GNG 1103 [G]

Engineering Design

Deliverable C: Design Criteria and Target Specifications

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Introduction

This document outlines specific design criteria that are necessary for the realization of our Tracking program. Our goal is to introduce a cheaper, easy-to-use and reliable tracking program to the squash world. While using only one camera, we want to be able to provide a 3D simulation of a squash game so that feedback such as ball speed or ball position can be given for improvement purposes. We are aiming for a program that can be accessed on any laptop and for a convenient recording setup that will not interrupt squash games or practices in any way.

Number	Need	Design Criteria
1	The product has to have a small, easy to handle and unobtrusive camera.	· Dimension · Weight · Strength · Resolution · Reliable · Battery powered · Camera mount
2	The product has to be able to track the ball.	· Tracking software
3	The product has to be accessible on a laptop.	· Operating system
4	The product has to provide a 3D simulation and information such as acceleration, speed, time, and position.	· 3D view · 3rd person view · SI unit (meters, seconds
5	The product is low cost.	· Cost
6	The product is easy to use.	· User friendly software · Camera easy to set up · Time to get used to the program
7	The product has to eventually be able to handle more than one camera.	. Easy network between camera and software

8	The product has to be easily modified to handle new features.	. Easy step-by-step of the procedures and the codes of the product.
9	The product should be able to gather data on the ball position as well as the time. It will also need to store the data.	. Tracking software . Data should be stored adequately.
10	The product should be user-friendly for coaches and players on the field.	. The product needs to be resistance and lightweight.

Benchmarking

	Importance (1 to 3)	SwingVision AI	HomeCourt AI	Hawk-eye
Company		SwingVision	HomeCourt	Hawk-eye Technology
Cost	2	12.49/month	7.99/month	60,000 to 70,000$
Tracking Software	1	Yes (tracks tennis balls)	Yes (tracks basket balls)	Yes (almost any sports ball)
Operating system	3	IOS (accessible on all apple devices)	IOS (accessible on IPhone, IPad and apple Watch)	Not specified
Camera	3	Phone or GoPro	Phone	Minimum of 6 high-speed expert vision processing cameras
Resolution	3	720p, 1080p, or 4K	720p, 1080p, or 4K	High resolution
Weight	3	6.84 oz ((iPhone 11) or 4.14 oz (GoPro)	6.84 oz	Not specified

Dimension	3	150.9 x 75.7 x 8.3mm (iPhone 11) 6.2 x 3.2 x 4.5cm (GoPro)	150.9 x 75.7 x 8.3mm (iPhone 11)	Not specified
Battery	3	Phone's battery	Phone's battery	Not specified
Camera mount	2	Fence mount or Tripod	Tripod	Not specified
Set up time	2	30 seconds	30 seconds	More than 2 hours
3D simulation	1	none	none	Yes
Ball speed Feedbacks	1	Yes	Yes	Yes
Easy to use	2	Yes	Yes	No (whole staff is needed)

#	Design Specification	Relation (=, < or >)	Value	Units	Verification Method
	<u>Functional Requirements</u>				
	Camera	=	1	N/A	Test
	Tracking of the ball	=	yes	N/A	Test
	3D simulation	=	yes	N/A	Test
	<u>Constraints</u>				
	Cost	<	50	$	Final Result
	Camera weight	<	0.194	Kg	Measure

	Camera dimension	<	150.9 x 75.7x 45	mm	Measure
	Resolution	=	1920x1080	pixels	Test
	Operating system	=	OS/Windows	N/A	Test
	Non-Functional Requirements				
	Aesthetics	=	True	N/A	Survey
	Reliability	=	True	N/A	Test
	Time to get used to it	<	10	min	Test
	Battery powered	=	True	N/A	Test
	Set up time	=	30	seconds	Test

Conclusion

Following the first meeting with our client, we noticed that the number one priorities were to track a squash ball, provide a 3D simulation and use only one camera with a total budget of 50$. Therefore, the design criteria directly related to those priorities will be prioritized. The main difficulty will probably be the 3D simulation. However, once this criterion is achieved, the rest should follow through. Finally, these design criteria should effectively fix our problem. Our final product will be able to offer a fast and easy way to mount and set up a subtle camera which will be able to record a squash game without interruptions. Also, its user-friendliness will help coaches and squash players to familiarize themselves pretty quickly with our software. Lastly, the squash world will be able to easily include our product in their practice routines and games which will effectively help them focus on athletes' improvement.

References

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