Internet Connected Chessboard

ECE 445 Design Document - Spring 2019

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1 Introduction

1.1 Objective

Chess is a board game that is centuries old. In the modern age of computers, there have been many online applications created to allow players to compete against one another despite being in different parts of the world. Looking at a computer screen for extended periods of time can cause fatigue in the eyes and mind, both of which are essential tools for any chess player.

To solve these problems, we plan to create a chessboard that maintains the ability to play opponents over long distances while eliminating the need for a computer screen to play the game. Our goal is to allow players to regain the physical interface of a chessboard to reduce strain on their eyes. To accomplish this, our board will interface with a PC to send and receive data about the current state of the game.

1.2 Background

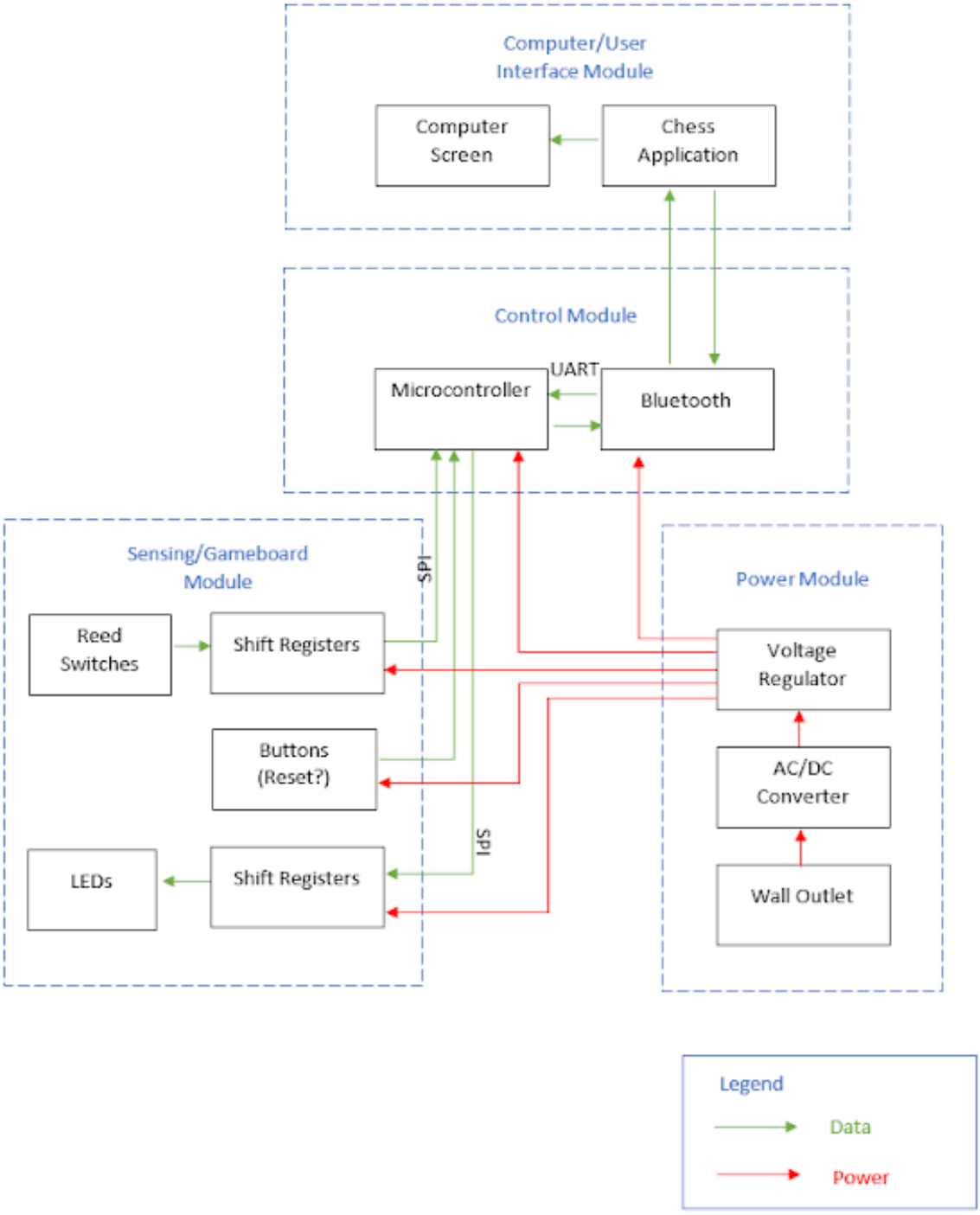
Playing online chess is extremely easy. One only has to have an internet connection and a computer to play. Some people may not like staring at a screen, as it takes away from the experience. We want to change that by creating a smart chessboard, which takes away the computer, but still allows people to play each other remotely.

