On Your Mark: A Smart Starting Block for Runners

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Objective

To create an affordable Smart Starting Block to donate to a high school track and field program. The block will help improve runners' race times by providing feedback based on collected data points.

A similar product already exists but is exceedingly expensive.

Project Overview

- Add pressure sensors to a standard track and field starting block. [1]
- Collect data based on foot placement and force applied to the block when runners launch.[1][5]
- Collected data will be compared with controlled/desired data results. (Controlled/desired results will be adjusted for height, weight, etc.)[2][5]
- After data comparisons, the user interface will give feedback on how the runner should adjust their stance and kickoff.[3]
- Each runner's information will be stored in a file management system that can be accessed when desired.[1][4]
- User interface will be a phone application.[4]

Diagrams/Materials

Phototransistor
IR LED
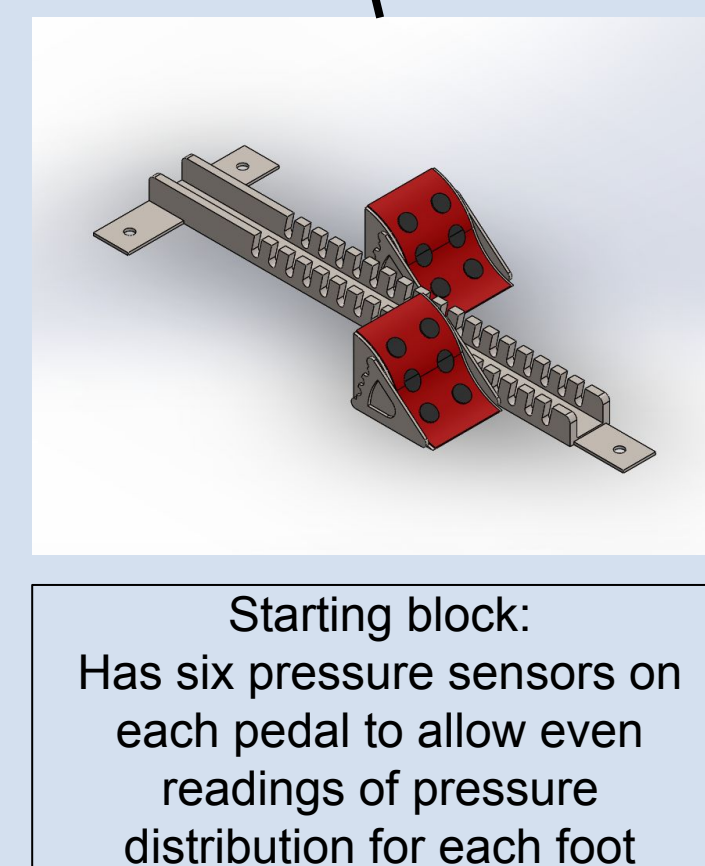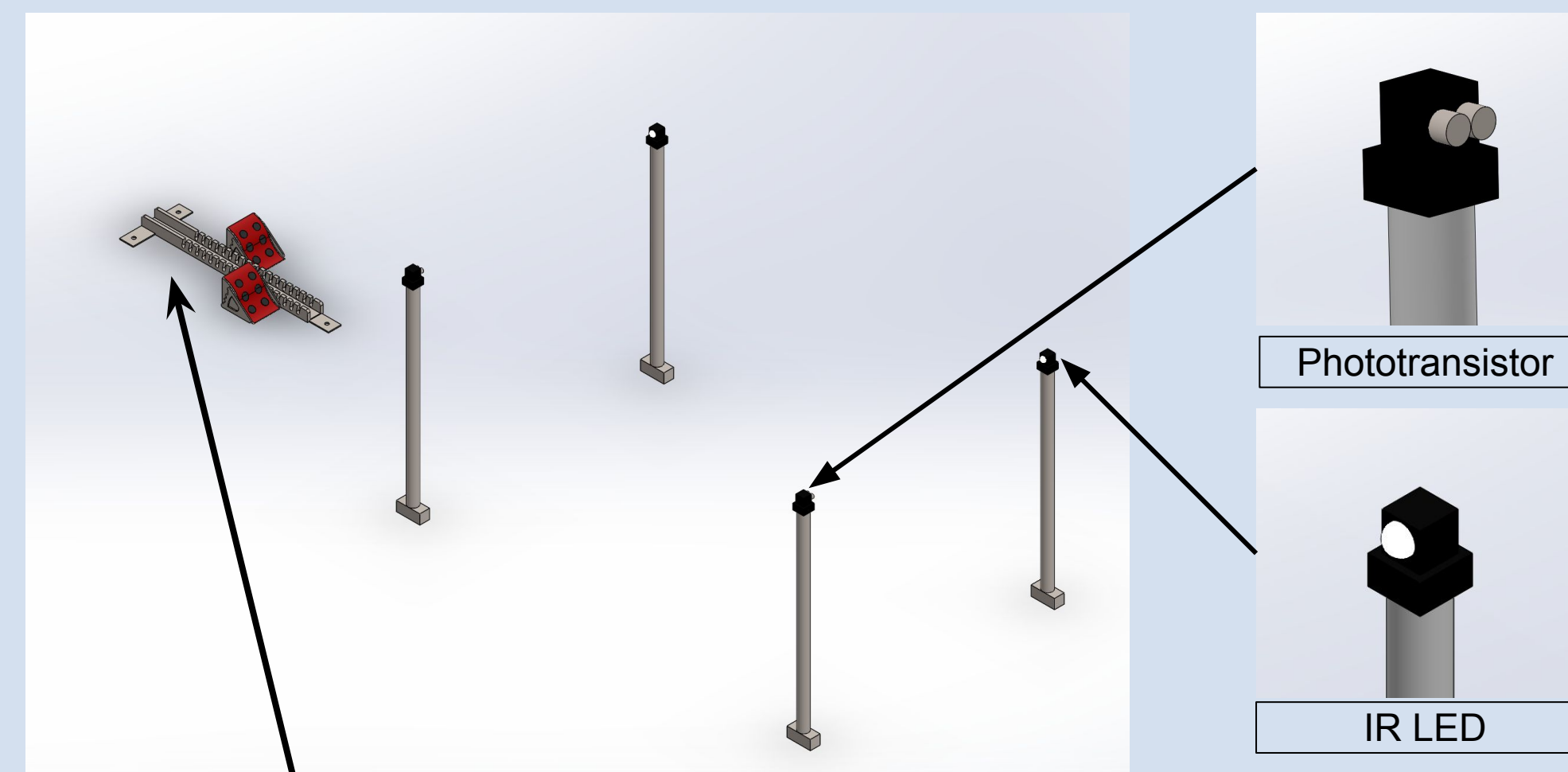
Starting block:
Has six pressure sensors on each pedal to allow even readings of pressure distribution for each foot

