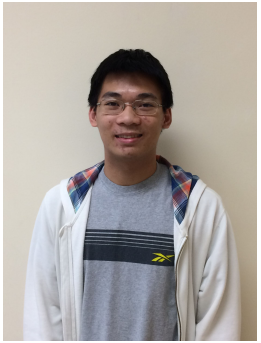
LASERef

Team 18

Final Project Review

Meet the Team

Advisor:
Professor Tessier



Josh Setow
EE

Tim Freitas
EE

Sam Auwerda
EE

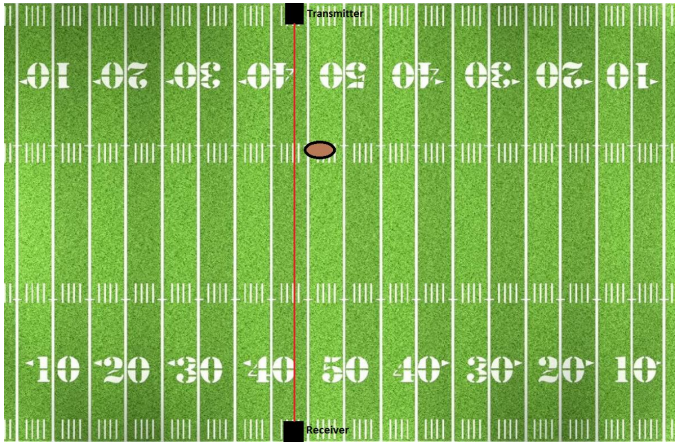
Josh Gallant
EE

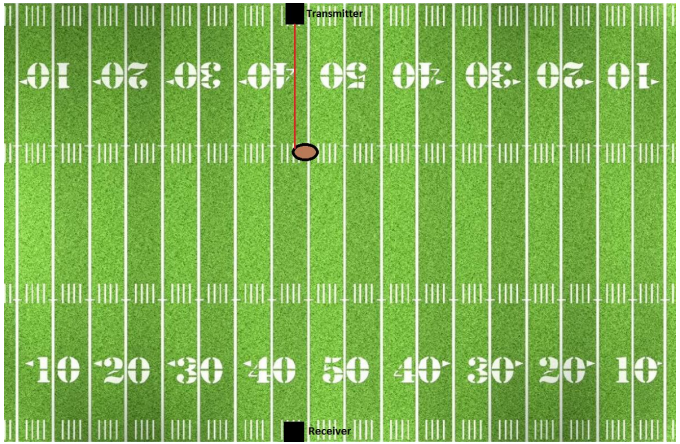
Overview

- The current first down marking system slows down gameplay and is prone to human error
  - On close calls the chain crew brings the markers out onto the field to measure
- The LASERef is a break-beam sensor that:
  - Beam a laser across the field to detect if ball has crossed the line
  - Updates a Twitter and GUI with down information and a picture

