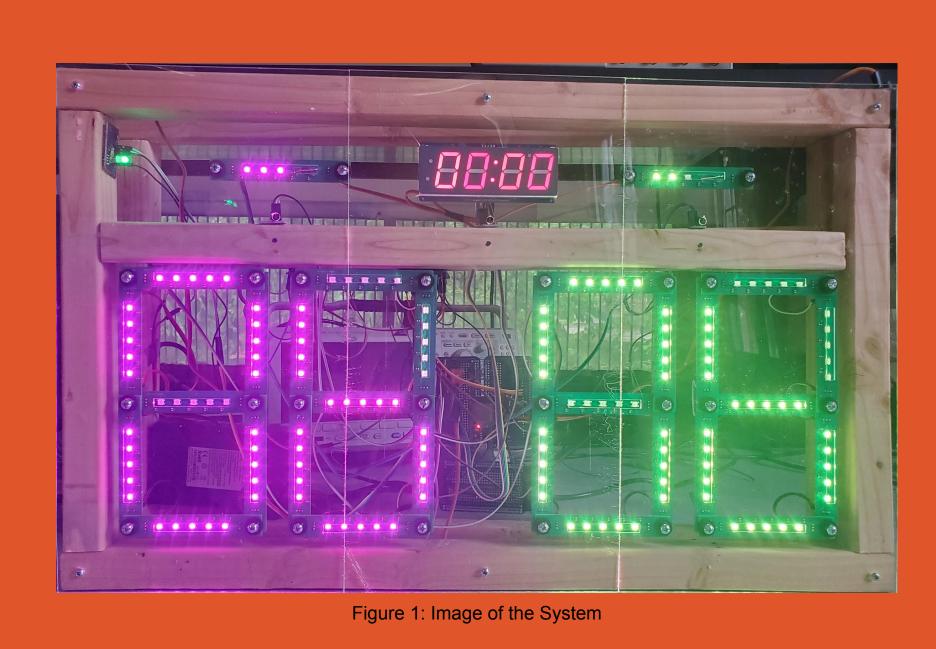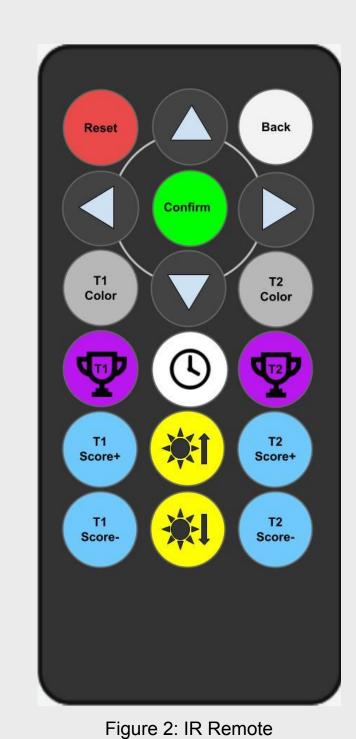## Engineering Requirements:

- Battery Indicator: The system will indicate when there is at least 90 minutes of battery charge left, at least 45 minutes of battery charge left, and at least 10 minutes left.

- Game Timer: The system will have a countdown timer that is accurate to under 3 seconds.

- Input/Output Processing: For all input combinations, the correct output will be displayed within 500 ms.

- IR Communication: Communication with the system will use a wireless remote. Inputs will be read correctly 9 out of 10 times within 15 feet.

- Power Supply System: At full charge, the system will last at least one hour.

- Scoreboard LEDs: The scoreboard lights will have at least 16 available colors with at least 3 brightness settings.

- User Setup: The system will be movable and mountable by 9 out of 10 users.

- Win Counter: The system will indicate up to 3 wins per team.

Figure 1: Image of the System

Tailgater Scoreboard

An easy to use, wireless scoreboard with customizability to add fun to any event

Figure 2: IR Remote

Figure 3: Tailgaters Playing Cornhole

Citation: PICRYL – Public Domain Media Search Engine, "Marines and family members play a game of cornhole - picryl - public domain media search engine public domain search," PICRYL, https://picryl.com/media/marines-and-family-members-play-a-game-of-cornhole-c73887 (accessed May 12, 2023).

