Final Project Proposal

Year: 2023 Semester: Spring Team: 18 Project: RDNT

Creation Date: 11 January 2023 Last Modified: 13 January 2023

Team Members (#1 is Team Leader):

Member 1: Anurag Numboori Email: anumboor@purdue.edu

Member 2: Graeme Usman Email: gusman@purdue.edu

Member 3: Avik Wadhwa Email: wadhwa13@purdue.edu

Member 4: Kahaan Patel Email: pate1410@purdue.edu

1.0 Project Description:

RDNT is a project that takes an input audio source and runs signal processing algorithms to communicate with LED devices to create a synchronized audio-visual experience. Our device will create communication channels between LED devices and the microcontroller and from an input audio source to external speakers. Signal processing of an input audio source will be done by the microcontroller, which controls the LED devices based on preset behavior. The preset behaviors can be changed by the end user through a connected application that will feature external controls that will be used to select color ranges and maintain connections to LED devices.

2.0 Roles and Responsibilities:

1. Anurag Numboori *Team leader – Maintains communication among team members, ensures team is progressing and assists fellow team members in addressing significant issues*

Anurag was able to develop his leadership abilities as Design Lead for his EPICS WRM team as a freshman. He used this experience as Design Lead of a 6-person team to learn powerful skills in compromising and keeping a team focused. He is also interested in software, which he draws from his experience in an internship and many high-level software courses. His interests include Web Development, Computer Security, and Game Design.

1. Graeme Usman *Systems engineer – Responsible for high level functional overview of the system, including the theory of operation, block diagram, and component selection. Ensures components and systems on project work together coherently*

Graeme has had experience working in software and hardware, as well as collaborating with engineers of similar backgrounds. He will be the systems engineer for the team, making sure that all components are integrated properly with each other, while maintaining a high-level view of the overall objective for RDNT.

1. Avik Wadhwa *Hardware engineer – Responsible for design of printed circuit board electrical schematics and layouts, often in charge of circuit board construction and packaging assembly*

Avik is significantly involved with learning more about embedded systems. Throughout his internship at Milwaukee Tool, Avik strived to develop an embedded prototype within project guidelines that are very similar to the scope of this class. He also has experience with developing quick CAD models for prototyping. Avik’s background and passion toward this project makes him a good fit for designing the PCB and developing the packaging assembly.

1. Kahaan Patel *Software Engineer – Responsible for design and implementation of source code. Undertakes functional prototyping efforts early in the semester to mitigate risk in the later stages of the design process*

Kahaan is a pioneering software engineer. He has strong experience in networks and also has experience with building web applications. Kahaan is a fast-learner who believes in rapid prototyping and loves to build software for networked systems, which makes him a great fit for being the Software Engineer for this project.

2.1 Homework Assignment Responsibilities

| *Design Component Homework* | | *Professional Component Homework* | |
| --- | --- | --- | --- |
| A3-Software Overview | AN | A9-Legal Analysis | AW |
| A4-Electrical Overview | AW | A10-Reliability and Safety Analysis | KP |
| A6-Mechanical Overview | GU | A11-Ethical/Environmental Analysis | AN |
| A8-Software Formalization | KP | A12-User Manual | GU |

3.0 Estimated Budget

| Category | Description | Total Estimated Cost ($) |
| --- | --- | --- |
| PCB | The overall cost of printing the schematic | 50 |
| Electronics | Includes:  Microcontroller  Power Distribution Electronics  Bluetooth Modules  LED Drivers | 65 |
| Speakers | Audio Speakers to play music the lights are syncing | 100 |
| LED Array | LEDs we will be using that will visually sync with the music | 60 |
| Acrylic Diffuser  Prototype LED addressable strip | Housing for the LEDs to improve visual appearance | 40 |
| Microphone | For prototype testing of audio I/O | 30 |
| Packaging | Will buy project box or materials to 3D print a box and multiple iterations. | 30 |
| Web Domain | For maintaining archive of project | 50 |
| Total |  | 425 |

4.0 Project Specific Success Criteria

1. (SW) The ability of our LED devices to be controlled (enabled and disabled) by a mobile device, verified through the demonstration of visual effects in response to inputs from the mobile device.
2. (HW) The ability of our LED devices to respond to audio inputs, demonstrated by visual effects in response to music inputs from the mobile device.
3. (HW) The ability of our device to provide a synchronized visual output with LEDs.
4. (HW) The ability of our device to adapt to specific frequencies in musical inputs and generate a visual response based on the tempo of specific frequencies.
5. (HW) The ability to regulate power to drive the LED strips, the microcontroller, and external peripherals.

We have the following Stretch Goals:

1. (HW) An ability to enable and disable the device by voice-activation through Google Home
2. (HW) An ability for user input to control present colors or patterns for the LED devices without music inputs.
3. (HW) The ability for an end user to install and establish a bluetooth connection with our device with minimal complexity, so that the LED devices can be controlled.
4. (HW) Connecting with multiple LED devices and creating a synchronized light display across the devices.

5.0 Sources Cited:

No external works were used to write this report.