



# **Lavallee Industries**

**Lab Section 1 – Group 4**

**Deliverable G – Prototype II and Customer Feedback**

**Engineering Design - GNG1103**

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## **Abstract**

This deliverable's goal is to talk about the second prototype and how the suggestions made by the client regarding the first prototype were put into practice. Additionally, it describes the testing procedure and provides input on prototype II. The feedback section contains content for both expert feedback and other feedback.



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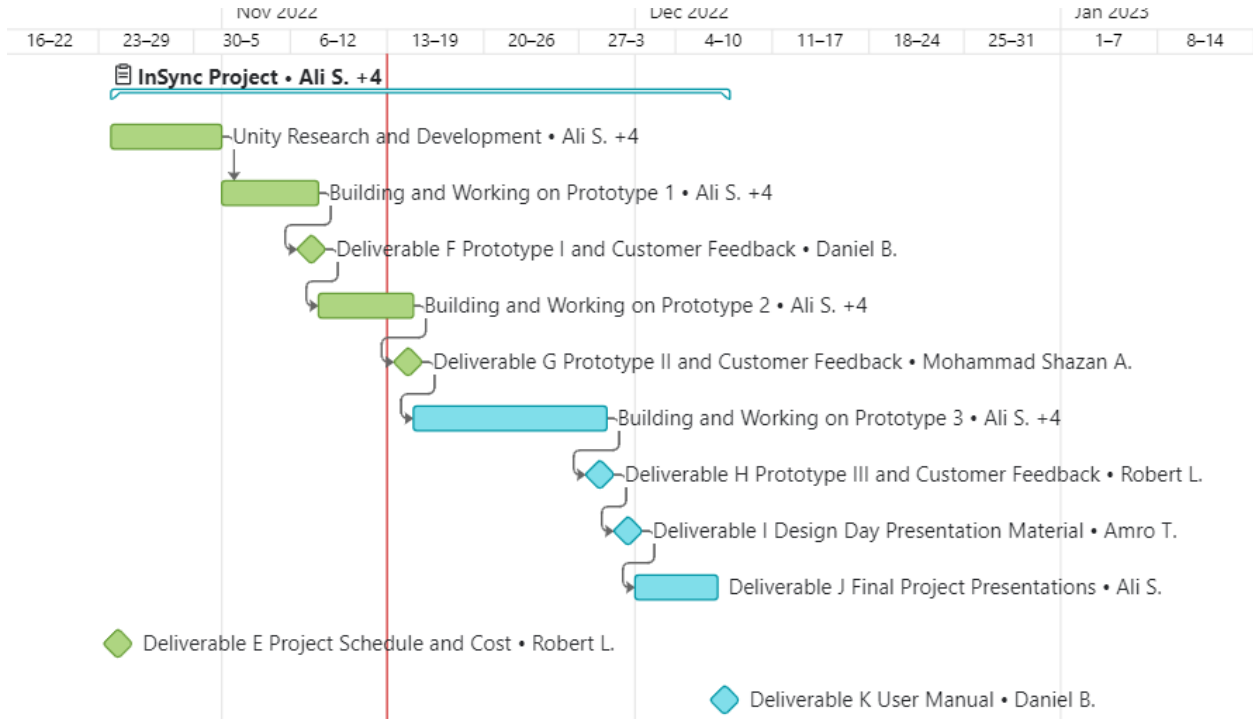


# Wrike

Link of snapshot:

<https://www.wrike.com/frontend/ganttchart/index.html?snapshotId=eNaLfr5JKJlmRNObcfKIZTjBuiHsoULy%7CIE2DSNZVHA2DELSTGIYA>

Screenshot:





## **1. Introduction**

In our previous deliverable, we had discussed how to better improve our first prototype by analyzing, testing, and altering using our clientele feedback. This deliverable is essentially targeted at reaching the same goal as the last deliverable, however now with an improved second prototype we shall discuss the prototype itself, the UI home screen, and our client feedback.



## 2. Prototype II

Prototype I included the basic features, such as the tracking of a ball accurately, while doing it with multiple cameras, as well as a simple design of the court inside of unity. The focus of Prototype II was to get furthermore accurate results of the tracking of the ball, creating a proper home screen/main screen (User Interface), and connecting the cameras to unity, ensuring that coordinates of the ball are being sent to unity. Another focus was to brainstorm and elaborate on how we will use the data retrieved from unity (coordinates of the ball) to create a proper XYZ location of the ball relative to the court, accurately.

