Final Project Proposal

Year: 2023 Semester: Spring Team: 8 Project: Engineer’s Chess

Creation Date: 1-11-2023 Last Modified: 1-12-2023

Team Members (#1 is Team Leader):

Member 1: Jack Gardel Email: jgardel@purdue.edu

Member 2: Tyson Kline Email: kline62@purdue.edu

Member 3: Andy Helton Email: helton4@purdue.edu

Member 4: Bazim Azeem Email: bazeem@purdue.edu

1.0 Project Description:

This project will be a voice activated chess game. The current state of the chess set will be displayed on a large central screen. A player will be able to give an input, such as “Knight to B7” to the game. A microphone will take the voice input and store it as data. A secondary computer will use that data to determine what move is being requested, then send that data to the main processor. Programmed logic will determine whether the inputted move is legal, then display feedback through a small secondary display. There will be multiple buttons to control the flow of the game such as undo buttons and reset buttons. There will also be a settable game timer to optionally be used during the game. When this project is complete two players should be able to play a complete game of chess using only their voices to control the pieces.

2.0 Roles and Responsibilities:

Jack Gardel has had experience coordinating group projects in courses such as ENGR 195 (Ideas to Innovation I & II) and ECE 437 (Computer Design and Prototyping). Through internships, Jack worked on coordinating with engineers in industry toward improving software and firmware. Jack has a passion for signals and systems and has taken a course in digital signal processing. For these reasons, Jack will be the team leader as well as the primary mathematician for writing the signal processing algorithms, and will choose machine learning algorithms and models from third party sources when necessary.

Tyson Kline has had experience in high-level diagramming and system level design from both ECE 437 and ECE 362. He has also had experience in both digital displays through internships and a course on high-level artificial intelligence. This broad experience over multiple areas of this project make Tyson well qualified to be the systems engineer ensuring all parts of the project work well together.

Andy Helton has had experience in PCB design and construction, within the confines of ECE 362. As well as printed circuit board skills, he also has experience with mechanical and physical elements, making the decision to put him in charge of product design a reasonable choice.

Bazim Azeem has had experience with object oriented programming and will therefore handle the game logic of this project. He has made simple browser games in the past. He also is a student in ECE 461 (Software Engineering). The appropriate role for him will be the software engineer.

2.1 Homework Assignment Responsibilities

|  |  |  |  |
| --- | --- | --- | --- |
| *Design Component Homework* | | *Professional Component Homework* | |
| A3-Software Overview | TK | A9-Legal Analysis | TK |
| A4-Electrical Overview | JG | A10-Reliability and Safety Analysis | JG |
| A6-Mechanical Overview | AH | A11-Ethical/Environmental Analysis | AH |
| A8-Software Formalization | BA | A12-User Manual | BA |

JG: Jack Gardel TK: Tyson Kline AH: Andy Helton BA: Bazim Azeem

3.0 Estimated Budget

Below is the estimated budget for the project.

|  |  |
| --- | --- |
| ***Electrical*** | ***Estimated Cost*** |
| Main Display | $100.00 |
| Printed Circuit Board | $40.00 |
| ***Mechanical*** | ***Estimated Cost*** |
| Casing | $40.00 |
| ***Computational*** | ***Estimated Cost*** |
| Single Board Computer | $100.00 |
| ***Other*** | ***Estimated Cost*** |
| Shipping | $30.00 |
| ***Total Budget*** | ***$310.00*** |

Electrical components are any component that requires power that is not a computer.

Mechanical components are anything that does not require power.

Computational components are all the computers that we need to buy, whether single-board computers or microcontrollers.

Other budget items are the extra incurred costs of the project.

4.0 Project Specific Success Criteria

The following project specific success criteria are proposed for Engineer’s Chess:

1. An ability to pass microphone data stored on the Jetson Nano to a speech recognition algorithm.
2. An ability to store and modify data within the microcontroller related to game state to efficiently interface with the game logic.
3. An ability to interface with an OLED feedback display over SPI with the microcontroller.
4. An ability to interface with a 64x64 LED matrix using a GPIO bit-banging protocol to communicate real-time game state.
5. An ability to communicate voice commands and Jetson Nano control commands between the microcontroller and Jetson Nano using UART.