- Build on top of a standard starting block. [1][2]
- Multiple pressure sensors laid out in a specific configuration [1]
- Photogates used to measure a runner's starting acceleration. [2][5]
- Raspberry Pis and Pi Zeros with XBee antennae transmit data to a central Raspberry Pi equipped with an XBee dongle. [4]

Item description	Quantity
Standard Starting Block	1
Round Force-Sensitive Resistor (FSR) - Interlink 402	12
Photo Transistor Light Sensor	2
Super-bright 5mm IR LED - 940nm	2
Raspberry Pi 3 - Model B+	2
Xbee Module	4
Pi Zero	2

Milestones

Fall Quarter Goals:
- Create a working prototype that collects data
- Create basic graphing and analysis methods for collected data

Winter Quarter Goals:
- Build a stronger/more stable prototype
- Create algorithms for comparisons and analysis
- Create a way to store individual data profiles
- Create a basic GUI

Fall Quarter	Complete	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
Create BoM	100%										
Research	100%										
CAD Design	100%										
Test	100%										
Physical Prototype #1	100%										
Winter Quarter	Complete	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
Basic Data Collection	50%										
File Storage Technique	15%										
Test Plotting Algorithm	15%										
Test Comparison Algorithms	0%										
Create User Interface	0%										
Debugging/refactoring	0%										

References

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5. R. Allain, "Maximum Acceleration in the 100 m Dash," Wired, 03-Jun-2017. [Online]. Available: https://www.wired.com/2012/08/maximum-acceleration-in-the-100-m-dash/. [Accessed: 23-Oct-2019].

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