor”. 2013 interactive video, accessed November 16, 2016, <https://www.justareflektor.com/>

<sup>13</sup> Naïve New Beaters, “Words Hurt”, 2017 interactive video, accessed June 18, 2017, <http://www.wordshurt-lefilm.com/>



### **3. DESCRIPTION OF THE CULMINATING EXPERIENCE**

#### **3.1. Distress EP Execution**

The tracks of the EP revolve around the theme “distress”, being all written in minor keys and with the prevalence of mostly modal harmony, each composition tries to evoke this feeling on the listener through the use of odd time signatures, dynamic variations, harmonic tensions, timbers, noise and distortion. All tracks were written and/or further developed during the academic year of 2016-2017. Based on a single melodic idea (theme) that evolves through time, changes in soundscape are promoted by counterpoint melodies and textures, while the arrangement relies heavily on electric guitar, synths, drum loops and samples.

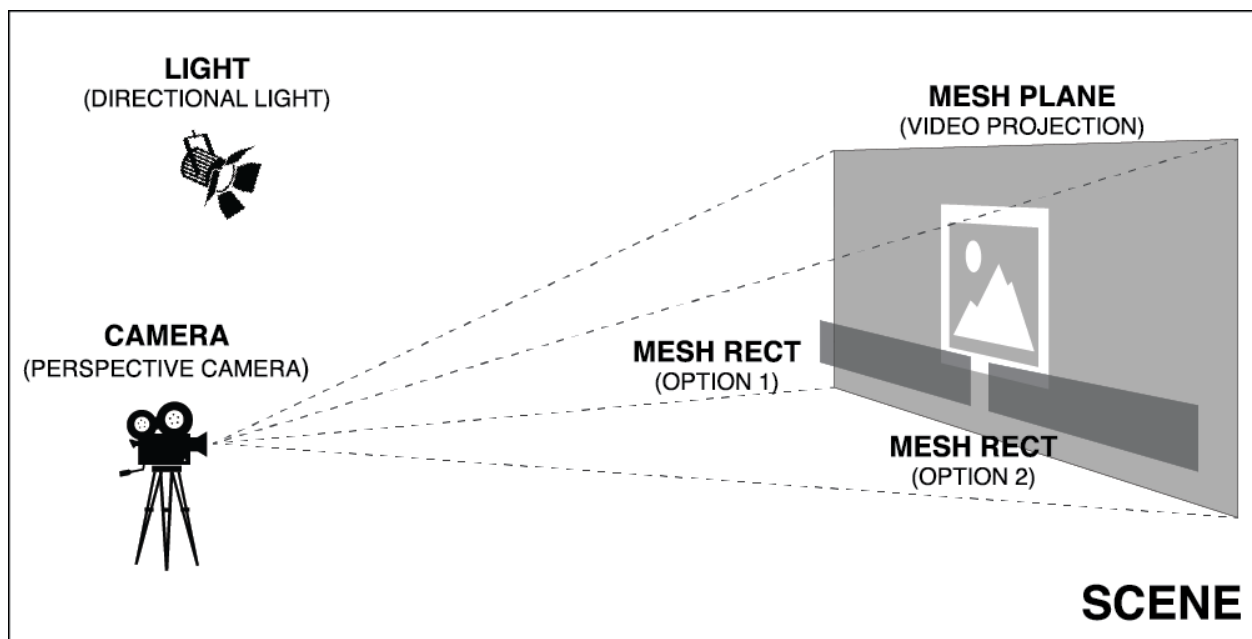
#### **3.2. Interactive Video Execution**

During the first months, it became clear that there were several different approaches to make the interactive video. In the “choose your own adventure” genre, a few platforms stand out, but in order to be considered a viable solution, some conditions had to be met: 1) the technology would have to be fully customizable; 2) audio and video would have to stream continuously, without any interruption, asynchronous behavior or glitch, even when some action was demanded from the viewer and 3) the final result should be made universally available to the viewers without relying on any kind of proprietary platform, i.e. the viewer should have ease access to the video without having to install plugins, add-ons or applications in their devices.