Function Overview

- Scorekeeping
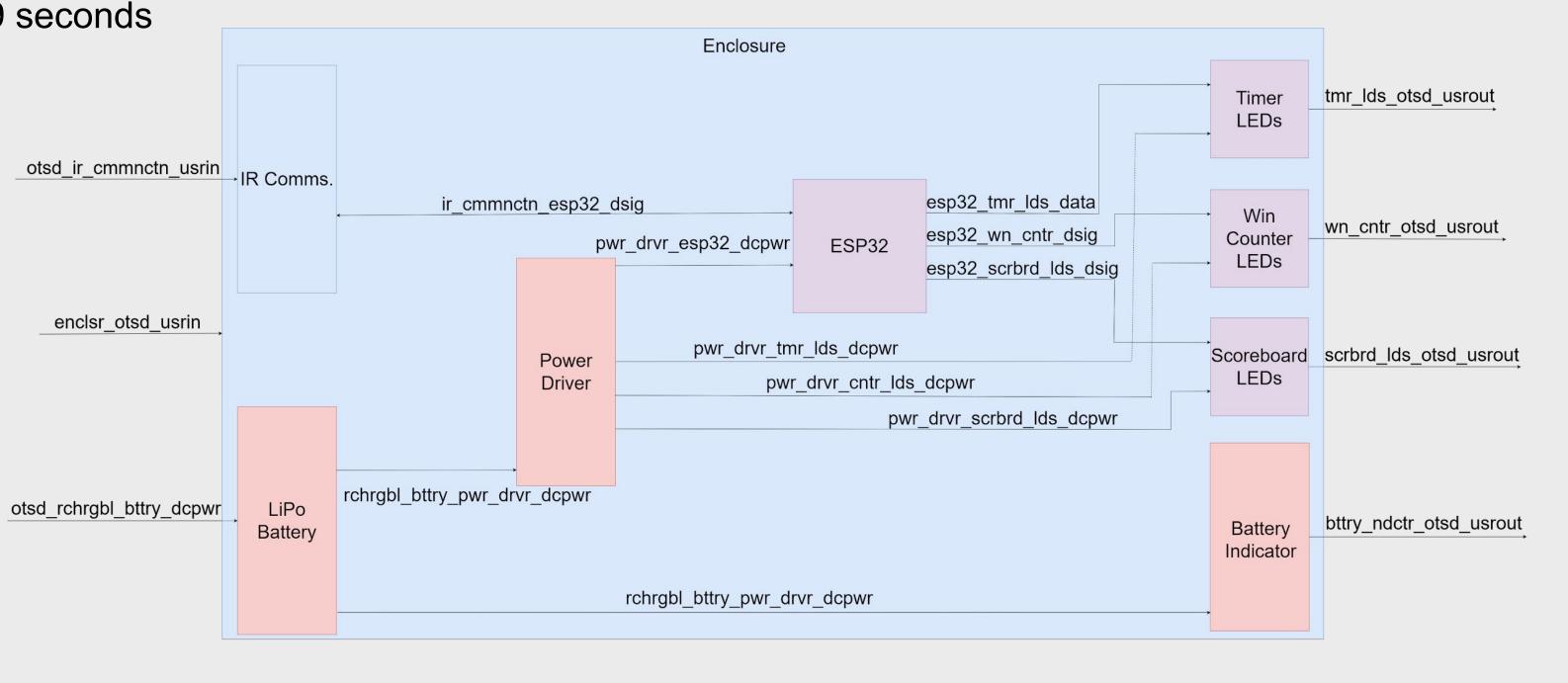- Win Counters
- Built-in Timer
- IR Communication
- Battery Indicator
- Mounting and kick-stand
- 16 available colors for each team
- 6 available brightness settings

System Summary

Inputs: The system has user inputs from the IR remote and power inputs from the power supply. The power supply consists of a 12v rechargeable battery with a buck converter that steps down the voltage to the necessary 5v. The power inputs are also measured using the battery indicator block. The user inputs come from the IR remote and are communicated to the microcontroller using several IR diodes.

