FAMU-FSU College of Engineering

Team 309: Sprinter Data Collection

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Background

- Sprinting is the action of running over a short period of time.
- Sprinter performance is influenced by many factors such as:
  - Start technique
  - Stride length
  - Stride frequency
- In order for improved performance in sprinting, advancement of data tracking is crucial to understand where certain factors can be improved.

Market Competition

Capability	Devices			
	1080 Sprint	Zepp Play	StatSports	Our Vision
Force	✓	✗	✗	✗
Acceleration	✓	✓	✓	✓
Speed	✓	✓	✓	✓
Stride Length	✗	✗	✗	✓
Stride Frequency	✗	✗	✗	✓
Distance	✗	✓	✓	✓
Deceleration	✗	✗	✓	✗
Active Time (Productivity)	✗	✓	✗	✗

Lucero Cruz

Project Scope

Project Description:

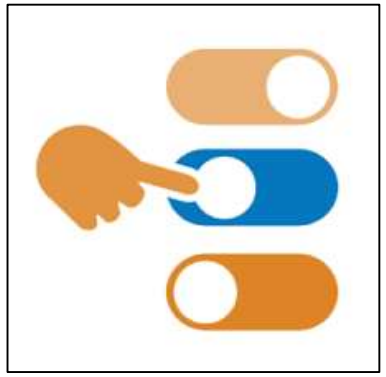
- A product that improves data tracking for sprinters/runners.

Goals:

- Create an alternative to devices already established for tracking runner data that is cost effective.
- Capture accurate data points.
- Provides similar or improved data sampling for the sprinters/runners.

Targets

Data Measurement



Customizable

Water Resistant

User Interface

Affordable

Lightweight

Lucero Cruz

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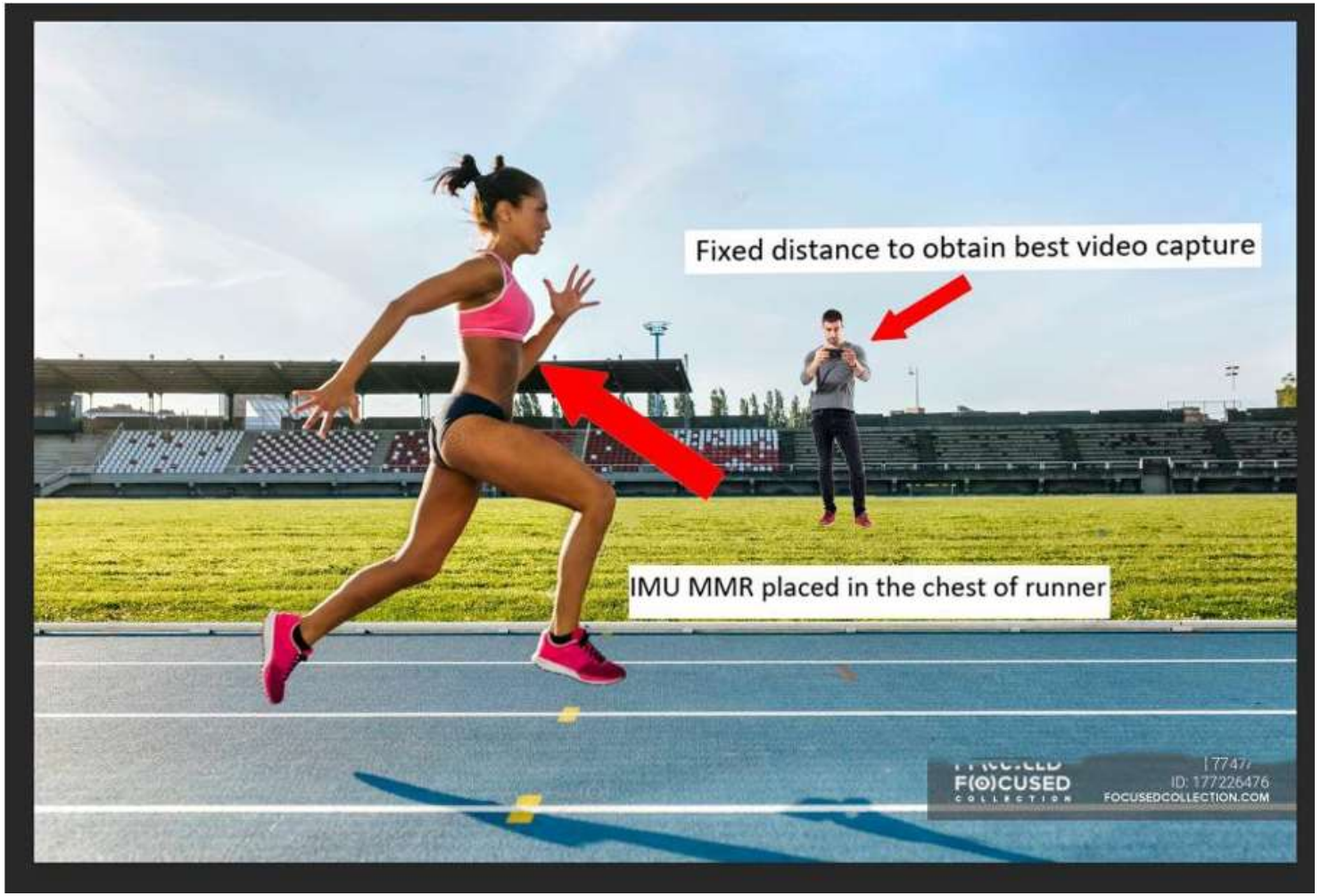
Major Modules