### 2.1 The Home Screen

The home screen is the first interaction the user has with the software, for this reason we aimed to make the experience as simple as possible. With a simple and efficient design, we can add whatever we need later without too much clutter. The current options include, start, settings, and exit. Later revisions we want to add a help section and expand the settings.

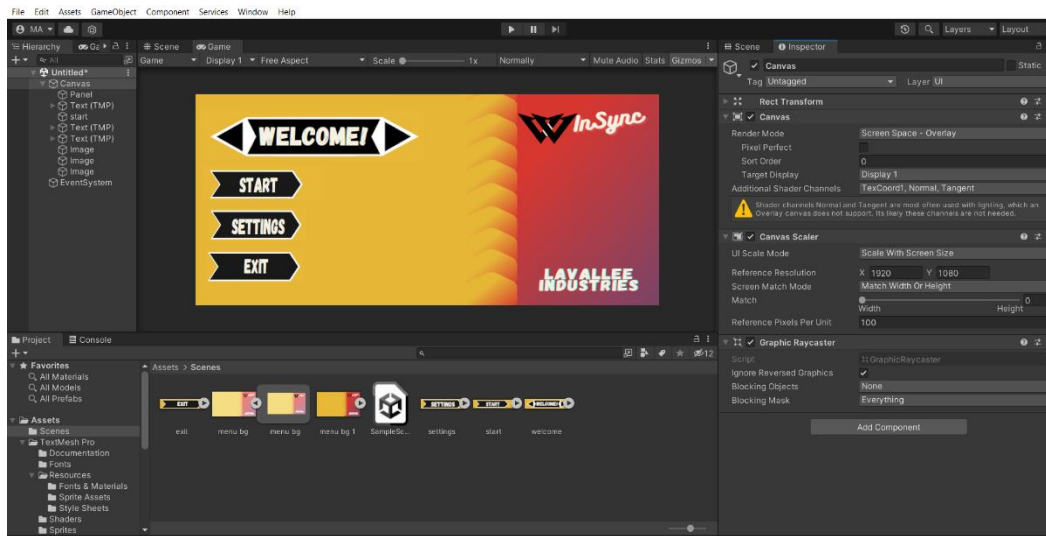


Figure 1, Home Screen

### 2.2 Camera Tracking System

In the previous deliverable we had connected our phones and had a solid ball tracking system. For prototype 2 the code has been altered for us to be able to get coordinates to send into unity for accurate ball tracking in real time. The changes have also given us a different display option to choose from.

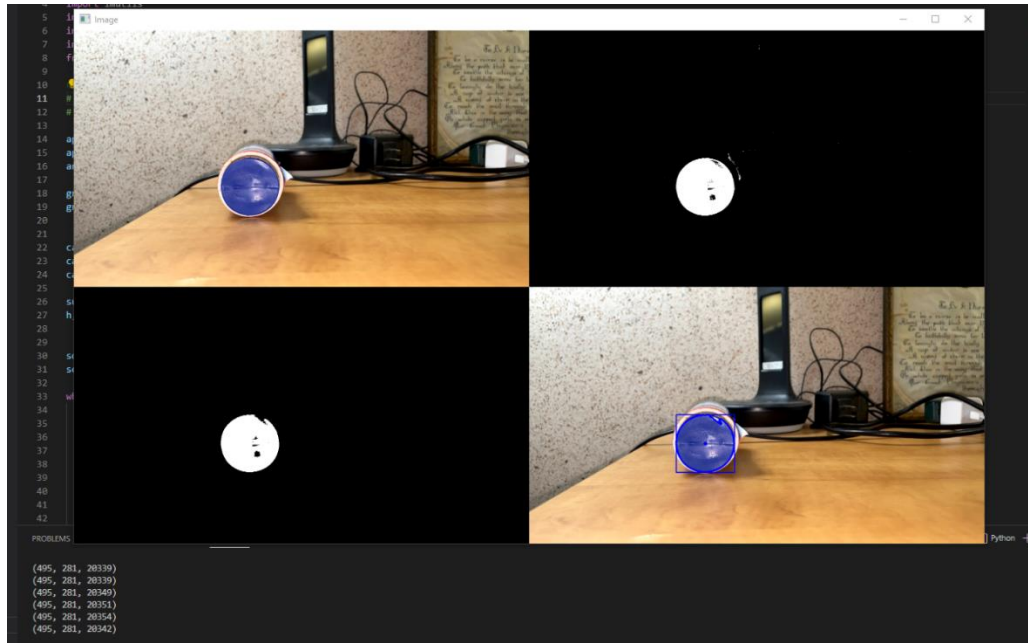


Figure 2, Object Tracking, View 1

The first option shown above is the new viewing option that shows the gray screen, the raw camera view, and the image tracking view. It also shows the coordinates of the shape in real time.

