EE/CprE/SE 491 WEEKLY REPORT 01

Start Date – End Date

Group number: 11

Project title: Slowpitch Softball Pitch Detector

Client &/Advisor: Nick Fila

Team Members/Role:

Andrew Vick - Machine Learning Integration

Casey Gehling - Client Interaction

Sullivan Fair - Individual Component Development

Ethan Gruening - Team Organization

Josh Hyde - Testing

- ○ **Weekly Summary**

Over the past week, our group's overall objective has been to finalize meeting times amongst ourselves and our advisor. After much discussion, we finally settled on times to meet with our advisor and each other. We have also had some minor objectives such as completing some product research, which lead to some minor adjustments on how we will navigate designing our product.

- **Past week accomplishments**

  - **Andrew Vick:**
    - During our first week, we mainly worked on coordinating with the team to schedule meeting times for our group and with Professor Fila. Outside of this, some research was done into different Object Detection Models (ODMs) we can use in the camera to find and track the ball's position in the frame.
      - Information Found on ODMs:
        - Since the camera will have to track the ball in real time the model will have to reside on the computer controlling the camera.
        - Due to limited resources on embedded controllers and lightweight computers, we should explore a model like TinyYOLOv3 which is designed to run on such computers. We will need to test if it's accurate enough for use in officiating technology.
  - **Sullivan Fair:**
    - Our first week was spent selecting a meeting time for us as a group and with Professor Fila. I was able to work around my schedule so we could settle on a collective meeting time. I also spent time doing some product research on existing softball pitch-tracking devices and software.
      - Yolov4 provides high-speed object detection
      - From the products I researched, the Rapsodo 2.0 can track metrics like height and release angle
      - I also read about someone using frigate, a coral device, and a raspberry pi to capture images
  - **Casey Gehling:**
    - Our first week was spent setting up meeting times with our group and Professor Fila. We also spent time designing our project sketch note, identifying our potential users, project constraints, as well as potential features that may be necessary when designing our project prototype. I spent time researching softball detection strategies and noted some particular technologies that could be of use:
      - OpenCV, a computer vision library with pre-existing APIs for Python, C++, and other languages.
        - Includes the necessary functionality for statistics tracking; useful for determining ball heights among other metrics.
      - High-speed cameras such as the ELP USB camera that could be integrated with multiple general purpose interfaces such as a Raspberry PI for image capturing.

- Apart from this, did some research into existing products that mimic the product we are trying to develop. In particular, I found a product called the *Tracker 2* that shares many similarities to the mechanism we are seeking to build. I found that its ability to navigate 3D spaces may prove as a useful feature in our application.

- **Ethan Gruening**
  - This week within Senior Design 491, our main objective involved getting aquainted and organized with our team, advisor, and project. With the inconvenience of our team being split between two sections, we discussed attending the same lecture, our team's expectations and weekly meetings, and our weekly meetings with our advisor. In addition to the building of our group's foundation, we also began evaluating our preconceptions of our project through sketchnotes and researching similar project models. This introductory period of Senior Design 491 helped solidify our team's expectations and schedule.
  - My contributions involve team organization and individual research findings.
    - When our team was in its initial stages, I contacted the team members to join a Discord server to communicate virtually for future scheduling. Additionally, since our group was split between two sections, I updated Thursday's section on our work on Tuesday and expectations for due dates and project deadlines.
    - Individually identifying a successful softball pitch radar application, PocketRadar, I was able to evaluate what made this application successful. The idea of a mobile application connecting to an external sensor device allowed for many developmental opportunities when running on mobile devices. Customers also pointed out our PocketRadar's failures such as its 1-hour battery life or failure to accurately read within 1mph. These failures and successes helped shape our vision for the project.

- **Josh Hyde**
  - A lot of this first week was trying to schedule meetings with our own group and scheduling meetings with our advisor. I gained a much better perspective as well in trying to better understand our project with all of the different aspects, constraints, goals and overall understanding of why we are doing this project in the first place. Additionally, we put in extra work to make sure everyone is up to speed with everything and we are working more together as a complete group.
    - Put some additional research into the Sports Radar Detector Baseball Softball Golf Tennis, which is a cheaper camera that can be potentially used or compared with for our design.

- ○ **Pending issues**

    Beginning our team formations, our team was split between the lecture sections. Although this is not a current issue, it was inconvenient when forming our team bonds and assigning our team and advisor meetings. To complete this week's objectives we made a Discord channel and Google Drive folder to collaborate by meeting and sharing documents virtually. Moving forward, consolidating time each week to meet as a group and all attending the same lecture will help mitigate this issue and strengthen communication and synergy within the team.

- ○ **Individual contributions**

NAME	**Individual Contributions** *(Quick list of contributions. This should be short.)*	**Hours this week**	**HOURS cumulative**
Andrew Vick	Sketchnote, research, coordinating meetings	6	6
Casey Gehling	Sketchnote, product research, project research, contract	6	6
Sullivan Fair	Product research, sketch notes, coordinating meetings, proof of concept research	6	6
Josh Hyde	Sketchnotes, Initial Project Ideas, Product research, meeting times	6	6
Ethan Gruening	Sketchnotes, PocketRadar research, team contract, team coordination	6	6

- ○ **Plans for the upcoming week**
    - ● Andrew Vick
        - ○ Research more products
        - ○ Research how accurate different object detection models are
    - ● Casey Gehling
        - ○ Product research
        - ○ Possible single-board computer research
    - ● Ethan Gruening
        - ○ Product Research sketchnote
            - ■ List commonly successful features
            - ■ List commonly unsuccessful features
            - ■ Identify goals, users, and requirements
    - ● Josh hyde
        - ○ Product Research

- - - Project Research
- Sullivan Fair
  - Existing project research (frigate with coral device)
  - Try to create some proof of concept designs