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AME 498/598: Programming for IoT

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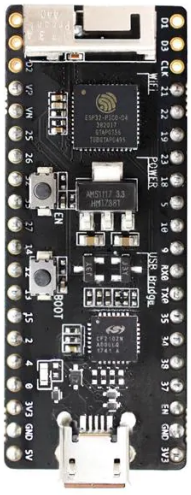
Musical Mechanics

The purpose of this project, dubbed “Musical Mechanics”, was based on the idea of a compact, lightweight, motion-based audio controller device. We borrowed a ESP32 PICO-D4 board for our “demo device”, as shown below. The problem we are trying to solve is the creation of a device that a multitude of people will be able to use, from dancers and choreographers to people with physical disabilities.



Coding Process

The techstack for this project included Arduino, a Pico-D4, Javascript, HTML, and CSS. Arduino and the D4 were both used to set up the hardware side of things and JS, HTML, and CSS made-up the user interface and behavior. Starting out, our first task was to establish the

interface for the end user. We wanted to make it both easy on the eyes as well as easily readable so we went with a pastel color scheme and a light blue button for the bluetooth connection. Next was the implementation of bluetooth connection over an HTML based webpage. For this we used the MPU9250.ino library online to receive a bluetooth signal from our device from a regular chrome webpage.

Once these two steps were consolidated into a single webpage work could begin on behavior. We used a JS backend to our HTML page which would receive a series of coordinates from the microcontroller, among these were acceleration values for the X, Y, and Z axises. This string is separated into an array delimited by commas which then allows us to read the current acceleration across any of the aforementioned axises. This information is then feed into a tree that weighs the data against a threshold, if said threshold is tripped then the command will be sent to the audio controller. Through this we can control stopping, starting, and seeking along the track all from the movements of the wearer. This works while connected, not connected, and not connected at range.

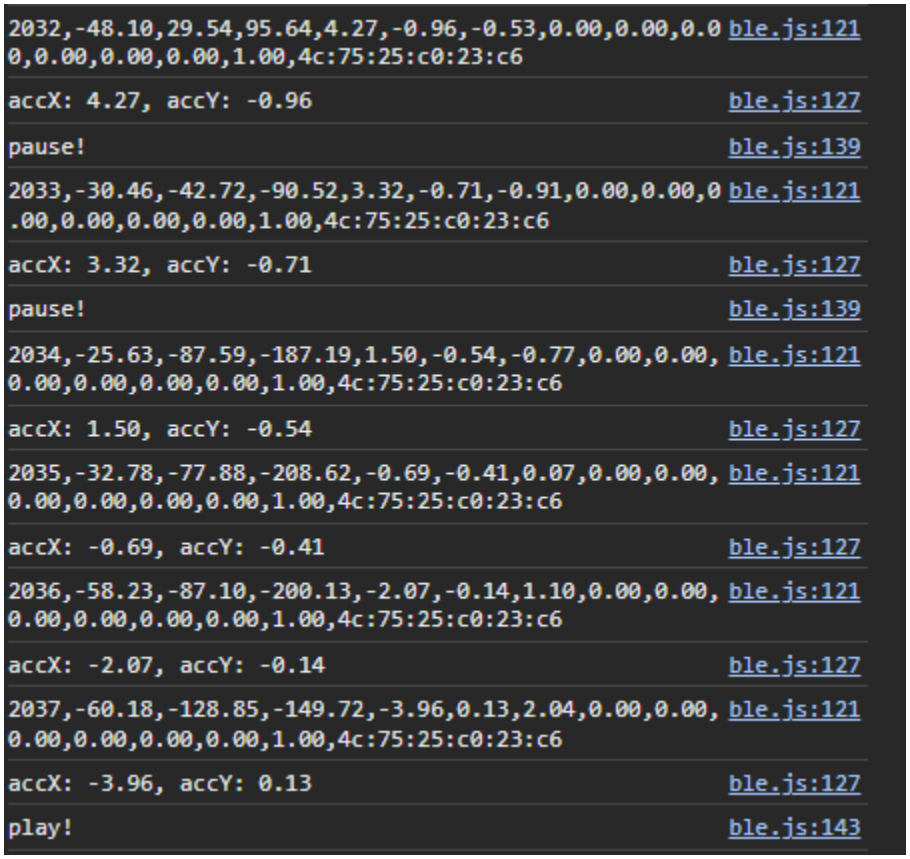
Importance of Sound. In the text *RTP: audio and video for the Internet* by Colin Perkins, the basic history of user-to-Internet connection is summarized in the beginning as is:

> "…development of IP multicast allowed the transmission of real-time data to any number of recipients connected to the Internet" (Colins para. 10).

Over the years, we have seen the Internet expand from simply a place where people can interact with websites to messaging one another via email, to people being given the opportunities to create their own websites and making their own platforms, whether they use images or video or audio to make their voices heard. However, many individuals may not be

physically able to do so or might be too busy to learn how to operate a larger and more complicated device; hence, the creation of our demo idea!

Final Images. Thanks to Arduino, we were able to get some screenshots of the working code for the HTML file interacting with the PICO-D4 device, as shown from the images below. In the future, we can possibly smooth out the edges of the code to make the interactions and connections work less jarringly, but we are glad with the progress made for now.



CONCLUSION

In the future, we may have looked more into finding code that could further highlight our server, such as adding more audio controls. For example, we could find a way later on to speed up or slow down the audio (i.e. tempo changes), add volume controls, or even showcase an alternative option to play the corresponding music video (or lyric video) as a pop-up if the viewer wished for this to occur. However, as we were both somewhat new to this sort of programming (specifically for wearables as we mostly have had done work with web design) there were definitely some moments where we felt stuck during the coding process. However, with advice from the professor and peers, as well as online resources, we managed to get the demo of our project working fine. Later on, if we were to work on something similar to this project again, we would need to research a bit more before the coding process so that we would not feel overwhelmed during the beginning.

During the course, the exercises working with Arduino and HTML definitely aided our knowledge in time for the project! We appreciate the use of wearable devices in the course alongside the Internet program code. For further research, we will probably look more into web design, but it would be fantastic to learn more about its relation with web audio!

Works Cited

Perkins, Colin. *RTP : Audio and Video for the Internet*. 1st edition, Addison Wesley, 2003.