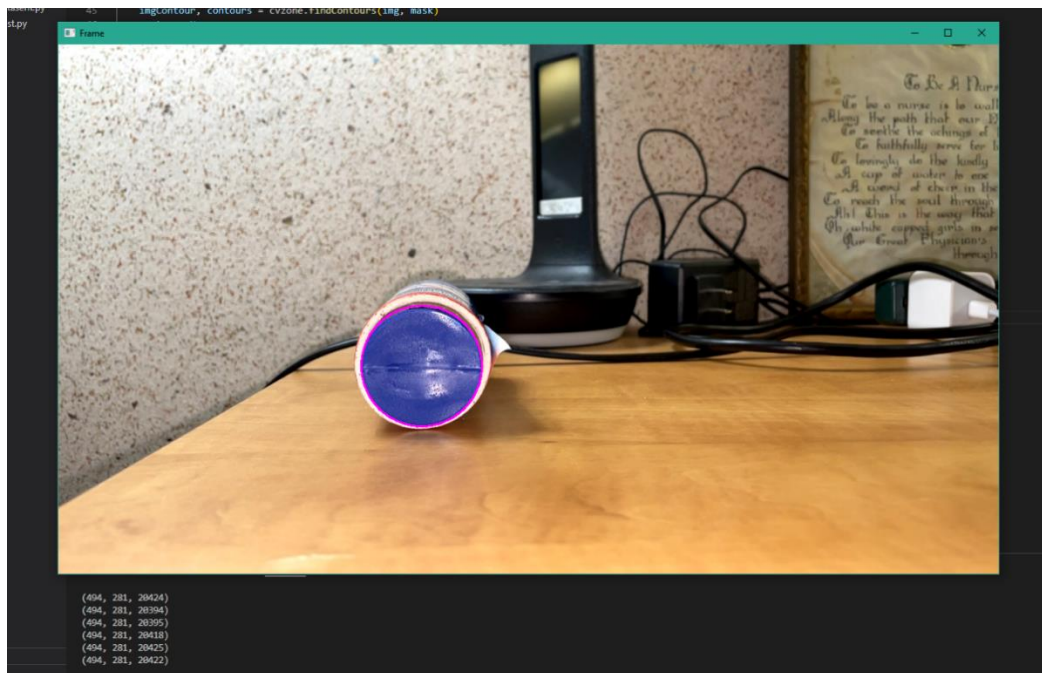


Figure 3, Object Tracking, View 2

The second option shown above is the same as prototype 1 but the coordinates are working and can be sent into unity. The ball tracking also seems much more accurate now than before.



In prototype 3 we will have to integrate multiple cameras and return a single coordinate of the ball from the cameras to send into unity. I would also like to create a frame to see all four camera views with the pink circle around the ball at the same time.

## 2.3 The Main Screen

The main screen is the most important screen and vital for displaying information to the user. From Prototype 1, there have been some major changes to the main screen.