- Accelerometer
- Camera system
- Video/Accelerometer Synchronization
- Program

Concept Selection

- Accelerometer: IMU MetaMotion R
- Camera system: Iphone 6s Plus Camera
- Image/video Processing Software Library: OpenCV
- Programming Software: Microsoft Visual Studio

Visualized Design



Stephanie Damas

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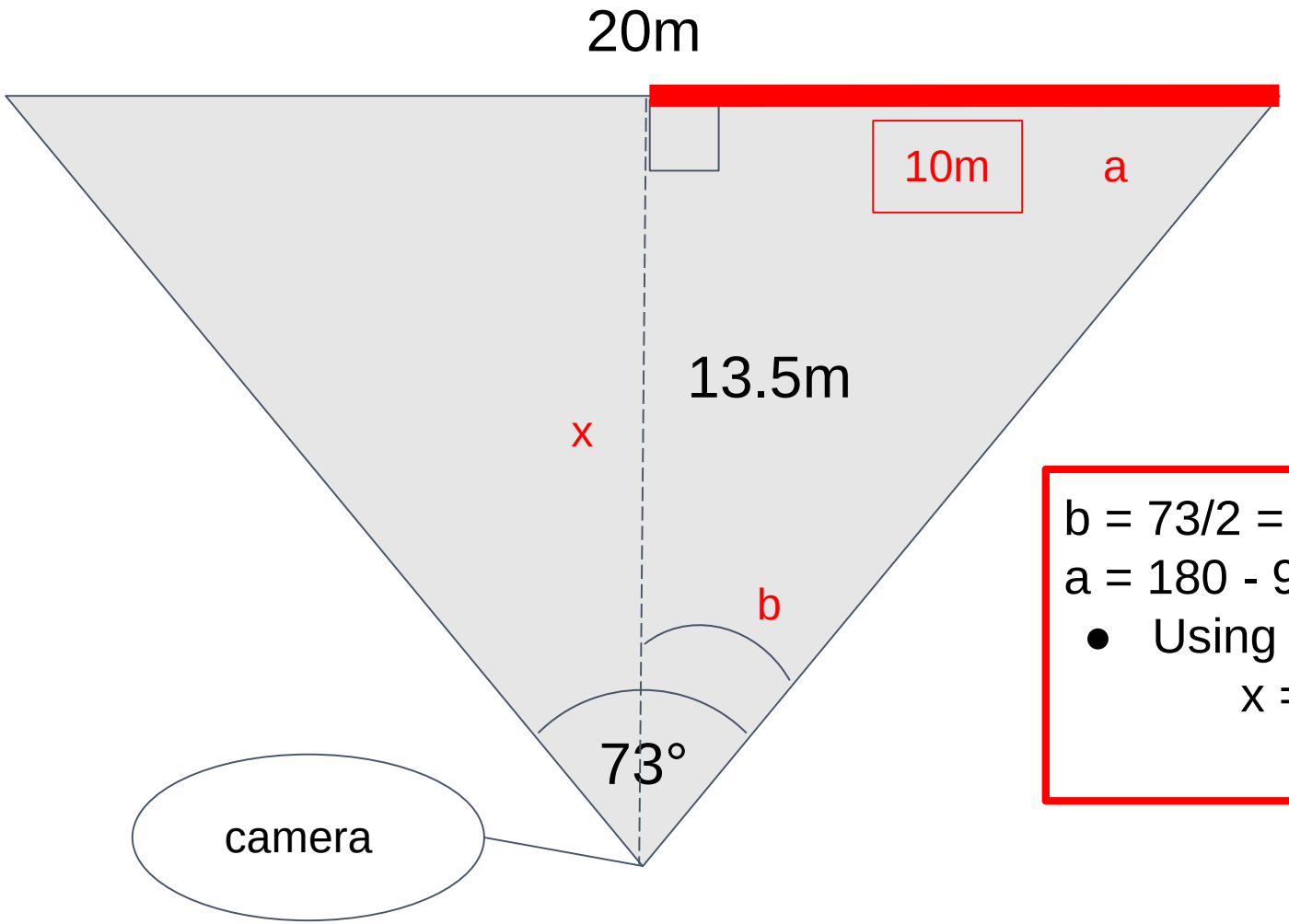
Field of View