In those regards, Three.js, a WebGL JavaScript library, stood out from the competition. The advantage of this technology is that the video can be embedded on a regular website and the

code runs exclusively on the client-side, i.e. browser, with no need to rely on 3<sup>rd</sup> party servers, applications or databases. Three.js is also compatible with all browsers, operational systems and devices.<sup>14</sup>

An HTML canvas element is placed in the DOM (Document Object Model) in order to draw graphics on the fly via JavaScript. Inside this element it was possible to create a 3D environment, project the video on a geometric plane, add camera and lights and create clickable 2D rectangular meshes (geometric shapes) that can conveniently appear on the foreground (in front of the video) whenever an action is required from the viewer.



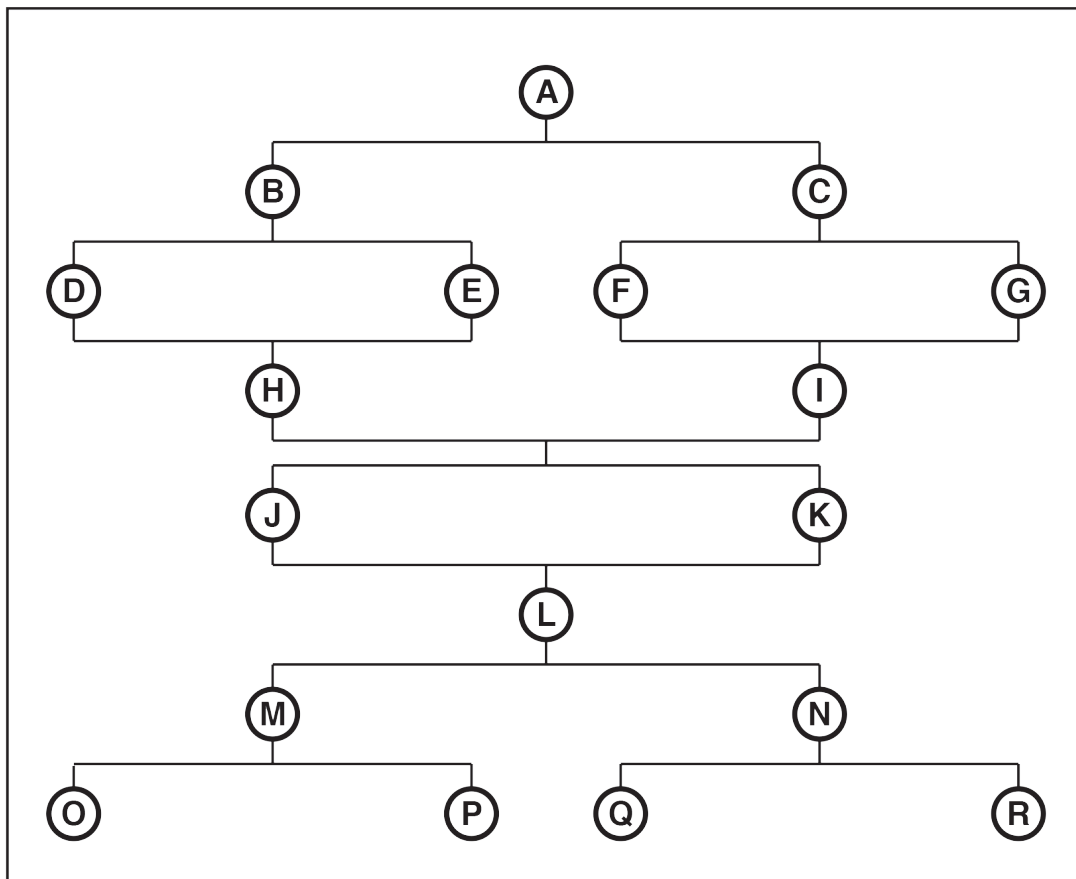
**Figure 1 - 3D Scene with video and CTA elements**

