

The Performance and Creation of Flex Sleeves

A study and execution of wearable technology

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Intro

My name is XANDR. I am a singer, songwriter, producer, keyboardist, and dancer. Those last two things have never really gone together; being a pianist and dancer. Hence I set forth to manipulate music through means of my movement in order to organically incorporate my dance into music. It was a long road, but I developed a performance utilizing gestural control to manipulate my voice, music, and projected visuals.

Description of the Work

My Culminating Experience is a performance of original tracks with the use of homemade and self-programmed wearable technology. The technology takes the forms of a sleeve that utilize electromyography sensors and the Myo by Thalmic Labs, a gestural control armband.¹² The technology translates my movements into visual and sonic manipulations, with a focus on vocal manipulation.

The main performance took place at SONAR+D in Barcelona.³ Other smaller performances were utilized as prototypes for this performance; supplemental demonstrations of this work occurred at MIDEM business conference, the Berklee Eclipse event, and Berklee's Innovation En Vivo.⁴

¹ <http://www.advancertechnologies.com/>

² <https://www.thalmic.com/myo/>

³ <http://sonarplusd.com/activity/the-sing-song-table-y-flex-sleeves/>

⁴ <http://www.midem.com/en/homepage/>

Innovative Aspects of the Work

Wearable technology is a relatively new field in its most recent developments. Most of the world is still on the whole unaware of the amazing functionality of current wearable technology. I have been innovative in helping bring this technology to the stage and the world; I also am one of the few artists really delving into this – Onyx Ashanti and Imogen Heap being other notable ones.^{5 6}

Besides using and publicizing this technology, I have also built and prototyped my own piece of tech. I also developed software for a brand-new to market piece of tech, the aforementioned Myo by Thalmic Labs. I believe that the future of music and performing is based in this wearable technology. I plan to be a pioneer in this immersing frontier, and therefore have spent significant time branding myself as part of my Culminating experience.

New Skills Acquired

I acquired a cornucopia of skills over the course of my culminating experience. The first and perhaps most unexpected is the ability to sew. Other more obvious skills include soldering, building circuits, stabilizing electronic connections. Along with this included using heat guns to shrink insulation around wires, assembling various electronic components, and configuring radio modules using the

⁵ <http://imogenheap.com/home.php?>

⁶ <http://onyx-ashanti.com/>

XCTU program.⁷ I greatly improved my programming skills in Max/MSP especially in regards to obtaining information for serial ports and other locations.⁸ I attained mastery of working with electromyography sensors. I learned how to use video projection software and control it with my wearable hardware.

On a less technical note, I learned how to publically present and discuss my technology, even when it was not working and unexpected errors occurred. I can now also handle long hours of work and presenting while still maintaining a bright disposition when approached with questions and comments. I learned to prioritize and make sacrifices to succeed and discover the most important aspects of a project. Finally, the most valuable skill I obtained is the ability to bounce back from failure – because working with new technology is not a clear and easy path by any means.

Challenges

My project was not short of challenges; in fact it was almost nothing but challenges. I approached the project expecting a fair amount of difficulties. I had never developed hardware before so I definitely expected unknown obstacles to occur; I did not expect the extent at which they did though. I had a decent background in programming so I was not so worried about that and knew I had resources and people to reach out to if anything went amiss.

My first issue challenge occurred after I had spent a couple weeks sewing conductive material into compression sleeves and attached snaps to them for the

⁷ <http://www.digi.com/products/wireless-wired-embedded-solutions/zigbee-rf-modules/xctu>

⁸ <https://cycling74.com/>

electrodes, but could not get my previously functioning electronics to work. I did research and discovered it is necessary to wet the conductive material for it to truly hold an electric current. This worked somewhat but failed to carry me through my first prototype presentation without a few bruises. I had applied too much water, and was greeted by a short circuit. Water proved not to be stable. I was able to demonstrate my tech after it had dried up some though.

I am glad this bump in the road happened publically because a peer gave me the idea of using conductive gel. Gel seemed like a better bet because it is slightly more tamable. In an effort to save money I decided to make the gel myself. I read online that it is very easy to make and only involves adding table salt to aloe vera. After trying multiple brands/types of aloe vera and salt, I discovered that the salt would always melt the gel into a liquid; the aloe lost all viscosity. This defeated the purpose of switching to gel from water in the first place.

I even ended up ordering medical-grade conductive gel afterwards but decided it was still not quite stable enough for my purposes and a hassle to apply anyways. I returned to using adhesive electrodes instead, which I had used in my initial testing stages.

Another string of challenges revolved around shipping and finding the right parts for the hardware I developed. A lot of the supplies I needed were not readily available in the city of Valencia and perhaps would not have been much more prominent in other cities; most of my components needed to be ordered online. Regardless of the initial research I did, my process required being hands on to truly understand what other components would be necessary to complete my goals. Most

stages of the process involved ordering new components, weather it were conductive thread, the right type of Arduino or wireless modules.⁹ This often put periods of time where I could make very little progress because I was waiting for a certain part – sometimes I would have to wait up to six weeks.

A related example to my shipping struggles was when I ordered the Lilypad Xbee.¹⁰ The Lilypad is a microcomputer and the Xbee is a wireless module. I assumed the Lilypad Xbee was both, but it was in fact just a mount for the Xbee. I discovered this after already having ordered and received the components. Fortunately I was overcome this by circumventing the need for computation outside my laptop altogether.

Soldering proved to be challenging as well. I had no experience with electric engineering and some of my soldering jobs ended up frying my EMG sensors and creating bad wire connections. Also I had the troublesome confine of sticking to the idea that my controller had to be a sleeve because I submitted an application to participate in SONAR+D in Barcelona. The application stated I was building these “Flex Sleeves” and that is what they would expect if I were chosen to participate. The idea of the sleeve inhibited my ability to pursue other designs that may have proved to be better choices. In the end I was chosen to participate at SONAR, which I think was well worth the limitation I took on because of it.

It was also a challenge to keep pushing forward with all of the setbacks. Early in the process I would take a week break between working on my project out of

⁹ <https://www.arduino.cc/>

¹⁰ <https://www.sparkfun.com/products/12921>

frustration. Over time I learned to subdue this feeling and continue on regardless of how futile moving forward seemed.

Future Ramifications and Plans for the Work

I plan to continue to prototype my EMG sensor based hardware. I also plan to continue to explore the possibilities of the Myo band through means of Max/MSP. I would like to make another sleeve for the other arm with different controls. I will continue to engage in performance utilizing this technology. I plan on helping other artists incorporate these sorts of technologies in their acts.

Essentially I will keep striving forward with performing using wearable tech until the possibilities run dry. And I do not believe they will run dry. I will do this with the audience and performance focus in mind. And of course, I will keep dancing and writing songs.

Conclusion

Working and developing hardware and software to the extent I did, was one of the hardest things I have had to do. The path was never clear, the goal was always falling from sight, and a constant feeling of failure was prevalent. In the end, I overcame all of it and created a compelling performance of my original work. I learned the most from the challenges I never expected to encounter and the constant demonstrations of my work. The Flex Sleeves still deserve another

prototype but I leave Berklee with a deep satisfaction and feeling of accomplishment.