Final Project Proposal

Year: 2024 Semester: SPRING Team: 4 Project: KayO

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Team Members (#1 is Team Leader):

Member 1: Raghav Kumar Sudharshan Kumar Email: rsudhars@purdue.edu

Member 2: Yolanda Chen Email: chen3633@purdue.edu

Member 3: Jessica Wong Email: wongjt@purdue.edu

Member 4: Minh Nguyen Email: nguye599@purdue.edu

1. Project Description:

This device is a controller intended to be used for play fighting games. It comprises a collection of buttons on the top of a box that can each input a specific action, with more buttons on the side that are used for auxiliary functions. The player character can be controlled using either a joystick or a set of 4 directional buttons depending on the type of controller. The controller will also have both USB and Bluetooth capability to connect to the PC that hosts the game. The current connection status will be displayed on a screen by reading the image from an SD card. The controller is intended to provide a more ergonomic experience when playing these games for hours at a go. This way any strain caused to the wrist by using a regular gamepad can be avoided.

2.0 Team Member Expertise and Team Roles and Responsibilities:

2.1 Team Member Expertise:

2.1.1 Team Member: Raghav Kumar Sudharshan Kumar

Raghav Kumar has worked on PCB design as a part of the IEEE ROV club and has leadership experience from that same club. He has also worked with microcontrollers on multiple hobby projects and classes, including ECE 36200, ECE 40862, and the same ROV club.

2.1.2 Team Member: Yolanda Chen

Yolanda Chen has practical experience with the STM32 controller from her time as a student and TA in ECE 362, and with the ESP32 in ECE 40862. She also has experience in ASIC design, SystemVerilog, and FPGA design.

2.1.3 Team Member: Jessica Wong

Jessica Wong has experience working with microcontrollers STM32 and ESP32 from course work in ECE 36200 and ECE 40862. Other relevant experiences in FPGA design come from completed coursework in ECE 33700 and ECE 43700. She also has extensive knowledge in systems engineering from past internships.

2.1.4 Team Member: Minh Nguyen

Minh Nguyen has experience mostly on hardware design especially PCB Design on both Autodesk Eagle and Kicad as he has built boards level systems in multiple projects. In addition, he has some experience working with power electronics including buck converter and linear regulator. Other than that, he is also familiar with embedded circuits such as Pi4B, FTDI, STM32, IO Expander, and FPGA Design.

2.2 Team Roles and Responsibilities:

|  |  |
| --- | --- |
| Role | Team Member |
| Team Lead | Raghav Kumar Sudharshan Kumar |
| Systems Lead | Jessica Wong |
| Hardware Lead | Minh Nguyen |
| Software Lead | Yolanda Chen |

3.0 Homework Assignment Responsibilities

|  |  |  |  |
| --- | --- | --- | --- |
| *Design Component Report* | | *Professional Component Report* | |
| A3-Software Overview | Yolanda Chen | A9-Legal Analysis | Jessica Wong |
| A4-Electrical Overview | Minh Nguyen | A10-Reliability and Safety Analysis | Yolanda Chen |
| A6-Mechanical Overview | Jessica Wong | A11-Ethical/Environmental Analysis | Minh Nguyen |
| A8-Software Formalization | Raghav Kumar Sudharshan Kumar | A12-User Manual | Raghav Kumar Sudharshan Kumar |

4.0 Estimated Budget

|  |  |
| --- | --- |
| Item | Estimated Cost |
| *Mechanical* |  |
| Buttons x 30 | $90 |
| Joystick | $40 |
| 3D Printing | $50 |
| *Electrical* |  |
| PCBs & Components | $50 |
| Bluetooth Module | $20 |
| Single Cell LiPo Battery (1S) | $30 |
| Battery Management System | $5 |
| Battery Monitor System | $5 |
| SD card | $10 |
| USB Port | $10 |
| USB Cable & Connectors | $10 |
| OLED Display 128x64 | $20 |
| *Others* |  |
| Shipping | $60 |
| Total: | $400 |

Mechanical items include the packaging of the controller. We have 8 buttons for one controller and 16 buttons for the other, the joystick goes with the controller with 8 buttons. We also decided to 3D print the box that our system would go in, and estimated a conservative price of $50 required for the 3D printing service.

The next section is electrical items, which will all be connected in some way to the development boards. We expect that we won’t have major issues with our board that would require us to repurchase any of these items.

Lastly, the shipping cost is expected to be around $60.

5.0 Project Specific Design Requirements

PSDR #1: An ability to handle and switch between two power sources, built-in battery switching to USB power when USB cable is connected. (hardware)

PSDR #2: An ability to communicate serially between STM32 and Bluetooth module. (hardware)

PSDR #3: An ability to utilize timer-based interrupts to read input from controller keys and fight-stick. (software)

PSDR #4: An ability to convert power from 5V to 3.3V. (hardware)

PSDR #5: An ability to read from SD card and display status image on an OLED/LCD screen using appropriate communication interfaces. (software)

6.0 Sources Cited:

No external works were used to write this report