b = 73/2 = 36.5

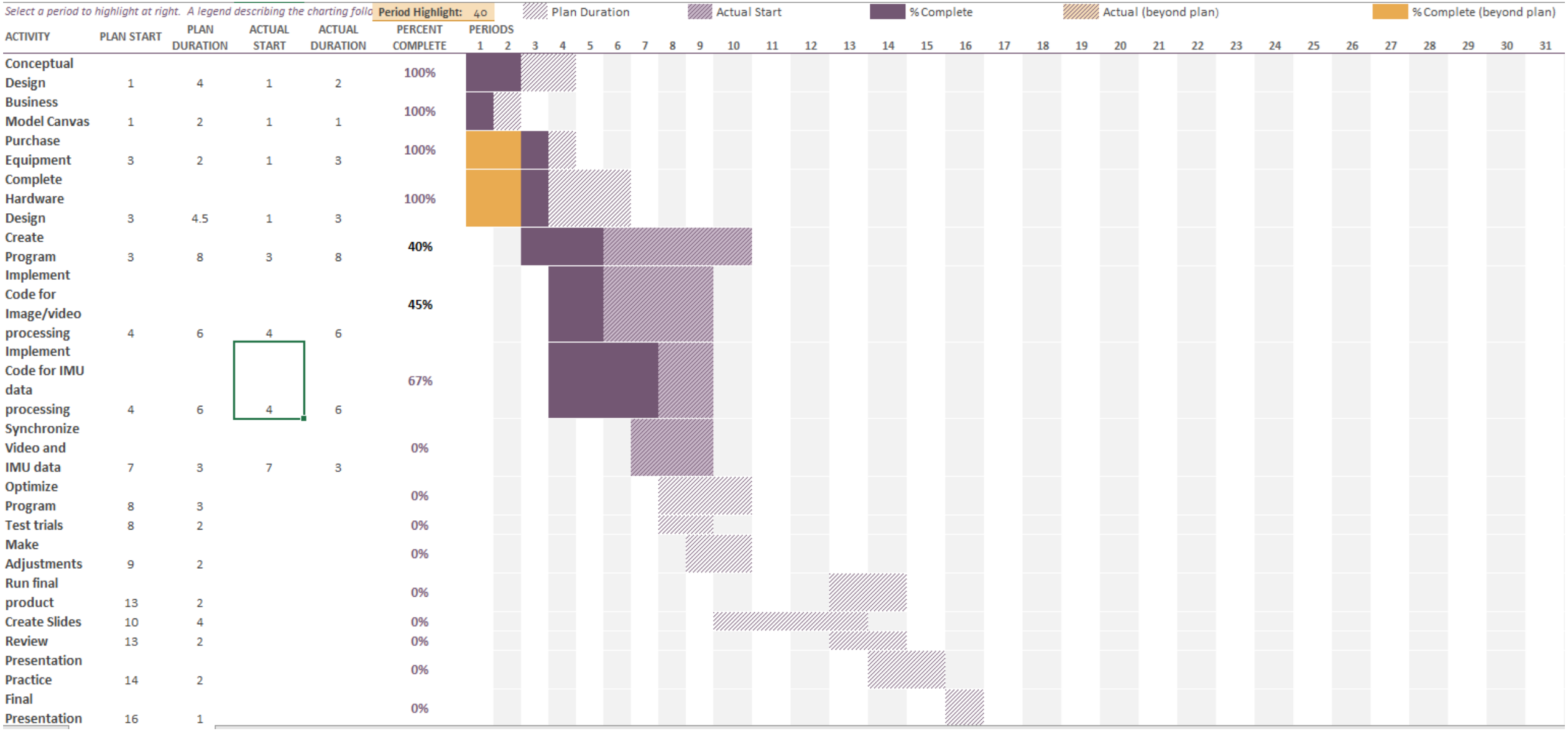
a = 180 - 90 - 36.5 = 53.5

- Using basic trigonometry

  x = 10sin(53.5)/sin(36.5)

  = 13.5m

Stephanie Damas



Stephanie Damas

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Image Processing

- Downloaded all software needed (C++ and OpenCV libraries)
- Loading video with OpenCV
- Research
  - Obtaining velocity
  - Types of tracking
  - Horizontal stride length
  - Correct number of data points

Image Processing

Adam Breindel

Image Processing

- Near completion
  - Obtaining velocity of runner
  - Accurate Start and Finish times of runner (20m)
- More challenging objectives
  - Tracking individual feet of runner
  - Calculating stride length

Adam Breindel

Accelerometer Progress

- Capable of reading accelerometer input data of x,y, and z-axis, and returning total acceleration values, through the use of a calibration program.

- Also calculates the instant velocity with the use of the previous velocity and current acceleration in relation to time.

