

**MOOVE:  
MOTORIZED, SMART, AUTOMATED, WIRELESS, MUSIC VIDEO  
MOTION CONTROLLER.**

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Culminating Experience Defense Paper  
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### *Introduction*

Ronald Ayala is a sound engineer, producer, singer- songwriter, pianist, guitarist and filmmaker. Even though, he has no experience or background in mechatronics, electrical engineering or programing, this year, due to the facilities and people he found at his masters degree program in Berklee College of Music Valencia Campus, he decided to go out of his comfort zone and make his dream product a reality. During the first weeks at Berklee, Ronald Ayala realized the importance of video and documentation, therefore the importance of professional looking video shoots and motions. That is why he decided to create a video motion controller that can easily and accessibly make perfect scenes.

### *Description of the culminating experience*

Now a day's, video is one of the most important communication tools. "300 hours of video are uploaded to YouTube every minute"<sup>1</sup>, and "many studies have proved that video can be a powerful tool"<sup>2</sup> to deliver information. Therefore, one of the best ways to make a statement and communicate it is through video. Nevertheless, the reality is that it is not so easy to have a good and professional video. Approximately "53% of YouTube's videos have fewer than 500 views, says TubeMogul. About 30% have less than 100 views. Meanwhile, just 0.33% have more than 1 million views."<sup>3</sup> There are a lot of reasons why this may happen, like: money, equipment, time, personal and budget, even personal interests. But what if all those production issues could be solved with just one machine?

People that work in the music and video industry know that having their own video is a challenge. So the purpose of this culminating experience project is to give a solution to that

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<sup>1</sup> Statistic Brain, *YouTube Company Statistics*

<sup>2</sup> Bulski, *Future of video*

<sup>3</sup> Angelova, *Chart of the day: Half of youtube videos get fewer than 500 views.*

problem by bringing an innovation to the market. It is based in products that already exist and presented in a completely different way.

This culminating experience is an automated, motorized, wireless, professional music video motion controller called “Moove”. It is a hybrid/fusion, between a three axis motorized gimbal and a motorized dolly slider that makes specialized video motions according to the direction, speed and duration that the user commands it to move by using a mobile application.

Moove can work as a standalone but it also comes with its own mobile application. As a stand alone, the user can use Moove with its built in joystick to control pan and tilt, and grabbing it to use the motorized gimbal stabilizer and manual slides with the wheels. For wireless communication it can be used with the mobile application to control its motion by sending data directly to the motors. These commands include the speed, direction and duration of the Slide, Pan and Tilt. Additionally, it can be synced with music by entering the BPM of a song, or the amount of time desired for the duration of the motion. There also is a virtual joystick to move it personally.

Moove motions are: Pan, Tilt and Slide, but they can be customized in order to have more complex motions by combining two or three at a time. Moove is a “all in one” motion controller, because it has the functions of a: tripod, dolly, slider, crane, time lapse controller, steady cam and handheld camera, all in one single product.

Motion can make a tremendous difference between a low budget video and a professional one. Cinematographers spend thousands and thousands of dollars in order to make stable shoots to add motion to their videos. With Moove one can achieve that same footage with out extra help, at a lower cost and in an efficient and user-friendly way. It is targeted for music video production, but it is also great for advertising, promotional videos, movies, broadcasters and youtubers.

### *Innovative Aspects*

At first motion controllers were only mechanical. The first motion controller ever created was the tripod in which users could manually use panning and tilting. Years later, the dolly was created, it was a big structure with wheels that people needed to push in order to move. There are also cranes, steadicams, monopods, sliders, and a few more manual motion controllers.

As part of this project, Ronald wants to join mechanical motion controllers with new technology such as motors. Now a day's motors make countless projects possible. There are DC motors, servo motors, stepper motors and brushless motors, each one with a different purpose. With brushless motors, gimbals were invented, accomplishing the difficult mission of keeping the camera steady. Also with stepper motors, motorized sliders were born, achieving controlled slide motions.

Innovation has been present throughout the whole creative process. Beginning with the construction of the product, going through the programming and ending Moore's motions. After various failures and trials, the used materials for the construction of the product were: carbon fiber pipes, bike stems, curtain rod end caps, 3D printed parts, three longboard wheels, three brushless motors, one stepper motor, lithium batteries, various chipsets, components and cables. It requires a lot of innovation to put all these items together to form a whole that makes sense together and has a good looking finished.

For the programming, this culminating experience used two main softwares. The first one was the programming the motors and motions, that was Arduino. "The Arduino Software (IDE) allows the user to write programs and upload them to your board."<sup>4</sup> This software allows the user to create sketches directly to the main board, "These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for

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<sup>4</sup> Banzi, *Arduino introduction*

cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom right hand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.”<sup>5</sup> So if in the process of creating there is something missing or a part of the code is not working, you can easily go back and change it or even erase it if necessary.

The second programming software was Xcode that “includes everything you need to create amazing apps for iPhone, iPad, Mac, Apple Watch, and Apple TV. This radically faster version of the IDE features new editor extensions that you can use to completely customize your coding experience. New runtime issues alert you to hidden bugs by pointing out memory leaks, and a new Memory Debugger dives deep into your object graph.”<sup>6</sup> This software helps create the mobile application that can control Moove wireless, this way everyone have has his/her own remote control in their pocket.

