Automated Golf Caddie

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Introduction

When navigating a golf course, one of the first decisions made by golfers is how they are going to get around the course. Some rent a drivable cart, while others prefer to walk, which requires pushing a cart or hiring a caddie to carry your clubs and other equipment. The scope of the project was to create an autonomous caddie that would be able to follow the user through bluetooth connection and detect and navigate around obstacles.

Figure 1. Golfer with Caddie

Background

The first semester of our project was used to create a preliminary design seen below. The design was decided on through the use of our selection matrix and morphological charts. The selection matrix focused on aspects such as: efficiency, safety, and manufacturing cost. The preliminary design was the best concept we had so we began the process of turning that concept into a reality in the second semester.
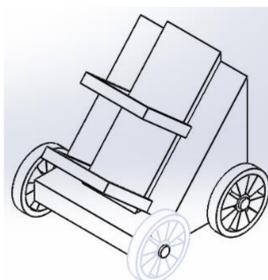

Figure 2. Preliminary Design

Methods

Initially there was significant research done by each team member and ideas were presented during meetings. When the team could collaborate decisions were made to order parts. The final price of the project was $422 which was under our goal of $500. Eventually, once parts were ordered and received, they were tested to ensure proper operation.

Part #	Name	Quantity	Price ($)	Link	Cost ($)
1	Single motor Driver (15A)	3	$20.00	https://www.amazon.com/15A	$60.00
2	Battery - 11.1V 5Ah	2	$28.00	https://www.amazon.com/5oc	$56.00
3	HC-05 bluetooth module	1	$9.00	https://www.amazon.com/05	$9.00
4	Arduino Uno MEga 2560	1	$28.00	https://www.amazon.com/ARD	$28.00
5	Ultrasonic Sensor	3	$5.00	https://www.amazon.com/Sel	$15.00
6	5V buck converter (5pk)	1	$8.99	https://www.amazon.com/Req	$8.99
7	Motor Mount	4	$2.94	https://www.amazon.com/dp/E	$11.75
8	Caster Wheels	1	$23.48	https://www.amazon.com/Fin	$23.48
9	Compass	1	$8.40	https://www.amazon.com/Ong	$8.40
10	Dual Motor Driver (L298N)	1	$6.89	https://www.amazon.com/Qun	$6.89
11	Battery Charger	1	$52.00	https://www.amazon.com/HTF	$52.00
12	Wires	1	$17.00	https://www.amazon.com/22G	$17.00
13	GPS Sensor	1	$19.99	https://www.amazon.com/KEY	$19.99
14	GPS Module	1	$36.75	https://www.amazon.com/gp/p	$36.75
15	Wiring Kit	1	$13.99	https://www.amazon.com/gp/p	$13.99
16	Allen Wrench Set	1	$12.97	https://www.amazon.com/gp/p	$12.97
17	Terminal Strip	1	$7.50	https://www.homedepot.com/p	$7.50
18	Electrical Tape	1	$3.98	https://www.homedepot.com/p	$3.98
19	Automotive Fuse Holder	1	$3.98	https://www.walmart.com/ip/C	$3.98
20	Automotive Fuse Kit	1	$15.97	https://www.homedepot.com/p	$15.97
21	Dean's Style Connectors (10pk)	1	$9.52	https://www.amazon.com/Hob	$9.52
				Total (without Tax)	$421.16

Figure 3. Finalized Bill of Materials

System Design

The system as a whole is driven through a lengthy code programmed to an Arduino and an application on the user's phone to track the user's and the caddie's GPS location. There are a variety of small factors that require "fine-tuning" for a system like the caddie to function properly.
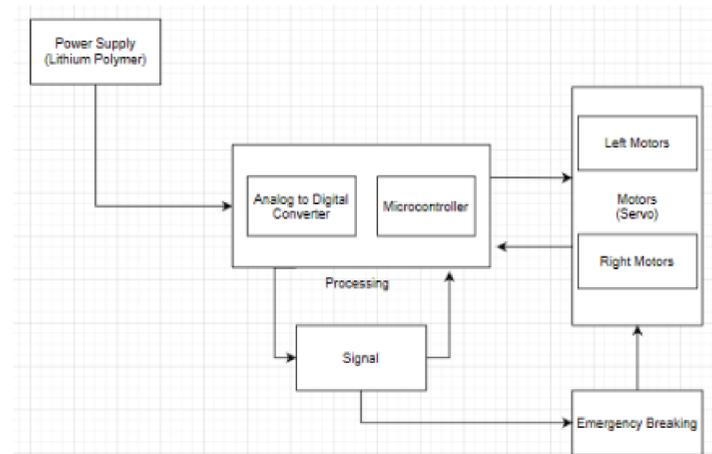

Figure 4. System Block Diagram

Results

Over the course of the project, the team experienced some difficulties in getting proper functionality out of the caddie. All the subsystems functioned properly when separate, but when they were combined there were problems. The driving force for the caddie is really the Bluetooth communication between the user and caddie. When the GPS unit on the caddie failed to transmit accurate readings after multiple troubleshooting attempts, the team decided to focus on documentation.
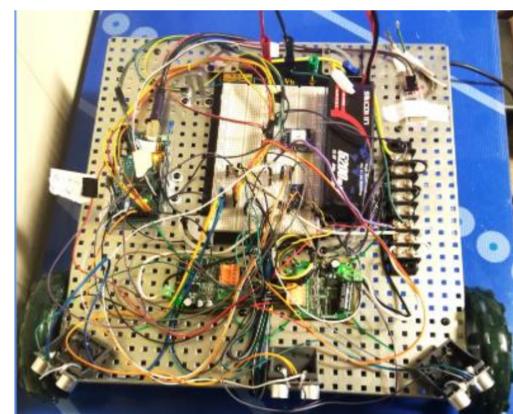

Figure 5. Finalized Caddie

Conclusions/Recommendations

We consider out project a success as the idea of the project was accomplished. In the end we ran out of time to get the robot fully up and running because of the coronavirus limiting our group access to the robot. We recommend that groups in the future that take on similar projects focus mainly on coding and wiring of the robot so that they do run out of time like we did.

Acknowledgments

Group dynamics are important and need to be maintained to accomplish complicated projects.

References

https://www.hackster.io/hackershack/make-an-autonomous-follow-me-cooler-7ca

https://www.sciencedirect.com/science/article/pii/S2314728818300084?via%3Dihub