



**Team “ACES”**

**Deliverable C**

**GNG 1103**

**Group GO1-1**

**Team members**

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## Abstract

*Deliverable C is meant to create design criteria based on the client's needs. The criteria are then sorted into three groups; Functional, Nonfunctional, and constraints. The deliverable will also compare the performance of similar products currently available to create benchmark performance stats for the final product.*

## 1. Introduction

It is known from deliverable B that the client is expecting a final product that can capture the motion, position, velocity, and force of a ball during a Padel Ball game and accurately display the output on a user-friendly platform (such as an app).

### Client needs by importance

#### 1. The product we create must have potential for further development

- Ease of adding more cameras and sensors for a more accurate position of the ball.
- Easy to add more features to view game data in different ways.
- Further developing the 3D space to provide an improved visual experience.

#### 2. Marketing for high performance athletes and trainers

- Technology that can determine the velocity, force of the hit and angles the ball reaches as well as being able to track it at every moment of time.
- Mechanism to replay the footage of the game so coaches can improve their teaching.
- Software that can also be used for smaller clubs and tournaments.
- Can detect whether the ball is in bounds or not.
- Can be installed on a court without interfering with the game.

#### 3. Quality of the product

- Must have accurate 3D positioning and good documentation.
- Must incorporate use of SI units.
- Must use software such as openCB or unity for data collection.
- Must store information in an app.
- Must stick to \$50 budget.
- Use good headers, footers and comments in final documents.
- Capable of streaming the collected data to graphics card.

## 2. Design Criteria

After the initial consultation, the clients needs were written down and subcategorized into design criteria for each specific task. Design tasks are useful in order to assign each need an action in the plan. The design criteria were then broken down into three further categories: Functional, non-functional and constraints. Functional criteria are characteristics that directly



impact the quality of the product, non-functional criteria focus more on the outside detailing of the product and finally constraints are important clauses that are specified by the client that will also impact the overall design of the final product

<b>The products must have a potential for further development</b>	
Functional Requirements	Software can receive more than 1 camera input
	Well documented code
	Object Oriented Programming
	Capture motion, velocity, and force of Padel ball
	Able to stream the data collected onto a graphics card
	Can be installed in court without interfering with the game
	Tracking the ball in every moment of time
<b>Marketing for high performance athletes and trainers</b>	
Non-functional requirements	Easy to add extra features to view game data in different ways
	Ability to replay footage so coaches can better their teaching
	Software that can be used for smaller clubs and tournaments
<b>Quality of the product</b>	
Constraints Metrics	Must use SI units
	Must stick to a \$50 budget
	Relatively small and easy to transport (maximum 8 inches x 8 inches and 25 pounds)

### 3. Technical Benchmarking

- 1. In/out:** This device is placed on the net post, and it indicates to the player (by sound or light), whether the ball was in or out of bounds. This system uses high-definition cameras in order to track the ball. This device also has some extra features that can show you ball spin, speed and movement of the ball, and this can all be linked to an app. Some professional tracking devices can cost tens of thousands of dollars, whereas this product costs \$200.
- 2. Hawkeye:** Hawk eye tracks the ball from multiple different angles with 10 high performance cameras. This technology represents the trajectory of the ball in three dimensions by triangulating the video of six of the cameras. Since the trajectory of the ball is tracked, this technology can determine whether the ball will go in or out of bounds. It is accurate with 5 millimetres.
- 3. Stat cast:** Stat cast tracks the motion of every player and ball on the field at every moment of the game. It has high-resolution cameras and can gather data from the game such as the velocity and the launch angle of the ball. It can also determine why a player was able to make a challenging catch in the outfield as well as the efficiency of their route while tracking a ball.



	price	Tracking of ball	Replay view	Replay quality	Detect ball in or out of play	Interference with game
stat cast	\$15000	Arm strength/ exit velo/ launch angle/ etc...	Overhead/from behind home plate	100FPS	Yes	no
Hawkeye		Judge where the ball landed	Line /court view from ground	340FPS	Yes	no
In/Out	\$275	Judges where the ball lands on the court	Overhead 2-D view	N/A	No	no

## 4. Conclusion

After meeting with the client, it has been determined that that the final product should use a camera to record a game a paddle ball. This recording will be fed to a computer with software that is capable of tracking the balls position as the game progresses. The software can then display a replay of the ball's movement in a 3D environment. Similar products exist for a variety of different sports and *In/Out* appears to be most optimal for benchmarking the final products performance.



## 5. References

Gentil, G. (n.d.). In/out: The portable ready-to-use line call device. Retrieved October 7, 2022, from <https://inout.tennis/en/index.htm>

*Statcast: Glossary*. MLB.com. (n.d.). Retrieved October 7, 2022, from <https://www.mlb.com/glossary/statcast>

*Hawk Eye*. Technology in Tennis - Home. (n.d.). Retrieved October 7, 2022, from <https://sarinachewyr10pass.weebly.com/hawk-eye.html>

Dominik. (2022, August 3). *Video evidence in tennis: Hawk-eye makes it possible*. Tennis Uni. Retrieved October 7, 2022, from <https://tennis-uni.com/en/hawk-eye-technology/>

## 6. Wrike Planner:

<https://www.wrike.com/workspace.htm?acc=4975842#/folder/968841774/timeline3?viewId=109685302>