A Computer Vision-based Approach for Sprinter Optimization: VDR4

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Team Members

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Outline

1. Project Scope
2. Selected Designed Concept
3. Preliminary Design
4. Preliminary Results
5. Future Work

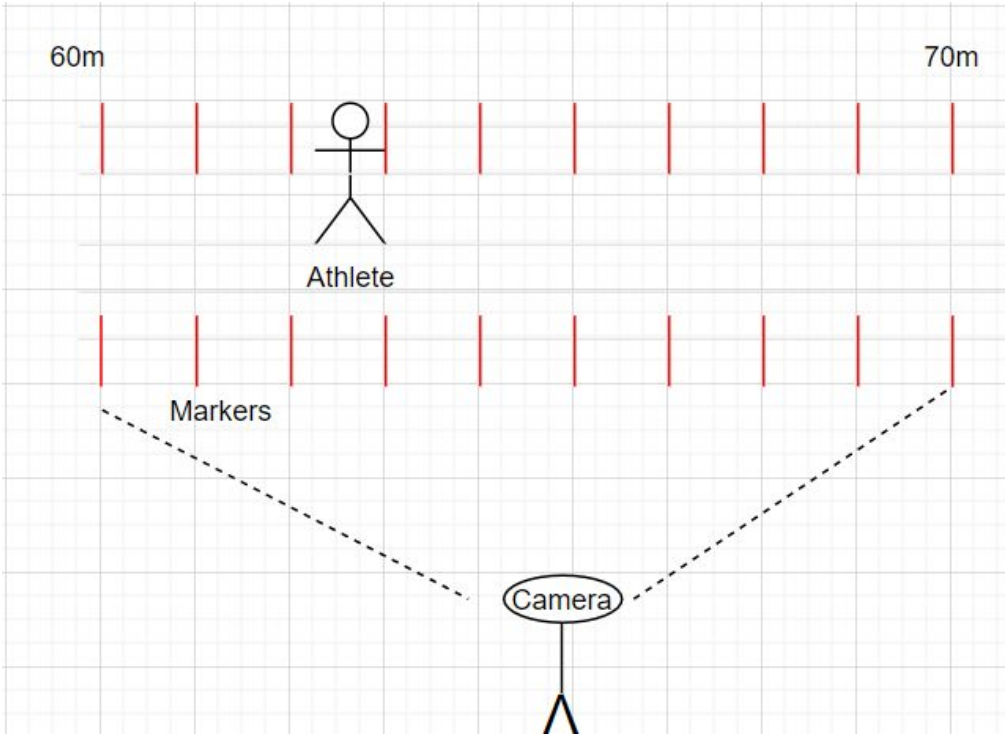
Scope

- Create a system that analyzes the technique of sprinters during the 100m event
- Provide a clear display of the sprinter while giving feedback on their form.

