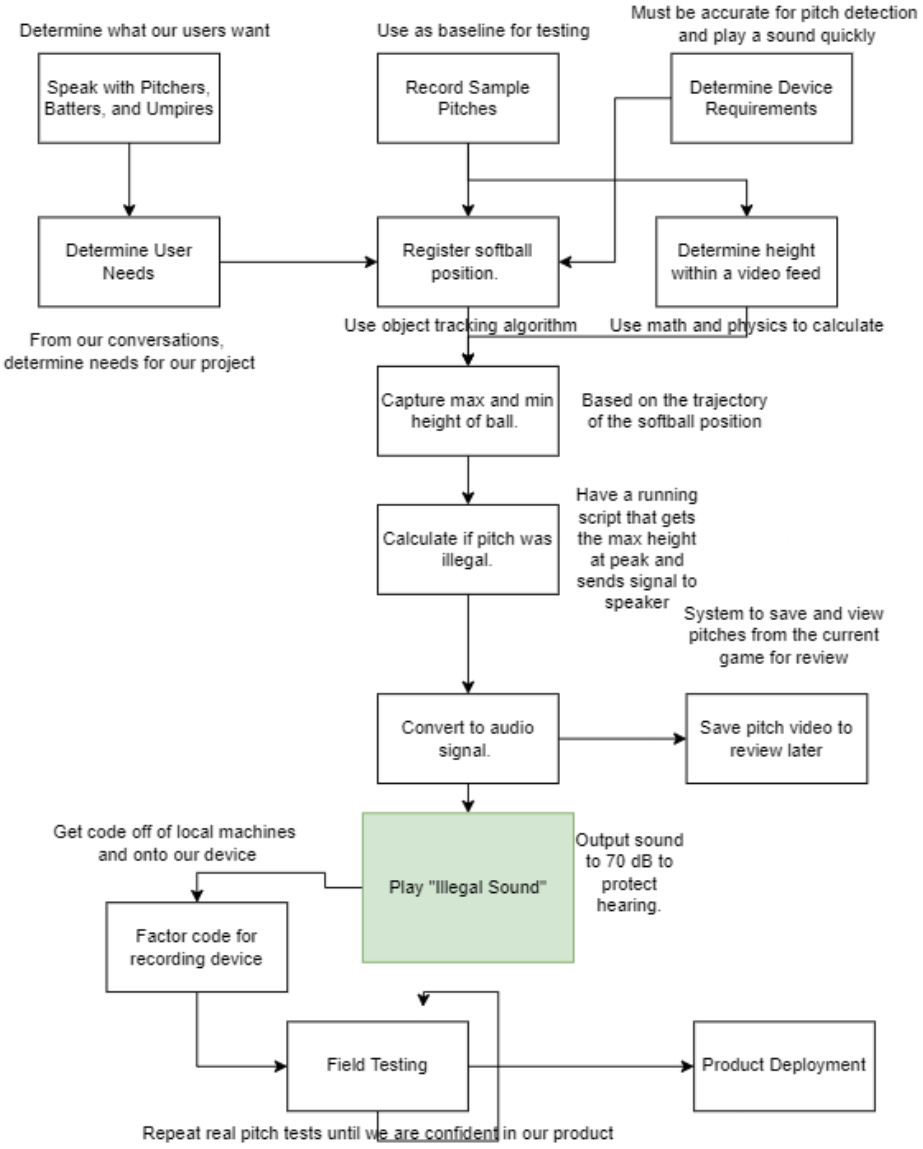
3 Project Plan

3.1 Project Management/Tracking Procedures

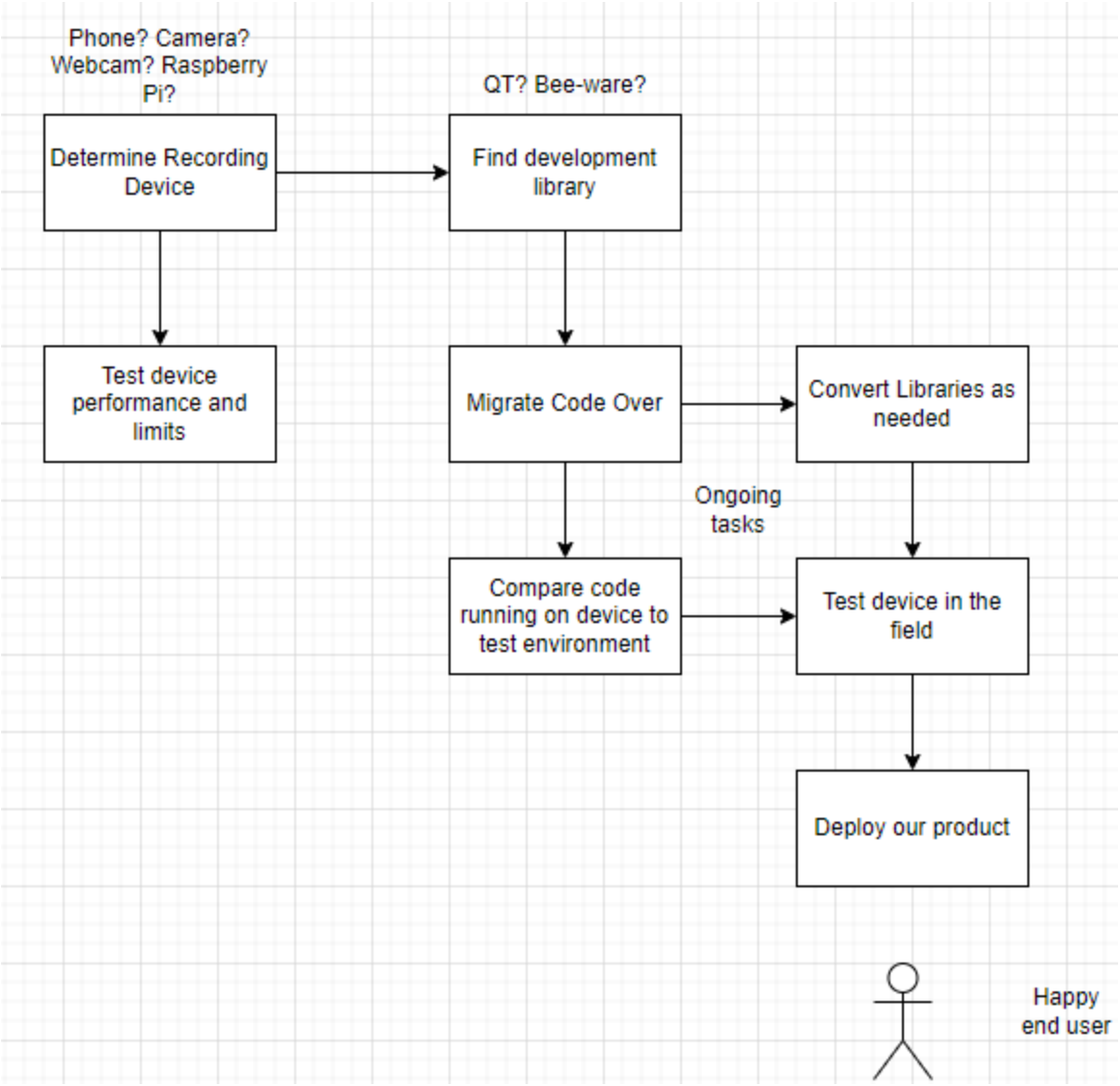
For Pitch Perfect, we will be using a hybrid style process where we adapt features from both the agile and waterfall management style. We will use waterfall elements like fixed timeline and sequential progression. We chose to adapt these elements from waterfall because with our app, we cannot do things like track the height of a ball if we can't track the ball itself. We will however be using Agile elements for the user interface as these tasks can be split up into a bunch of different smaller tasks and allow for more precise workflow. Our team also does weekly client meetings which is a lot like agile. Throughout the semester we will create a job board with issues in github that we will be assigned to each team member so that no two people are working on the same issue and we can enhance the productivity of our group.

3.2 Task Decomposition

We have broken down each functional component of our project into a separate task that must be solved, as well as a flow of how each of these components (or tasks) will flow together in our final design:



Many of our early tasks can be completed nonsequentially, in a sprint style, such as our player interviews, pitch recordings, and client requirements. As we move forward with our project, much of our tasks fall into a waterfall style, as we cannot determine the height of a ball until we register it's position, and we cannot determine and illegal pitch until we have registered it's height, so on and so forth. During our early development, we broke our team up to solve each sprint-like task, but as we got to the point where each task relied solely on an earlier task, we would break off our team to solve external tasks, such as our application development:



3.3 Project Proposed Milestones, Metrics, and Evaluation Criteria

Many of our milestones in our early development and prototyping process are defined by working features of our device, object detection and tracking, tracking a pitch through it's arc, tracking the height of a ball, so on and so forth. Thus, we have broken down our developmental milestones, followed by our product accuracy milestones:

Development and Prototyping Milestones:

The device can identify and track a softball in ideal conditions.

The device can follow the arc of a softball throughout its pitch.

The device can track the height of a softball with an accuracy of 1 ft.

The device can play a sound within 0.5 seconds of detecting an illegal pitch.

The device can work with all unknown elements inputted by a user.

A working prototype to detect and call an illegal pitch in a live setting.

The device can accurately run for 10 consecutive pitches.

Product Accuracy Milestones:

The device can identify and track a softball in any lighting condition.

The device ignores all elements of the frame except for the arc of the pitch.

The device can accurately track the height of a softball throughout its arc within 4 in.

The device works with only necessary elements inputted by a user (camera height).

The device can run for an entire softball game, two hours.

Our device is complete.

