Padel Pals

Team G01-2

Deliverable H: Prototype III and Customer Feedback

Engineering Design GNG1103

Team Members:

Faith Harmath	300316328	Zahra Alavi	300259587
Connor Mackillop	300231023	Marissa Ruth	300220560
Layane El Merini	300288563		

Faculty of Engineering

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Abstract

The following deliverable will provide a detailed description of prototype III created based on the previous client feedback on prototype II, as well as showing the improvements to the features already present. Comprehensive testing of all features will be performed and analyzed as preparation for the final presentation of our application.

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1. Introduction

In the previous deliverable, our team developed prototype II. Prototype II underwent testing, as well as many improvements and new features were added. Building on the problems of our previous prototype and outer feedback, we have developed Prototype III. The purpose of this deliverable is to present our design for Prototype III, analyze the results of its performance during testing and discuss the problems we went through. This deliverable will also cover feedback from potential users to improve our next design, as well as our ambitions for the future.

2. Prototype III

Prototype III builds up on the ideas we had for the previous prototype, with enhanced coding and virtual environment implementation and improvement.

2.1. User Interface Improvement

We started developing the UI in the previous prototype, especially the layout and overall aesthetics of each page. In this prototype, we made the interface interactive, which means the user can now access it and click on buttons to open the different functionalities of the app. Each button displayed is fully functional. For example, we linked the window that displays the ball and virtual environment with the buttons. Additionally, we have created text input sections for the user to create accounts and access previously existing accounts. This facilitates our goal of privacy for each user by requiring access to view each player's recorded matches and statistics. This will operate differently for players and coaches however, as seen in figure 6, where coaches can view the stats and recorded gameplay of their team members. This is important since coaches should be able to see how their players have improved or where they need more practise.

Figure 1: Main Screen

Figure 2: Couch Log In

Figure 3: Player Log In

Figure 4: Sign Up Page

Figure 5: Main Player Page

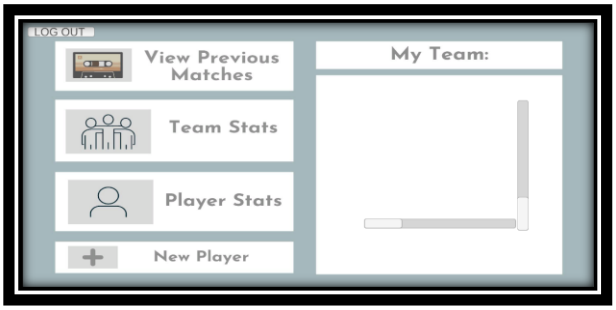

Figure 6: Coach Main Screen

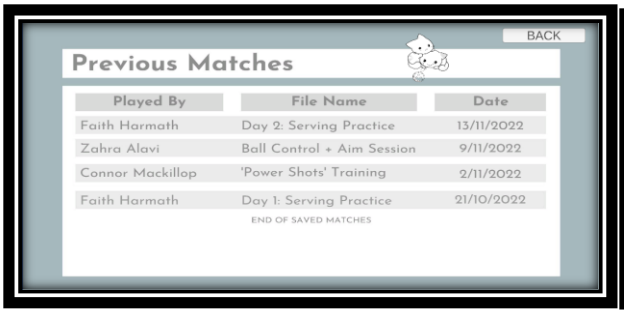

Figure 7: Previous Matches

Figure 8: Training Options Page

Figure 9: How to Serve Page

Figure 10: User Manual Page

2.2. Virtual Environment Implementation

The virtual environment was added for prototype III. This environment contains a replica of the padel ball court and the game ball. The game ball will move like the ball does in the game recording.

