CD Tower Interactive Music Controller: Executive Summary

Group 31: CD Tower Interactive Music Controller

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1.0: Problem Statement

The purpose of this project is to create a system for CD collectors in need of a way to store and play their music collections. Current systems require users either manipulate the CDs by hand, risking damage to the discs, or rip the data from them to digital format, bypassing the need for a physical music product. The CD Tower Interactive Music Controller allows a user to interact with their physical music collection to play the songs, while still providing a safer experience for those who are averse to handling CDs.

2.0: Project Development Process

Development began with preliminary research into the target market. On the software side, this included determining which music server platforms to utilize for the system's music playback, which toolkit to use for the webserver, and what playback features to implement. Our final design boasts compatibility with the Kodi music server platform utilizing a nodejs backend, and enables play, queue, and pause functionality through interaction with the physical CD tower.

The hardware side of the project has the responsibility of sensing playback gestures (tapping, double-tapping, or pressing and holding a CD) and relaying them to the web server for issuing playback commands. The primary challenges of this subsystem came as a result of the requirements outlined by the team's project partner: The physical system had to be battery powered, modular (able to be mounted to a variety of CD racks and towers), and wireless. The final design has the capability to be mounted with minimal profile to a variety of CD racks, and utilizes an onboard wifi chip to relay playback gestures.

For integration of the hardware and software halves of the system, we developed a proprietary method of encoding the CD index and playback command for wireless communications between the two. The software side is able to decode this data to determine which album to reference and what playback command to issue to the music server.

In the final stages of the project's development, we worked to refine the system and improve usability. The physical system saw improvements to its firmware to reduce power consumption, while the software side underwent many iterations to its user interface and feature additions, including the ability to modify and delete entries into the system's database which maps CD slots to albums.

Project Timeline:

Task Name	Task Owner(s)	Fall Term	Winter Term	Spring Term
Fall Term - Pre Planning				
First Project Partner Meeting	XA, WD, EH			
Research	XA, WD, EH			
Engineering Requirements Draft	XA, WD, EH			
Block Diagram Draft	XA, WD, EH,			
Project Charter	XA, WD, EH,			
Tech Demo	XA, WD, EH,			
Testing	XA, WD, EH			
Winter Term - Project Development				
Block Development	XA, WD, EH			
Hardware Interface Testing	WD			
Software Interface Testing	XA, EH			
System Assembly	WD			
Software Integration	XA, EH			
Polishing System	XA, WD, EH			
Spring Term - Refinement and Eval				
Bug Fixes and Refinement	XA, WD, EH			
Ensure Engineering Requirements are met	XA, WD, EH			
Usability Testing	XA, WD, EH			
Final Presentation	XA, WD, EH			
Project Communications and Meetings				
Weekly Team Meeting	XA, WD, EH			
Project Partner Update Meeting	XA, WD, EH			
Per-term Preplan	XA, WD, EH			

3.0 Key takeaways and Lessons

As a team we learned a lot from the project, including lessons regarding project management, planning orders for parts, and design choices. The workflow used by the team this year was guided almost entirely by the cadence of the ECE 44X series of classes. While this did not negatively impact our project management, using an industry standard development cycle instead would have yielded better results. Using the Agile development cycle and splitting development into sprints would have improved our workflow by allowing for smaller, more discrete chunks of progress.

One of the risks we expected for the project was vendor delay, however we underestimated how long the delays would be, as well as how much this would affect our project timeline. In future projects, it would be best to assume there will always be significant delays in shipping, and order parts in advance as much as possible. As the project has come to a close, we've been able to identify multiple places where improvements could be made on our design. These

improvements include a more robust battery design, a more hobbyist-friendly assembly, add compatibility for other media servers and types.