The final innovation is the amount of motions available with one single device. Being able to do more than six motions with a single device is a true innovation, because normally video motion controllers can make just one or two motions per controller. As an example a tripod “video head provides your camera with a platform for smooth pans and tilts”<sup>7</sup>, that is just two motions. So on with different video motion controllers. That is why having a single device that provide us with all those facilities is simply amazing.

### *New Skills Acquired*

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<sup>5</sup> Banzi, *Arduino environment*

<sup>6</sup> Apple, *Xcode 8*

<sup>7</sup> <https://www.bhphotovideo.com/explora/video/buying-guide/how-buy-video-tripod>

Ronald Ayala acquired several skills in this process, but the most important ones are collaboration and trustiness. This project became a reality because of all the people that were willing to help out and give a hand is this culminating experience.

Mechatronics and programing were also skills acquired by the student. Before the culminating experience, he was never involved in projects like this one. Therefore, in a certain way it forced him to learn this topics.

Because the purpose of this project is video production, the student needed to improve his camera and video direction skills. For instance, he needed to learn the reason why or why not to use certain motions or movements in certain scenes or parts of a video.

#### *Challenges, both expected & unanticipated*

Ayala knew that the major challenge for this culminating experience would be coding. From the moment he thought about his project, the major preoccupation was coding because he did not know anything about it. As the days went through, the student found some partners that have background in programing and electrical engineering in the same master program. So as soon as he found it out, he talked to them to collaborate with him and they accept. Nevertheless, in the process the student needed to learn the basics of coding. With out this tremendous help, he could never have done it.

An unexpected challenge was finding the correct wheels. The first wheels bought by the student seemed to work just fine, but then more ideas came in the process, like a track and suspension. He bought eleven more wheels and he made a few trials but none of them convinced him. In the end, he returned to the first ones but he modified them in order to make a concave center so they can roll in a track with out problems.

The enclosure of the chipset was also a challenge, because even though the facilities at the school have a 3D printer, it is not working, and because this was at the end of the

construction, these 3D impressions were out of the student budget. Fortunately, he made a friend, Juan Ramon, that lives in Albacete, a city 2 hours from Valencia that has 3D printers and works with them. Juan Ramon helped him out printing those parts for free.

#### *Plans for the work*

Since this product can be of great convenience for multiple persons, Ronald wants the world to use it and play with it. Therefore, the main objective for this project is not to invest in mass production of Moove because of all the time and money it demands, but rather to create a patent of the product and sell it to a company that currently makes similar products, such as DJI, Feiyu Tech, Zhiyun, Revolve or Rollocam.

#### *Conclusions*

Moove is an innovative product that will bring the user a friendly tool to work in his/her own projects and present them in a different more professional way. With Moove, professional video will escalate in social network. For instance, Facebook and YouTube could be filled by professional music videos that are so attractive that everyone wants to see them. It is the time to make truly professional music videos with plenty of non stopping motions without the need of a gigantic budgets, equipment, time and crew. Moove is a product born from the heart of a musician, for everyone's use.

## FOOTNOTES & CITATIONS

1. Statistic Brain, *YouTube Company Statistics*
2. Bulski, *Future of video*
3. Angelova, *Chart of the day: Half of youtube videos get fewer than 500 views.*
4. Banzi, *Arduino introduction*
5. Banzi, *Arduino environment*
6. Apple, *Xcode 8*
7. Sachtler, *How to buy a video tripod*



## BIBLIOGRAPHY

- Angelova, DanTube Frommer and Kamelia. "CHART OF THE DAY: Half Of YouTube Videos Get Fewer Than 500 Views." Business Insider. May 20, 2009. Accessed June 01, 2017. <http://www.businessinsider.com/chart-of-the-day-youtube-videos-by-views-2009-5>.
- Banzi, Massimo. "Arduino Introduction." Arduino - Getting Started. October 03, 2012. Accessed June 01, 2017. <https://www.arduino.cc/en/Guide/HomePage>.
- Banzi, Massimo. "Arduino Environment." Arduino - Getting Started. October 03, 2012. Accessed June 01, 2017. <https://www.arduino.cc/en/guide/environment>.
- Inc., Apple. "Xcode 8." Xcode - Apple Developer. May 2016. Accessed June 01, 2017. <https://developer.apple.com/xcode/>.
- Krzysztof Bulski. "Promising Future of Video in Social Media." Brand24 Blog. Accessed February 15, 2017. <https://brand24.com/blog/promising-future-of-video-in-social-media/>.
- Sachtler, Wendelin. "How to Buy a Video Tripod | B&H Explora." Tripod Video Heads. Accessed June 1, 2017. <https://www.bhphotovideo.com/explora/video/buying-guide/how-buy-video-tripod>
- Seth. "STATS | YouTube Company Statistics." Statistic Brain. September 04, 2016. Accessed February 15, 2017. <http://www.statisticbrain.com/youtube-statistics/>.