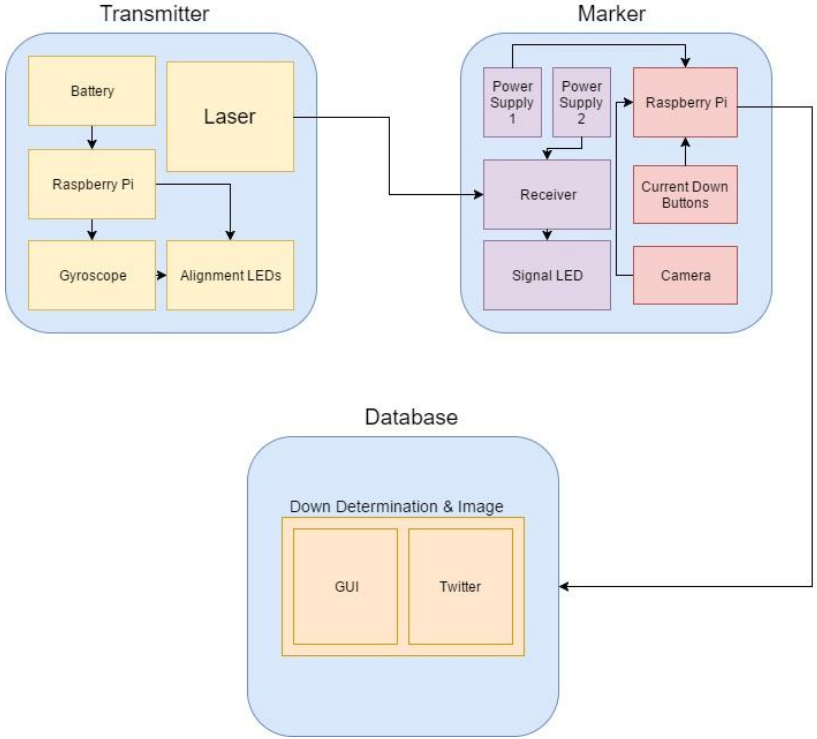
Overview

Ball is detected when beam is broken





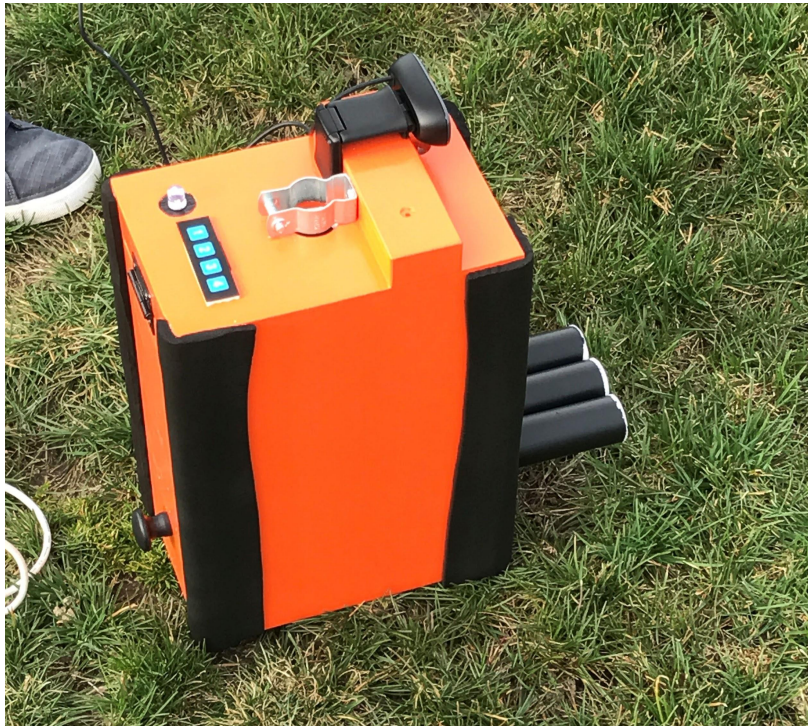
Block Diagram



Promised FPR Deliverables

- New Housing Units for Transmitter and Receiver
  - Padded, Durable, Visually Appealing
- Improved Materials for Light Shield
  - Matte color to avoid unwanted reflection
  - Filter in-front that will allow laser but restrict ambient light
- Improved accuracy on angle detector
- Testing and Data Collection

Final Receiving Box



Final Receiving Box

Dimensions:

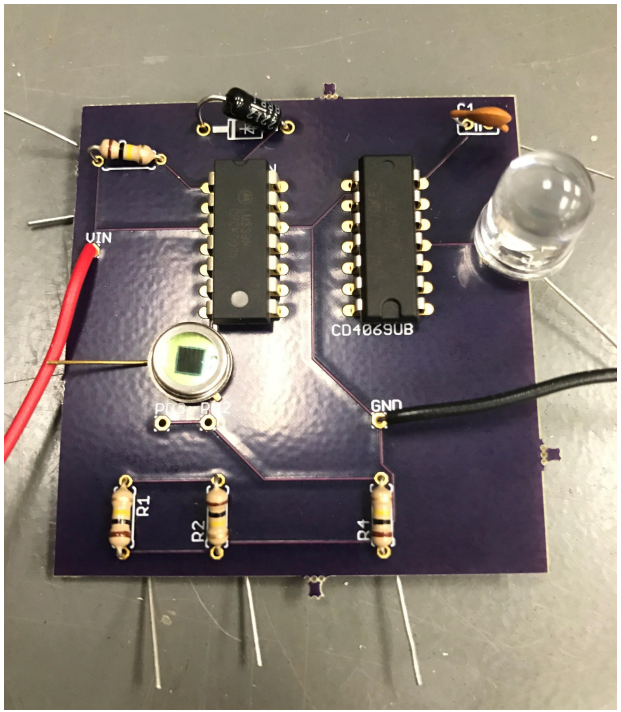
12” x 5.5” x 13”