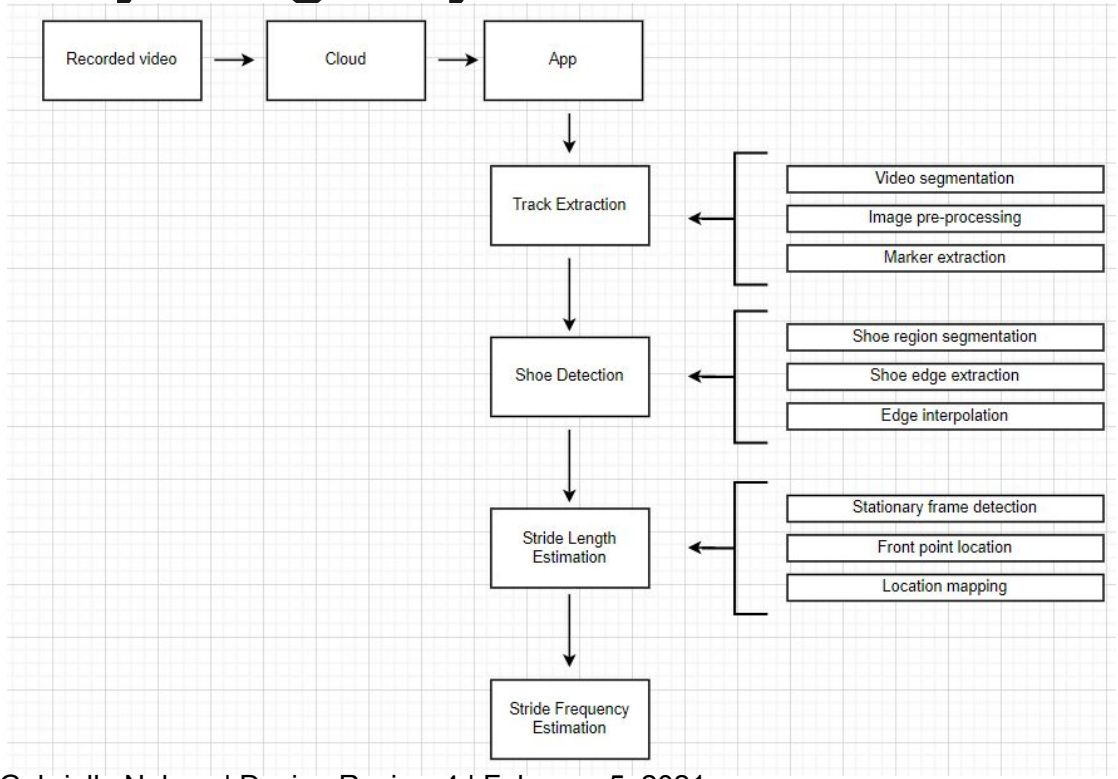
Selected Design Concept

Hardware	• Camera • Tripod • Markers
Software	• OpenCV and python • Android app • User inputs • Save/delete
Outcomes	• Frame by frame analysis • Stride length and stride frequency • Playback

Preliminary Design- Set up



Preliminary Design- System Overview



Preliminary Results

- Initial data collection
  - Challenges: wind, marker visibility, wrong SD card size
- Secondary data collection
  - Challenges: poor weather conditions, marker stability

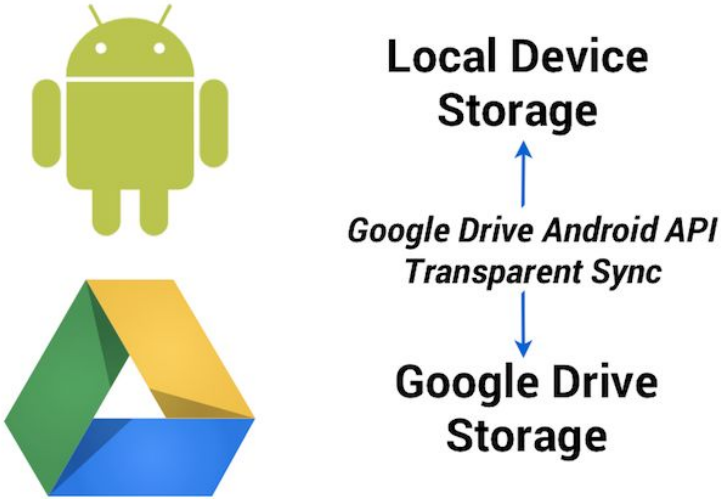
Preliminary Results cont.

- 15 recorded runs/trials
- Code
  - Successful algorithm for reading in each video from cloud
  - Partial shoe detection algorithm
  - Partial track extraction algorithm
- Hand calculated stride length and stride frequency for future validation of algorithms (seen below)

Trial Number	Time (in seconds)	Number of Steps	Distance (in meters)	Stride Length (in m)	Stride Frequency
Malique 1	2.11	6	10	1.666666667	2.843601896
Malique 2	1.77	6	10	1.666666667	3.389830508
Gaby 3	5.9	12	10	0.8333333333	2.033898305
Gaby 4	2.04	6	10	1.666666667	2.941176471

Pulling Video from Cloud

- Using the Google Drive API



Pulling Video from Cloud

Track Extraction Before

Track Extraction After

After

Shoe Detection Before

Shoe Detection After

Challenges

- Slow download times
- Hard to detect markers near the edge
- Not all videos working
- Accuracy with validating
    - Human error (stopping/starting timer)

Future Work

- Detect front point of shoe contour for shoe detection algorithm
- Finish the track extraction algorithm
  - Stride length algorithm
  - Stride frequency algorithm
- App
  - Designing
  - Functional for displaying data

Thank you!

- Dr. Boyd Anderson
- Dr. Hooker
- Dr. Chuy
- Dr. Devine

Questions?

Equations

Calculate Stride length = race distance / steps

Calculate Step frequency = race distance / (finishing time * stride length)