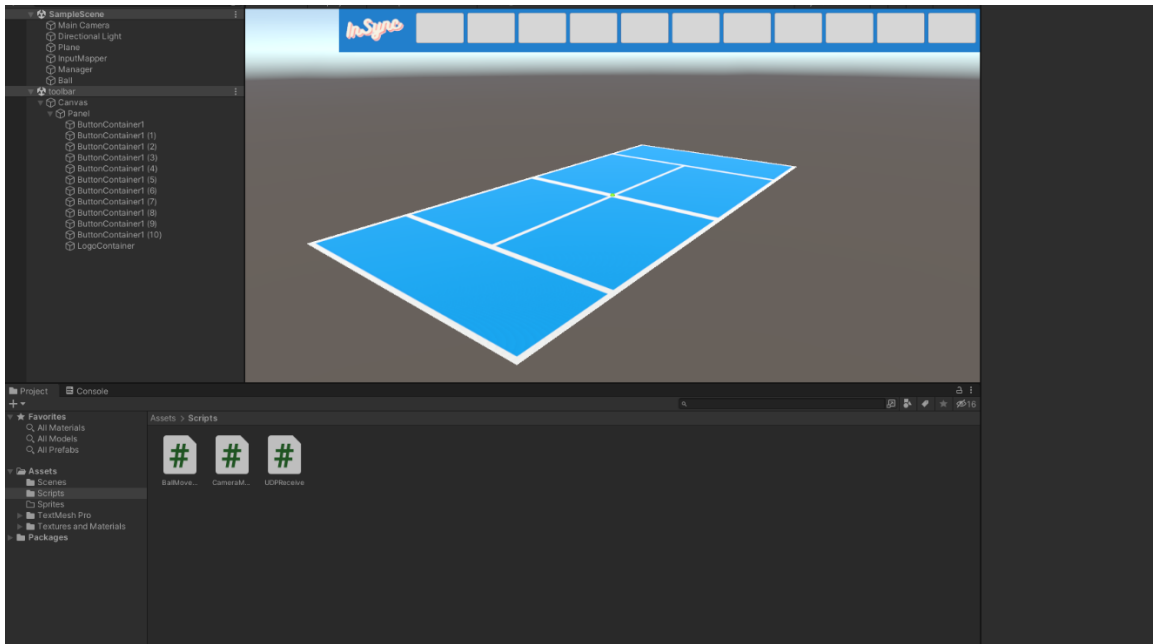


Figure 4, The Main Screen

The first major change is the scale of the court. In Prototype 2 the court is the proper size of an actual Padel ball court. The second major change is the toolbar at the top. Currently the buttons have not been scripted and the rectangles at the top are just placeholders for the buttons.

For prototype 3, the buttons will have icons and most of them will be scripted and usable in the application. The ball will be tracked using four cameras and not just one and the data should be sent to unity and tracked properly and accurately.

## 3. Feedback

The two main categories in the feedback for the second prototype are expert and other feedback. For the expert feedback, a person who has substantial experience in Unity and uses it on a day-to-day basis provided input that was mostly used to determine how the application seemed from an engineering standpoint. The other feedback consisted of general comments made by clients and/or users with a fundamental understanding of software function and development. The





feedback helped to better understand the user's experience and how the layout of things can better suit the user's preferences.

### **3.1 Expert Feedback**

The expert feedback which we received for prototype II consisted of 3 main points: the accuracy of translating points to unity, the curvature of cameras affecting radius tracking, and coming up with a solution for having our cameras outside the ring. To begin with, our client had informed us that the tracking accuracy of our (x,y,z) coordinates had to be highly accurate to pair well with unity. This meant that the code should know exactly where the ball is at any distance and angle with no malfunctions. This portion of the feedback went hand in hand with the second part of the feedback, which was accounting for the curvature of our cell phone cameras (fisheye lens). In each smartphone there is a slight curvature to the camera lens, which distorts the frame in which it is capturing into a more wide-rounded shape, this meant that the further the ball moved from the camera, the more apparent it would be that its shape was changing. Furthermore, this meant that the radius of the ball would seem different on camera from what it was. This fact leads us to our final point of expert feedback, which is having our cameras set up outside a plexiglass frame in order to see and capture the ball's motion while not being within the bounds of the court. Then idea surrounding the solution of the feedback given about the angle of the lens and having it outside the court is quite simple; we begin by mounting all four cameras outside the court right at the corners and use a glass film that can somewhat revert the effects of a rounded camera lens.

### **3.2 Other Feedback**

There were two slight adjustments recommended from our other feedback, these include ensuring that four cameras are used for our device and suggesting a very uncluttered and straightforward UI for the user. As for the four cameras, since our second prototype submission, we have successfully implemented this function with accuracy. For the UI, we plan to create a very clear taskbar with visuals for the user and a start setting and exit button layout to simplify the front cover as much as possible.



## 4. Conclusion

Overall, Prototype II was a success, and we managed to achieve the goals we were aiming for. We have a much better user interface now, as well as sending data to unity now and have the cameras connected to unity. The main things which we are trying to accomplish for prototype III are fully accurate location coordinates of the ball relative to the court, have a full tracking system of the ball, and a reversing factor to account for the curvature in the shape of our given camera lenses, something along the lines of a glass screen that reverts the focal length (Changes field of view to 90) of the lens to a flat one.