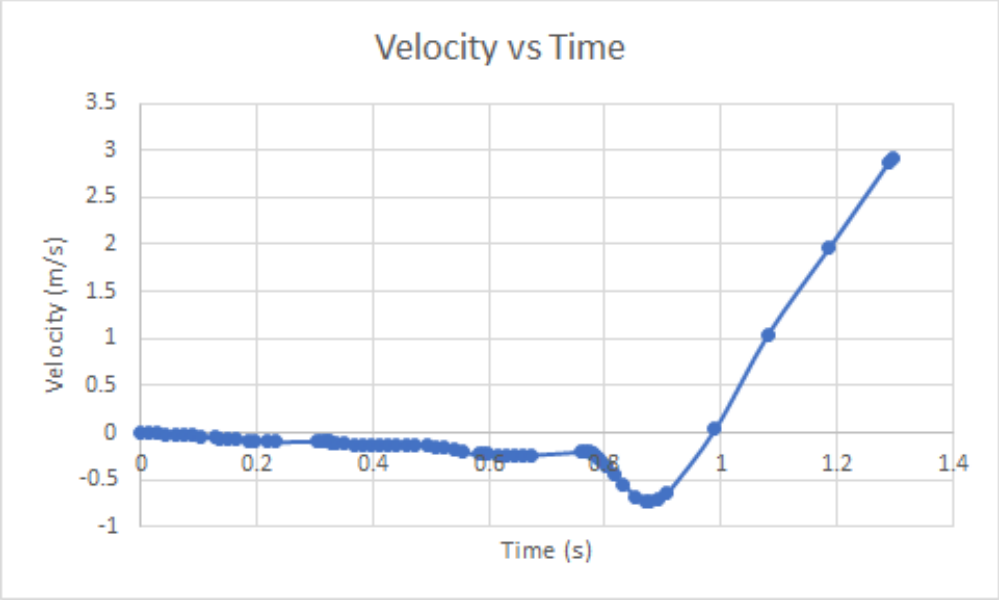
$$v = v_0 + at$$

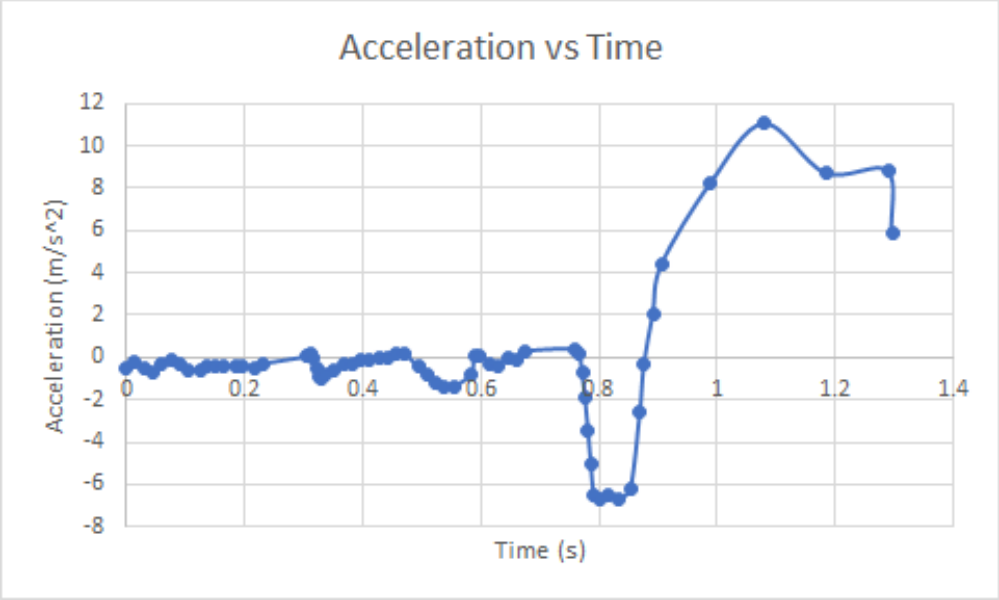
```
Time: 0
Acceleration: -0.497162

Speed: 0

Time: 0.014
Acceleration: -0.243763

Speed: -0.00341268

Time: 0.029
Acceleration: -0.522622

Speed: -0.011252

Time: 0.044
Acceleration: -0.702636

Speed: -0.0217916

Time: 0.059
Acceleration: -0.308952

Speed: -0.0264258

Time: 0.075
Acceleration: -0.0809183

Speed: -0.0277205
```

Christian Gazmuri

Accelerometer Next Steps

- Graphing of outputs for the user in order to visually understand the data.
- Clear indicators regarding where outputs occur in terms of position.
- More test samples to determine best method of getting stride frequency.





Accelerometer Next Steps

- Based on the graphs created from a short sample run, velocity and acceleration show direct correlation, meaning program calculations are correct.
- Ideal graphs would look similar to the ones shown on the left, except extended out further for a clearer visualization.
- When synchronizing with the video, showing checkpoints on the graph regarding the distance the runner has reached in collaboration with the data provided.

Christian Gazmuri

Moving Forward

- Thursday February 20, 2020 at 2:30 PM
  - Rickards High School Track and Field Team Practice
    - ensure accurate distance measurement (20m)
- Meet with Faculty Advisors
  - analyze methods of collecting stride length with OpenCV
  - review synchronization tips
  - discuss best means for showing outputs
- Programming
  - clean up code for future use

Christian Gazmuri

Questions