Processing: The ESP block handles all of the processing. It takes input from the IR diodes that correspond to different buttons being pushed on the remote. It then processes these inputs and turns them into the correct outputs. If a timer has been set, it also counts down and displays the current time in the background.

Outputs: There are many outputs for this system. The score display shows 4 digits, two for each team. Each team also has win counters for tournament-style games. Both light displays have 16 available colors and 6 brightness settings. The battery indicator light also displays different colors corresponding to how much power is left in the system. Finally, the timer block contains 4 seven-segments displays that show the user how much time is left in the game. It has a maximum time of 99 minutes and 59 seconds

Figure 3: System Block Diagram

Meet The Team

Figure 4: The Team. From Left to Right: Cymon Dillon, Chris Dueber, Sultan Aldhaheri

- **Sultan Aldhaheri:** I'm an Electrical and Computer Engineering student interested in communications and signals. Worked on the power supply system along with the battery indicator.

  Email: aldhahes@oregonstate.edu

- **Cymon Dillon:** An ECE student with a CS minor. Very interested in coding and computer engineering. Wrote all of the code for the system, also designed and built all of the PCBs and protoboards. Main blocks were the ESP, timer, win counters, and score display.

  Email: Cymon.Dillon1965@gmail.com

- **Chris Dueber:** Electrical and Computer Engineering major / Computer Science minor, my interests include embedded systems and power electronics. Lead for sensing and enclosure designs.
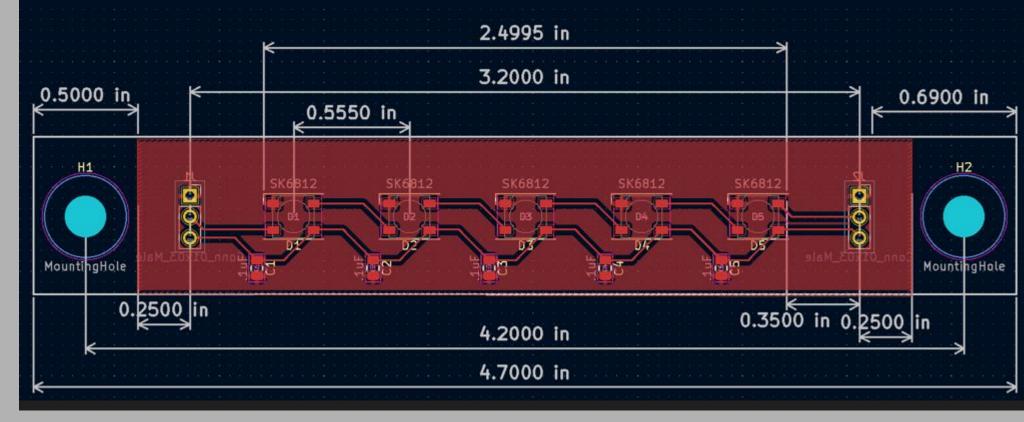
  Email: dueberct@gmail.com

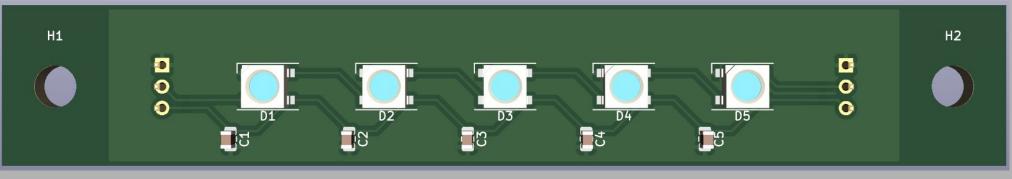Figure 5: Light Segment PCB Design

Figure 6: 3D Model of a Completed PCB

Business Motivation

When looking at the market, consumers are only able to buy highly expensive, professional-level scoreboards or cheap products with little functionality and poor-quality construction. This product aims for the middle-point with a range of functions and high quality construction while limiting the size to keep costs down.

Oregon State University