



UCF

Divide & Conquer

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Group 10

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Solar Tennis Ball Collector

Motivation & Background

Tennis is a very challenging, demanding, and rigorous sport. Athletes want to spend as much time as possible training to hone their craft. Over time in the field of tennis with technology we have helped athletes to train and become more efficient. With the introduction of machines that can automatically serve the ball to you, Hawkeye Technology, etc. have helped tennis athletes to be able to practice more often and spend more time on their craft. However, what if there was a way to cut down on even more mundane tasks for tennis athletes.

After a long match or practice session the last thing you want to worry about is cleanup. However, what if there was a way to make that easier. In our project we hope to create a Solar Tennis Ball Collector. This will be a small autonomous vehicle that would essentially roam around the perimeter of the court and sweep up all the extra balls that are laying around. Essentially this would get rid of the tedious task of picking up every single tennis ball. This then allows for the players to spend extra time practicing instead of having to worry about and completing the mundane task.

Goals & Objectives

Our ultimate goal for this project is to build this solar autonomous tennis ball collector. We do have some smaller goals we want to specifically showcase in the project. The three main goals we want to achieve are the Signal analyzer, the energy storage, and the brushless electric motors.

Existing Product / Past Project / Related Work

Currently there are a few similar projects. However, the most notable is one created by the company *Tennibot* that has produced a model of something similar to which we are trying to build. The model from *Tennibot* is essentially a Roomba. Using an app on your phone you can tell the Tennibot to sweep around a certain area of the court. As it passes over a ball it gets sucked in by a rotating belt and gets launched into the back storage space. Using the app, you can also manually drive the Tennibot.

There have been similar projects at Cornell University, Auburn University, etc. A lot of these projects have different designs and technology that comes with them. For example, in the project done at Cornell university they did not use a belt to transport the tennis balls into the basket, instead they used wooden turnstiles to scoop up the balls and put them into a storage unit on the back end.

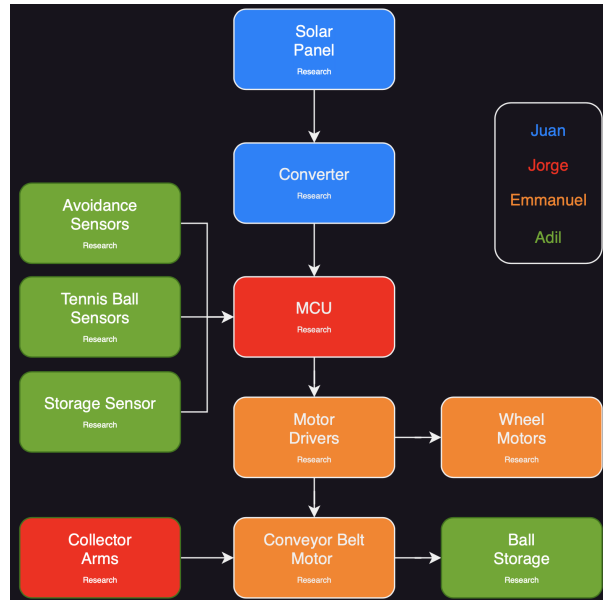
Engineering Specifications Table

<i>No</i>	<i>Requirement</i>	<i>Values</i>	<i>Description</i>
1	PCB	4" by 4"	Printed Circuit board will be used to show and create all electrical connections
2	Energy Storage	630mAh-680mAh	Energy storage will be used to store energy that is getting from solar panels that is built in on top of the robot

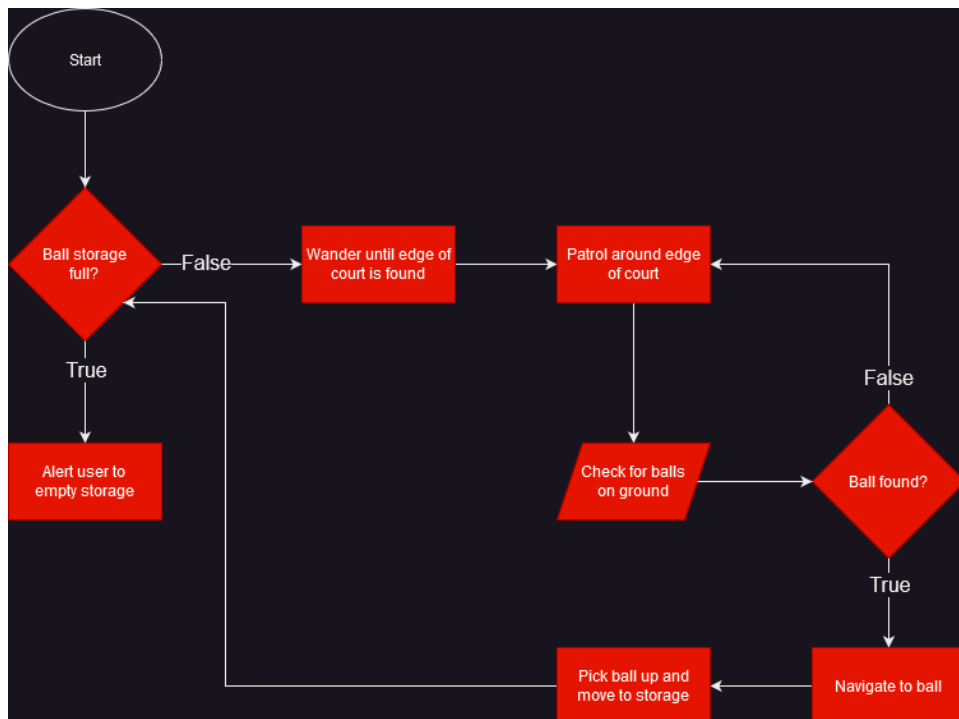
3	Camera	180°	Camera will be used to see surrounding of tennis court
4	Signal Analyzer	At least 4 ft	Signal analyzer will help robot to scan white lines of the tennis court
5	Brushless electric motor	40 watts-120 watts	Electric motor will help robot to move around tennis court
6	Solar Panel	Up to 50 watts	Small solar panel will help robot to charge in outdoor tennis court
7	Storage Capacity	Up to 7 balls	Storage capacity is being limited to 7 balls