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<sup>14</sup> David Scott Lyons, “Intro to WebGL with Three.js”, davidscottlyons.com, December 17, 2016, accessed April 10, 2017. <http://davidscottlyons.com/threejs/presentations/frontporch14/#slide-0>

The script was designed to reproduce, in just over 3 minutes, a simplified version of the 3 act structure journey often seen in feature films. This is a common template that provides a recognizable and compelling story arc for the main character.<sup>15</sup>

Along the course of the video, 4 calls to action (CTAs) with 2 options each are presented. Depending on the selected option, the story branches out and takes a different path – as contingency, if the user abstains to choose, the first option will be always selected by default. Concurrent paths have the exact same length and are structured to convey the same emotional arc/climax.

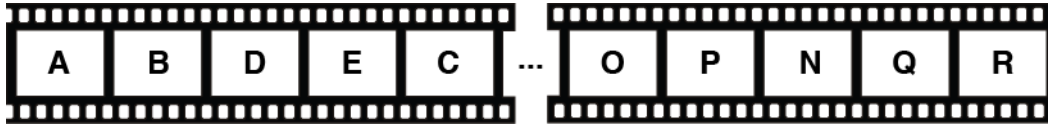


**Figure 2 - Video sections and branches**

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<sup>15</sup> Indiana University Bloomington, *Three-Act Narrative Structure*, indiana.edu, n/a, accessed June 13, 2017. <http://www.indiana.edu/~audioweb/T206/three-act.html>

After shooting, editing and applying effects, all video segments were then compiled into a full-length video. And this is the file that will be played for the audience.



**Figure 3 - Full-length video structure**

HTML version 5 (HTML5) made easy to control video playback, including retrieving information of the current position (in seconds) of the video play head and skipping entire sections of the video by using the property *.currentTime*. Video timecode can also be easily converted in seconds. Example: 00:02:00:11 (hrs:min:sec:frames) equals to 120.5 seconds

Example: `video.currentTime += 10`, skips 10 seconds ahead on the video.

Every 400ms a javascript function verifies the current video time and compares it against an array containing information about the position of each segment inside the full length video in order to check which segment is being played at the moment, when is it time to display or hide the CTA and where to jump next based on the viewer choice of lack there of. The array stores the following data:

- **[0] Name:** as convention, the letters of the Latin alphabet were used to name the segments
- **[1] Duration:** how long a segment lasts (in seconds).
- **[2] Starting time:** starting position (in seconds) of the segment within the full length video

- **[3] Ending time:** ending position (in seconds) of the segment within the full length video
- **[4] CTA starting time:** starting position (in seconds) of the CTA of that particular segment within the full length video
- **[5] Option 1 starting time:** starting position (in seconds) of the segment triggered when the user chooses option 1 or when the segment reaches its ending time and option 1 is selected by default
- **[6] Option 2 starting time:** starting position (in seconds) of the segment triggered when the user chooses option 2.

#### 4. INNOVATIVE ASPECTS

The musical element is an amalgamation of personal references and preferences that leans towards rock/post-rock genres. Mostly it represents a personal breakthrough since it combines composition and performance with engineering skills into one project as never done by the artist before.

In the past years a lot have been done in this area as seen in the chapter 2 **Review of the State of the Art** of this report. However, this is certainly one of the first “choose your own adventure” style music video that relies exclusive on footage, as oppose to animation, to tell its story. One of the challenges of this kind of interactive video regards the audio streaming, which must occur seamlessly in order not to interrupt or disturb the musical experience and still maintain synchronicity between imagery and sound.

Unlike *YouTube* annotations and “Word Hurts” (see chapter 2. Review of the State of the Art), which require the viewer to click on a specific area in order to skip to a part of the video, it is possible to programmatically skip to a predetermined section as soon as the video reaches a certain playback time. This action can be triggered, for instance, as a fallback in the case of no user interaction.