3.4 Project Timeline/Schedule

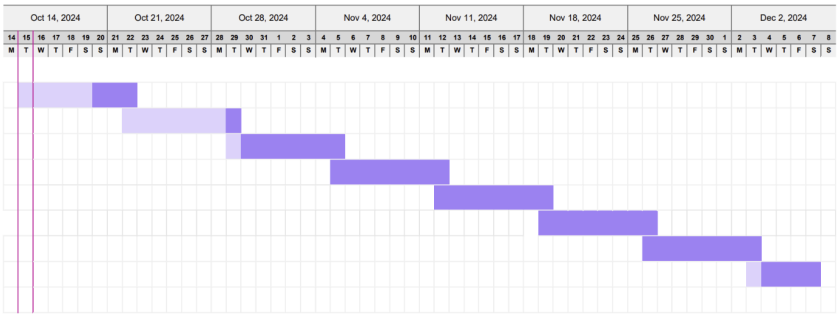
Pitch Perfect

Group 49 Client: Nic Fila

Project start: Tue, 10/15/2024

Display week: 1

TASK	PROGRESS	START	END
Tasks			
Wk 8: Track the softballs location	70%	10/15/24	10/22/24
Wk 9: Observe different ways of tracking the softball	90%	10/22/24	10/29/24
Wk 10: Prototype height calculation	15%	10/29/24	11/5/24
Wk 11: Further develop height tracking	0%	11/5/24	11/12/24
Wk 12: Image Calibration	0%	11/12/24	11/19/24
Wk 13: Functional Prototype	0%	11/19/24	11/26/24
Wk 14: Prototype Testing	0%	11/26/24	12/3/24
Wk 15: Faculty Presentation	15%	12/3/24	12/10/24



We as a group have set up a tentative schedule based on everything going smooth. We have broken it down into 8 weeks for the remaining of the semester. These tasks range from tracking the softball location and height of the softball to prototyping and the faculty presentation. Throughout the semester these times could change depending on tasks being completed faster than expected or a little longer than expected however the deliverables of a prototype application and presentation upon it will be scheduled to be done by December 3, 2024.

3.5 Risks And Risk Management/Mitigation

A potential risk that comes from any live recording device is performance. How can you capture enough data in real-time and process it quick enough to satisfy users, while still being accurate enough to satisfy our client's requirements? The more resolution our camera takes information in as, the more data we will have to process, and the more our framerate could suffer, and vice versa.

We can mitigate this risk by using a device with a natively powerful camera (such as an iPhone or similarly powerful camera) to give us options on our recording resolution, so we can scale to whatever level of performance is needed. We can also simplify our algorithms and use threading on our processes to keep our processing time low.

Another risk to the integrity of our device is the accuracy of our measurements. We want our device to be able to measure to the accuracy of one softball diameter (4 inches) when detecting illegal pitches. If something causes that accuracy to not be met, our device will not be seen as reliable and risks not being used by our users, or satisfying our client.

We can mitigate this risk by testing using as many known measurements as possible to make sure our device is meeting its accuracy requirements. Having recordings where a ball height is known, and seeing if our device can measure to that ball height, will allow us to avoid the guesswork of our accuracy during our development process. We can also mitigate this risk by introducing more components to our design, such as a second camera or more user-inputted fields, but that could compromise the simplicity of our end design.

Another risk comes from the nature of having a device in a sports setting: keeping the device safe. We do not want our camera to be hit with a flying softball and have our project break, but we also want it to be close enough that it can capture all needed elements of the game.

We can mitigate the risk of our device being damaged by placing it outside the fence of a given softball field. This will protect it from any foul balls, while also still allowing it to record through the links of a fence.

3.6 Personnel Effort Requirements

Task	Prep Hours	Work (Code) Hours	Explanation
Prototype Height Calculation	5	8	Doing the math to determine the height of a ball given most known parameters + having the program compute that math.
Further Develop Height Tracking	0	10	Tweaking code to have the most accurate height. This includes detection for pitches thrown off center.
Image Calibration	10	20	Determining the process of setting up the camera and making the application do most of that work. This includes making the user experience as light as possible.
Functional Prototype	20	20	Prep time includes moving the application to an Iphone development platform.

			Work will include changing any threading or weird iphone things, so basically a continuation of the code base transfer.
Prototype Testing	0	30	Make any changes needed to make the product as accurate as possible, even if it's on known heights and distances from the mound and plate.
Faculty Presentation	The semester	10 (each)	The semester is the preparation that we get for the presentation, but each individual can expect to work a significant number of hours to make the presentation as presentable as possible.

3.7 Other Resource Requirements

To complete this project, we needed to acquire multiple resources. One is a phone fence mount to accurately and consistently measure pitch height. The following resource we required was a softball to test our height detection. And finally we made a contraption with strings at 6ft and 10ft to help with calibration and testing. Some other resources that we could benefit from are a tripod, potentially a camera, and a speaker.