Players just beginning to learn the game of chess may find it difficult to find other players to compete against. Playing the game of chess online can look and feel quite different than when playing on a board. Allowing beginners to consistently improve their skills with the board will help them to learn the game faster because they will not need to learn about the interface that comes with an online version of the game.

1.3 High-Level Requirements

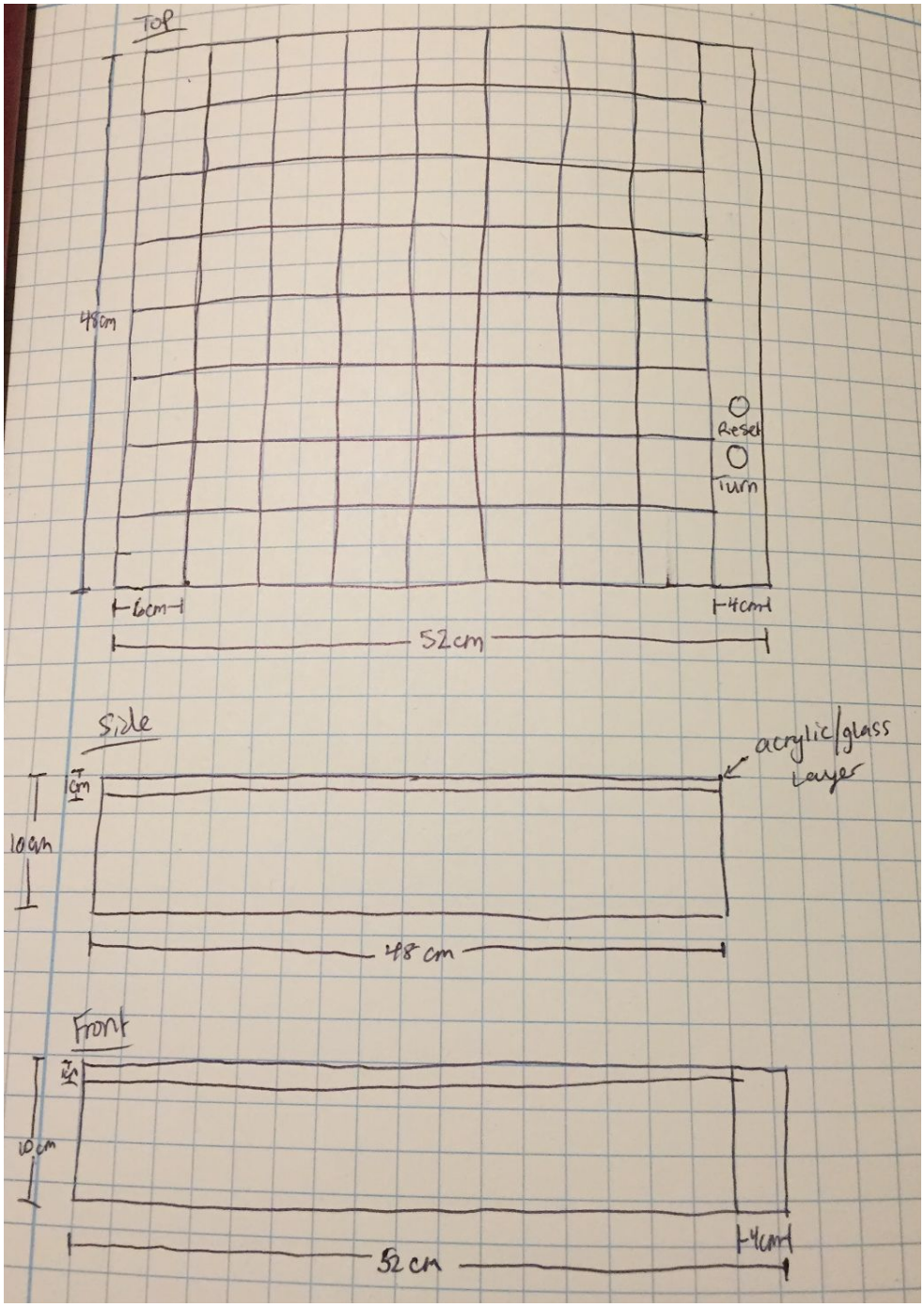
1. The chessboard must be able to sense the location of the player's pieces and send this data to a PC with 100% accuracy.
2. The chessboard must be able to receive data from the PC about the location of the opponent's pieces and display this data on the chessboard accordingly with 100% accuracy.
3. The chessboard and pieces must maintain a similar feel to existing, high-quality chess sets.