## **5. NEW SKILLS ACQUIRED**

Among pre-production (script, storyboard, casting, etc.), production (camera operation and direction) and post-production (editing, virtual effects and color correction / grading), this project allowed for a deepening of knowledge in all stages of video production. Many of these steps represented uncharted territory and required a great amount of research, experimentation and consultation with colleagues and professors in order to better understand the process and the necessary tools. Working with a 3D framework and being able to devise a script (code) that could account for all the challenges of an interactive video is too a brand new competence that can bear future fruits.

## **6. CHALLENGES, BOTH EXPECTED AND UNANTICIPATED**

Accomplishing all tasks in a 6 months limited framework invites along an array of unforeseeable challenges, such as 1) accommodating and planning in accordance with the schedule of collaborators; 2) selecting and committing to a interactive technology; 3) troubleshooting and solving bugs on the code; 4) discovering less resource intensive algorithms 5) getting back to a guitar performance level worthy of being recorded - the initial plan was to invite different guitar players to perform on the EP, however, as the project developed and the compositions were being finalized, the idea of performing the main instrument became more and more attractive. Some of these issues took longer than the expected to be solved and some were not even accounted for in the planning stage.

Nevertheless, a handful of challenges were not only predictable but also played a crucial role on the project scope. It was not despite of them rather because of them that this project was defined as it was.

- a) Writing a script with multiple story threads while keeping it interesting, appealing and comprehensible to a broad audience. As aforementioned, paths multiply exponentially at every CTA milestone. It was necessary to devise a strategy to keep the amount of simultaneous possible threads under control. The solution found was to maintain plot symmetry among the different paths – concurrent sections with the exact same duration – so they could still be able to merge again into one common line, granting the possibility to divide the storyline again far ahead.



- b) Accounting for audio and video synchronization, once audio and video are being played separately to prevent any jumps and glitches. The solution was to create concurrent segments with the exact same number of frames and, when assembling the full length video, making sure to have the last 7 seconds of the previously played segment (CTA or not) on the very beginning of each following segment. In this manner, when the video play head jumps one can make sure that no frame will be skipped regardless of how fast or slow the viewer clicks on the CTA.
- c) Considering the premise of avoiding flow interruption at all cost, it was a necessity to elaborate a CTA fallback behavior. The solution was to default to option 1 every time viewers do not provide an input for the CTA. Nevertheless, it is intended for future versions to make the fallback behavior random, i.e., an algorithm would randomly choose the next video path.
- d) Making use of the recently learned sound design tools and skill in order to blend acoustic and electronic instruments/elements. Matching timbers at the very early stages of the production certainly avoided a lot of problems in the mixing stage.

## 7. FUTURE RAMIFICATIONS

The EP release is intended as a portfolio piece that showcases production skills. The full album will be available for download at *BandCamp*, yet excerpts of each track will also be hosted at *SoundCloud* and *www.andreacazza.com.br*. For the months following the release, links to the excerpts and to *BandCamp* will be posted on social media websites such as Facebook and Twitter in order to reach a wider audience. The goal is to continue to write and produce original songs, releasing at least one EP every two years.

A natural ramification for the interactive video would be the creation of a website platform, released under an OpenGL license, that can auto generate the necessary JavaScript code for any footage-based interactive video. With specific inputs provided by the user, the programming process could be completely automated and the system could deliver specific instructions on how to assemble the full-length video.

## **8. CONCLUSION**

Being responsible for all stages of an EP and music video production, as well as researching and implementing interactive solutions is a very demanding creative, technical and organizational undertaking, particularly when approaching certain production steps for the very first time.

Many skills must be acquired and refined for the sake of the completion of the work so as to meet professional standards without compromising the initial creative vision. All this provides an opportunity for personal growth, the expansion of one's professional skill set, the acquisition of a holistic understanding of the process and an enlightened awareness of personal strengths and weaknesses, as well as furthering the development of an audio-visual artistic identity.

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