Energy storage, signal analyzer, and brushless electric motor are 3 major requirements of this project. Energy storage will be used to store energy that the robot will consume from the solar panel. It will help the robot to operate better and reach its superior level. Brushless electric motor is going to be the heart of the robot. The Solar Tennis Ball Collector robot cannot move without an electric motor. An electric motor will help to move quickly from each point to another. There are specific restrictions for the robot. The robot should keep a distance of at least 4 ft with a tennis court line. Signal analyzer will help to observe the tennis court's white lines and it is not going to be able to enter into the court for safety reasons.

Hardware Block Diagram

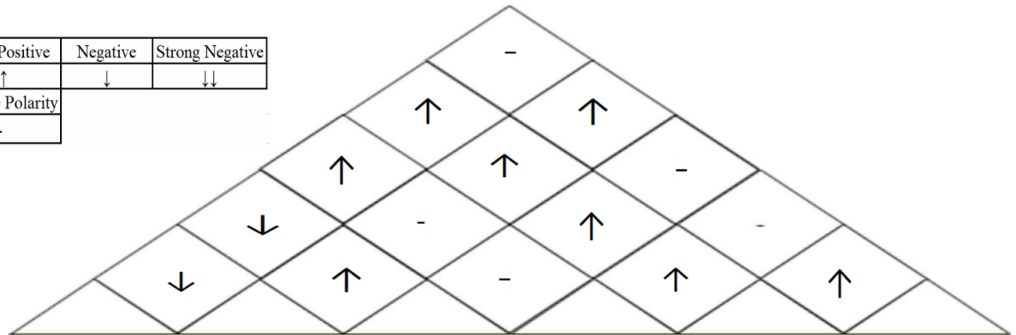


Software Flowchart



House of Quality

Correlations	Positive	Strong Positive	Negative	Strong Negative
	↑	↑↑	↓	↓↓
Polarity	Positive Polarity	Negative Polarity		
	+	-		



		Dimension	Signal Analyzer	Brushless electric motor	Storage Capacity	Energy Storage	Camera
		-	+	+	-	+	-
Design	+	↑	↑↑	↑↑	↑↑	↑↑	↑
Cost	-	↑		↑	↑	↑↑	↓
Battery Life	+	↓	↓	↓	↓↓	↓↓	↓
Quality	+	↑	↑↑	↑↑	↑	↑	
Environmentally Friendly	+	↑↑	↑↑	↑	↑	↓	
Targets of Engineering Engineering Requirements		24"x20"x10"	At least 4 ft	120 watts	Up to 7 balls	680mAh	180°

Cost Estimates

Item	Quantity	Estimated Cost
PCB	1	\$ 2
Microcontroller	1	\$ 2
Battery	1	\$ 10
Brushless motors	2	\$ 200
Solar Panel	1	\$ 50
Camera	1	\$ 70
Wheels	4	\$ 100
Structure materials		\$ 50
Total		\$ 484

Milestones (UCF imposed dates in blue)

6/02 - Divide and Conquer

Write ~5 pages a week each group member

6/26 - Finalize 60 page Draft

6/30 - 60 Page Draft due

Write ~5 pages a week each group member

7/20 - Finalize 120 - page draft

7/25 - 120 Page Draft due and start ordering parts

8/21 - Fall Semester starts and start Building Robot

8/29 - Testing & Troubleshooting Phase

9/25 - Finalize Testing

10/20 - Finish Project (TBD)

Contribution Table

	Primary	Secondary
Hardware	Adil, Emmanuel, Juan	Jorge
Software	Jorge	Adil, Emmanuel, Juan

References

- “Tennibot: The World’s First Robotic Tennis Ball Collector.” *Kickstarter*, <https://www.kickstarter.com/projects/770435035/tennibot-the-worlds-first-robotic-tennis-ball-coll>. Accessed 1 June 2023.
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- Kung, Peter, and Charles Cheung. “ECE 4760: The Autonomous Tennis Ball Picker.” *Electrical and Computer Engineering | Electrical and Computer Engineering*, <https://people.ece.cornell.edu/land/courses/ece4760/FinalProjects/s2009/peterfkung/BallPicker.htm>. Accessed 1 June 2023.
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- Harvey, Alec. “Auburn Grad Invents World’s First Robotic Tennis Ball Collector - This Is Alabama.” *This Is Alabama*, <https://www.facebook.com/ThisIsAlabama/>, 12 Aug. 2019, <https://www.thisisalabama.org/2019/08/12/auburn-grad-invents-worlds-first-robotic-tennis-ball-collector/>.

Declaration: We hereby declare that we have not copied more than 7 pages from the Large Language Model (LLM). We have utilized LLM for drafting, outlining, comparing, summarizing, and proofreading purposes.