2.1 Block Diagram



2.2 Physical Design

Our physical design will mimic a professional chessboard as closely as possible. The recommended size of the base of a king is 75-85% the size of the square [1]. Assuming we make individual squares a size of 6cm, that allows for a king base size of 4.5-5.1cm. There will be two buttons to the side of the board to allow for reset and changing whose turn it is. A thin, translucent layer of acrylic will be what the chess pieces will be placed on top of. This layer allows for the LEDs to shine through while still hiding the underlying electronics.



2.3.2 Sensing/Game Board Module

- **Reed Switches**

Requirements	Verification
Switch from the effects of a magnet from 0-6 cm away.	A. Place reed switch at 0 cm mark of a ruler. B. Connect switch to test circuit found in figure y. C. Start a magnet at the 10 cm mark on the ruler. D. Move magnet closer to switch by increments of 1 cm, monitoring the voltage at each increment. E. Ensure that the measured voltage is supply voltage ±5% until the magnet is at <6 cm mark, where it should transition to 0 V.

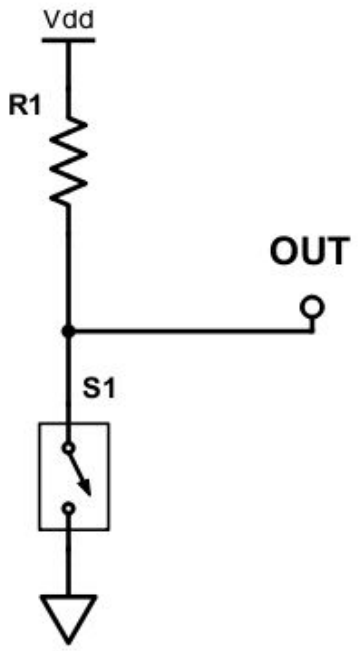


Figure x. Reed switch schematic. OUT signal goes to shift register parallel input

3. Ethics and Safety

Our smart chess board is limited by its sensors on board, and its interface with the internet. As a result, there is not much room for misuse. One minor problem which could arise through intentional misuse if our project were to go out into the industry would be manipulation of the game state. A player could potentially make illegal moves through manipulation of software. This would violate ACM's code of ethics section 1.3 "Be honest and trustworthy" [2].
We aim to adhere as much to ACM's code of ethics especially 1.2 "Avoid harm to others", so the device is made very safe, there are no sharp edges, dangers of fire hazards or any other major harmful side to the project [2].

References

[1] “Chess Size Guide,” The Regency Chess Company [Online]. Available: https://www.regencychess.co.uk/size_guide.html. [Accessed Feb. 7, 2019].

[2] Acm.org. (2016). *ACM Code of Ethics and Professional Conduct*. [Online] Available at: http://www.acm.org/about-acm/acm-code-of-ethics-and-professional-conduct [Accessed Feb. 6, 2019].