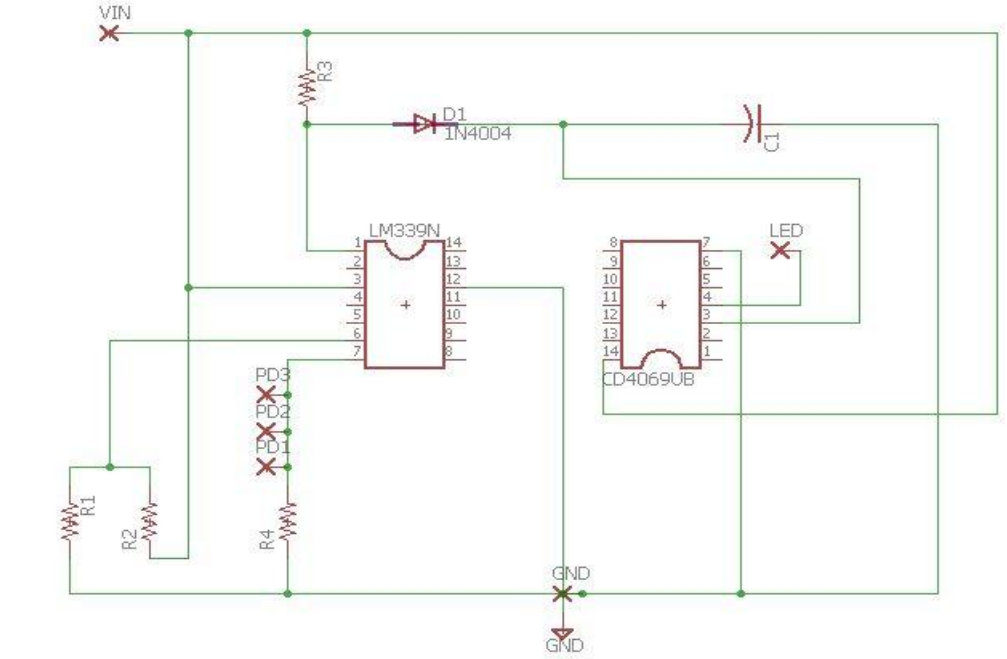
Contains:

