

Auto Caddie

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Abstract

We propose an autonomous golf caddie that follows alongside a golfer at a walking pace. Human golf caddies are expensive to both individual players and country clubs. The average caddie earns \$30,240/yr, but the salary can increase up to \$1 million for PGA (Professional Golfers' Association) services. Furthermore, carrying a golf bag induces further stress on a caddie's back throughout a game. Our proposed autonomous golf caddie will be able to follow a golfer and avoid obstacles which will make them more cost-effective for golfers.

System Overview

The Auto Caddie systems asserts a connection between the mobile device and the bluetooth module implanted on the caddie. Once a connection is established, the user can turn on the auto caddie remotely to begin the following phase. The caddie uses ultrasonic sensors to receive an array of positional and directional data of its environment. Our caddie uses a drive motor algorithm in addition with the H-Bridge to determine the location of the golfer, the speed at which to follow the golfer, and stop when the golfer is playing.



Block Diagram



Follow Me

Auto Caddie successfully follows a golfer throughout the duration of a game



Mobile Application

Integration between user's mobile phone and caddie allows for seamless real time communication

System Specifications

Collision Avoidance



System avoids colliding with people, dogs, trees and other obstacles on the field.

Requirements	Specifications	
Terrain	Outdoors on a golf course (fairway/pavement)	
Battery Life	Sufficient for a whole game of golf	
Rechargable	Battery can be re-charged	
Following	Rover follows golfer as he/she walks	
Avoidance	Prevents collision while following golfer	
Payload	Able to hold at least 30 lbs of golf equipment	

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Power Supply & Drivetrain

Auto Caddie is powered by a sealed 12V 35Ah lead-acid battery, it provides power to the two heavy duty electric motors and the Atmega328 system. This battery will allow the rover to operate for approximately 3 hours which is more than an approximate estimate for 1 game of golf (18 holes). The power is distributed to the 2 heavy duty motors on board through a dual H-Bridge capable of providing 24V at 10A to both motors simultaneously.

Chassis & Design

The body of the Auto Caddie is made of high-strength steel and equipped with off-road tires capable of handling any terrain on a golf course while carrying heavy golf equipment. The mount is custom designed & built using construction-grade lumber to safely transport golf clubs while following the golfer.

Ultrasonic Sensors

The use of three ultrasonic sensors is the mechanism behind the Auto Caddie"s golfer-following and collision avoidance capability. Two ultrasonic sensors are used to determine the trajectory and direction of the golfer, and one in the middle to detect the golfer's distance from the rover to avoid collision. With the array of incoming positional data, the Auto Caddie can determine the position of the golfer in real time.



The custom designed PCB includes a relay that is connected to the motors allowing them to be disabled/enabled via Bluetooth.





Bluetooth Integration

The phone application will communicate with the Auto Caddie via Bluetooth and allow the golfer to stop the rover from his/her phone.



Drivetrain Algorithm



<u>Cost</u>

Part	Unit Price (Production)	Unit Price (Development)
Batteries (x2)	\$134.99	\$134.99
Motor Driver	\$20.20	\$23.49
Bluetooth Module	\$3.15	\$6.75
PCB	\$0.40	\$2.00
Ultrasonic Sensors	\$15.60	\$20.40
Mount	\$7	\$10
Chassis	\$150	\$0 (Donated)
Total	\$331.34	\$197.63