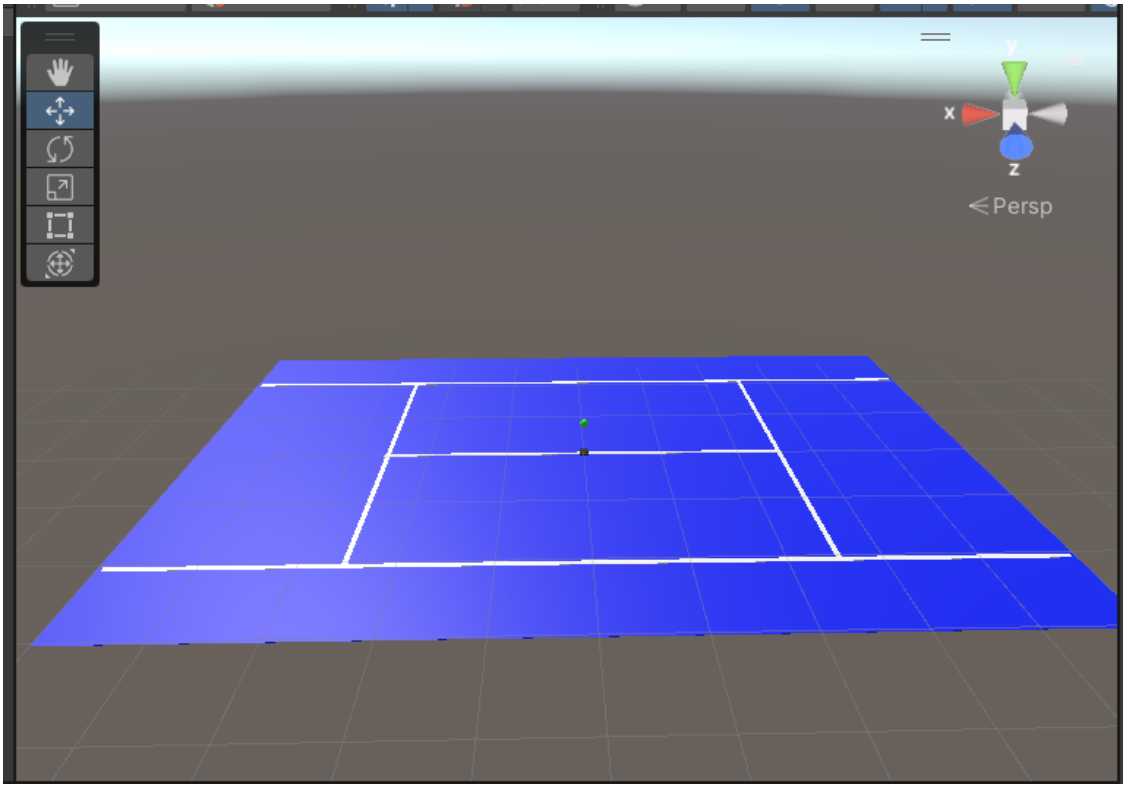

Figure 11: Virtual Environment Preview

2.3. Ball tracking

Ball tracking has been developed to be more accurate by using object tracking with colour tracking. Additionally, the mask setting for contour detection was increased. This limited the number of other objects the camera detects behind the ball creating a more accurate set of results. The positions of the ball were also sent to an external spreadsheet rather than not being saved, like in the previous prototype. This data is what forms our 'Player Stats' data, as the change in position (equivalent to velocity) can be determined from this, as well as direction.

3. Testing

3.1 UI Screen Navigation

The user-interface was put to test by allowing a peer other than a member of our group to use the app and comment on how the overall experience was. The user had no experience with our application or how to navigate between screen screens prior to the testing, completely unbiased. The application was found to work well and was easy to use by the peer. Comments from the user included compliments of how clean and organized the application is. The buttons were well displayed, and everything was easy to see, nothing was hidden or hard to find. One comment was the suggestion of making some of the buttons less generic looking, which can be fixed before our design is finalized.

Another point of improvement for the user interface is to add functional logins by saving account information. This can be done by linking the text input buttons to a spreadsheet where the 'Create an Account' information is saved and used to verify or deny future logins with a username and password. This is currently being worked on by our team and is on track to be completed before the presentation of our final design. However, this is not crucial to our design since its only benefit is privacy, but will not affect the functionality of the application or the fulfillment of the initial goal, in any way.

3.2 Ball Tracking and Recognition

The ball tracking was tested by analyzing what the camera picks up using the masking feature on the camera. It was tested repeatedly during development and has shown significant improvement in accuracy in prototype III. An additional feature was added where the (x,y,z) position of the ball was saved in an excel spreadsheet. This is different from the previous prototype where the positions were not saved anywhere external for future reference. By adding this feature, the data can be used to form 'Player Stats' which is not fully developed yet. However, this can easily be added to our application before the final presentation. This data is also sure to be accurate with the improvements in our object tracking and recognition.

The virtual environment was tested during development as well. The movement of the ball was analyzed, and settings were adjusted until the ultimate setting was found. This required changes in the size of the ball relative to the court. Overall, the virtual environment works very well with our ball tracking software. The only other improvement that could be made is a feature for setting an origin of the court after the camera is moved (or initially set up) to ensure the ball stays within the boundaries of the court during a match in the virtual environment.

4. Feedback and Next Steps

After the third client meeting, we did not get any other feedback from our client. However, we asked for feedback from our teaching assistants and project managers, who told us that we needed to focus more on the object tracking software and perfecting it. Regarding our user interface, they said it looked professional and functioned well. We also had potential users test our app to check if it was user friendly. It is concluded that the application is very user friendly and easy to navigate; the users overall enjoyed using our application.

The feedback regarding the ball recognition and tracking was taken and used to produce prototype III. The accuracy of our recorded positions has improved greatly and is ready for design day.

5. Conclusion

In conclusion, our team has made significant progress on tracking the position of the ball with two cameras and improving the user interface. We have followed through on all our plans discussed in the previous deliverable, greatly improving the quality of our application. Though the third prototype is not our final design, it includes most of the features which will be presented during the final presentation. The addition of 2-3 features have been discussed above as player statistics (velocity data), the saving of individual account data, and finally setting an origin within the virtual environment.