Name(s)

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Project Number

S1017

Project Title

Prototyping an Omnidirectional Drone Collision Avoidance System with Sweeping Ultrasonic Sensors

Abstract

Objectives/Goals

The objective was to design a reliable omnidirectional drone collision avoidance system to assist drone users and expand drone capabilities.

Methods/Materials

The task of creating a collision avoidance system was split into three different subcomponents: an onboard drone collision avoidance system, a ground control system, and the drone itself. The onboard system had an Arduino Microcontroller running two ultrasonic sensors mounted on top of a servomotor. The motor swiveled the sensors, and collected data from its surroundings. Based on the data, the system chose whether to give the user control or take actions to move the drone away from the object. The data was passed onto a ground control system, where the data was processed. The commands to move the drone away from objects were forwarded to the drone, and user control was taken in when the drone was in any safe zones. The drone then received all of these commands from the ground control station over Wi-Fi protocols and maneuvered accordingly. The Drone was tested through two different types of test cases, and data was recorded and mathematical models were developed.

Results

The drone was run through twenty presentations of obstacles. The drone successfully avoided seventeen out of twenty and failed to avoid three presentations of objects. The presentations had different types of objects, forms of presentation, and methods of avoidance to them.

Conclusions/Discussion

Based on the experiment, a mathematical model was developed. The net velocity shared between the drone and the object was strictly limited by the time it took to rotate the servomotor. By either decreasing the time it takes to rotate the servo, increasing the threshold of the drone, or increasing the number of sensors onboard the drone, the amount of net velocity can be increased. By changing any of these factors, the drone system would be improved, and obstacle detection successes would be greatened.

Summary Statement

I created an omnidirectional drone collision avoidance system with sweeping ultrasonic sensors and drone apis.

Help Received

Did internet research to help with component selection and coding.