Receiver Circuit - PCB
Raspberry Pi
2 Power Sources

Padded

Printed Circuit Board





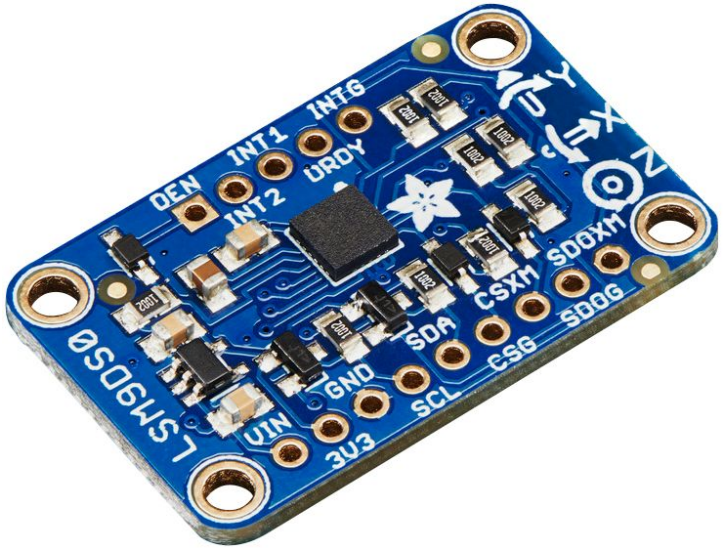
Transmitter Box

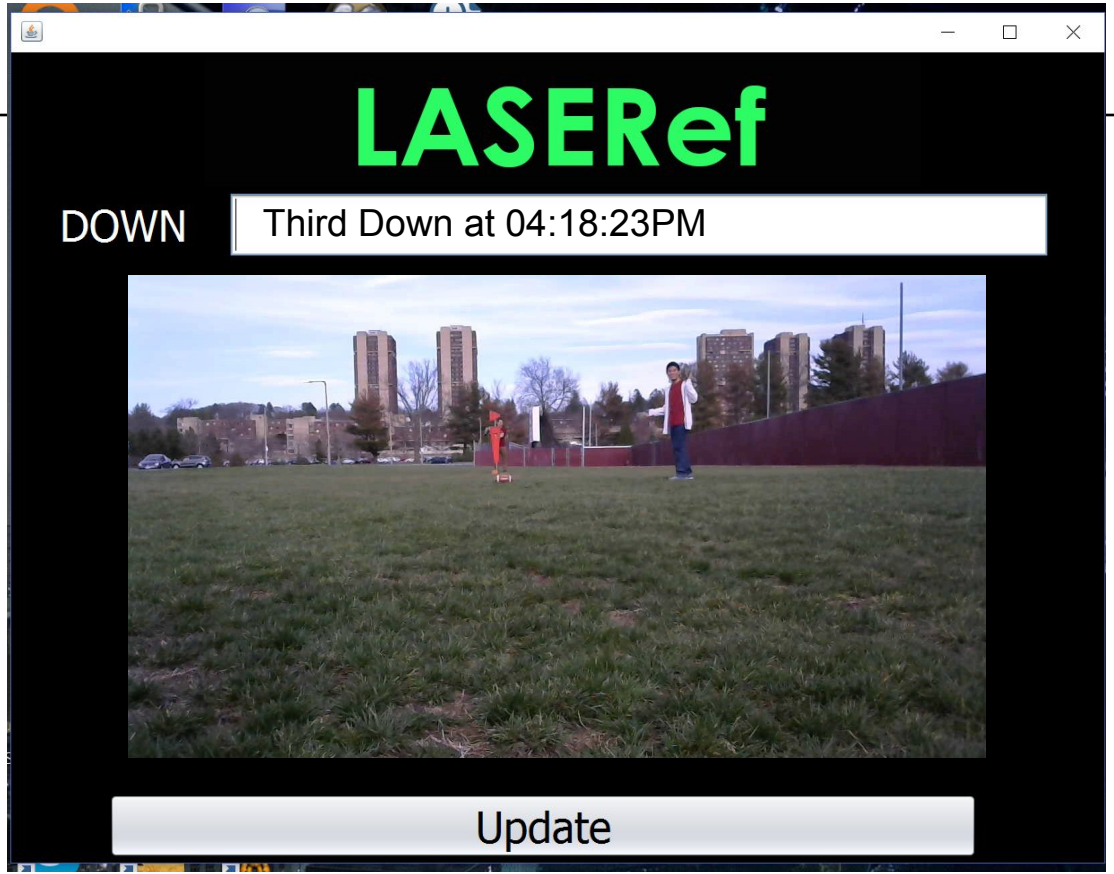
- Built by a 3D printer
- Dimensions:

  5.5″ x 7.5″ x 7.5″
- Contains:
  - Laser
  - Raspberry Pi
  - Alignment LEDs
  - Gyroscope
  - Power Source

Angle Detector

- Angle detector is accurate to 1.5 degrees
  - Improvement from 2 degrees




LASERef
DOWN
Third Down at 04:18:23PM
Update

Eduroam on the Pi

- Pi now automatically connects to Eduroam
- A monitor no longer needed to set up system
- Equipped with red/green LEDs to show status of Wifi connection

Final Product Specifications

Specifications	Value
Transmitter Weight	1.96 lbs
Transmitter Box Dimensions	5.5” x 7.5” x 7.5”
Receiving Box Weight	6.2 lbs
Receiving Box Dimensions	12” x 5.5” x 13”
Battery Life	Approximately 5 hours
Alignment Time	~4-5 seconds
Receiving Distance	> 50 yards

Prototype Cost

Part	Quantity	Prototype Cost	Production cost
Power Supplies	3	$30	$10
Photodiodes	3	$30	$21
Raspberry Pi	2	$70	$40
Receiving Box	1	$25	$5
PCB	3	$22.95	$5
Laser	1	$21	$10
Gyroscope	1	$22	$10
Total		$220.95	$101

Where will this be used

- Works best on flat turf fields
  - Professional and College stadiums
  - High-end high school fields

- Not Recommended for youth leagues
  - Inconsistencies in the grass or field layout can cause issues

Uses Beyond Football

- House/Building Surveillance Systems
  - Notify owner when someone entered property and take picture of them

- Traffic
  - How many cars on a road
  - Toll Collection

Automation & Operating the System

- Chain crew is still needed to operate this system
  - They will require training on how to use it
- Allows chain crew to do their job faster and display more information
  - No jobs will be lost because of this

FPR Deliverables

- New Housing Units for Transmitter and Receiver ✓
  - Padded, Durable, Visually Appealing
- Improved Materials for Light Shield ✓
  - Matte color to avoid unwanted reflection
  - Filter in-front that will allow laser but restrict ambient light
- Improved accuracy on angle detector ✓
- Testing and Data Collection ✓

Team Contributions

- Josh G
  - Software
- Josh S
  - Box Designs
- Sam
  - Transmitter Design
- Tim
  - PCB and Receiving Box

Thank You

Questions and Demo