2. Requirements, Constraints, And Standards

2.1 Requirements & Constraints

Functional Requirements:

- Our device must be able to detect an illegal pitch lower than six feet (specification)
- Our device must be able to detect an illegal pitch higher than 10-12 feet (specification)
- Our device must be able to detect illegal pitches within four inches of accuracy (specification, constraint)
- Our device must alert players as fast or faster than an umpire (specification)
- An audible signal must be made upon detection of an illegal pitch (specification)
    - The signal must be loud enough for the batter, pitcher, and umpire to hear
- The device must be usable in a location where it does not interfere with the game (physical, constraint)
- The device must be usable in a location where it is not in danger from the game (physical, constraint)
- The device must be portable (physical, constraint)
- The device must have a fast enough camera to process a pitch, greater than 30fps (resource)
- The camera must have a resolution high enough to accurately process each frame, at least 1080p (resource)

User Interface Requirements:

- Our device should be simple for any softball player to set up and use (user experiential)
- Our device will have clear instructions for users to input needed measurements for calibration (user experiential)
- Our device should be cheap enough to not:
    - A) Effect league fees if leagues provide the device (no more than $10)
    - B) Be a large expense on a player or team (economic, constraint)
- Our interface should record and replay pitches (user experiential)
- Our interface should clearly indicate how a pitch was illegal (too high or too low) (user experiential)

2.2 Engineering Standards

Engineering standards are important because they give us as engineers a baseline for minimum requirements to ensure safety and health. These standards play a vital role to make sure we as users or consumers are given a quality product and not something that will just break shortly over time or not be able to perform certain actions it claims. Through these standards, engineers are given a minimum benchmark to ensure all of these standards and qualifications are met.

2.3 Engineering Standards in our project

ICS 17.020: Metrology and measurement in general

This standard covers a variety of aspects in regards to measurements. The standard serves as a guideline for engineers to ensure consistency, accuracy and reliability in terms of measurements.

ICS 17450-1:2011: Model for geometrical specification and verification

This standard is part of the GPS standards that covers geometric features of products. This standard ensures that measurements in the geometrical way are consistent and accurate throughout different procedures.

IEEE 1448a-1996: Standard for information technology- software life cycle processes

This standard provides a framework for the software development and management processes creating software processes. It establishes a common ground for definitions and processes that help software engineering teams follow best practices for large scale software projects and development.

2.4 Engineering Standards relevance in our project

ICS 17.020 provides relevance to our slowpitch softball project because we are creating an application that relies solely on measurements. If the measurements are inconsistent or inaccurate, our application is useless and will give an unfair playing field in a softball game.

ICS 17450-1:2011 provides relevance to our slowpitch softball project because as we are gathering our measurements, we will be relying on geometrical measurements to ensure the measurements of the height are consistent and accurate.

IEE 1448a-1996 provides relevance to our slowpitch softball project because our projects end deliverable will be an application that users can use to track the height of a softball to determine whether or not a pitch is illegal. Throughout this process of creating our application, we will rely on the software life cycle process in order to deliver the best version of our product.

Q4) Review with your team the standards that each of you have selected. What other standards did some of your team members choose that are different?

2.5 Engineering Standards that could be considered in our project

ISO 5725-1:2023: Accuracy(trueness and precision) of measurement methods and results

ISO 9241-210:2019: Ergonomics of human-system interaction

ISO/IEC 25010:2023 Systems and software engineering- systems and software quality requirements and evaluation

2.6 Modification to meet these standards

One modification we intend to make is improving our device calibration and how we detect height. We are not currently at a level of measurement accuracy that would comply with this engineering standard (ICS 1745-1:2011) so we need to do some more work to get there. Specifically, we are going to include more known variables during our testing to make sure we can accurately make certain measurements before we do full “game” testing.

We also intend to start considering our end user interface. As of now we have done minimal work on developing our application piece, which will be a large part of our deliverable. Going forward, we are devoting at least two of our five members each week to work on developing our user application and interface, and will make sure that it complies with our third selected standard.