Quadcopter

Ken Katagiri, Jeffrey Lu, Lawrence Ng

EECS149 Fall 2014 Project Charter

Project Goal

The goal of this program is to implement a quadcopter such that it gives velocity control to the user through a flexible user input device such as a gaming controller. Moreover, the completed product should filter out any user directives that would result in damage to the quadcopter (ie wall collisions, crashes).

Project Approach

User inputs will be communicated from a laptop radio broadcast to a radio input mounted on the quadcopter. This radio input will be connected to an Arduino Uno board, which will handle logic to then control attached motor controllers for propeller control. Control logic to handle user input will be placed in interrupt handlers uploaded to the Arduino Uno microcontroller on the quadcopter. Moreover, modeling of all physical/mechanical dynamics will also be done in timed interrupt handlers on the arduino side to preserve modularity between the quadcopter and the user-side logic. This physical/mechanical dynamics modeling will include obstacle avoidance, and user input filtering of hazardous behaviour via data interpretation through mounted 3-axis gyroscopes, 3-axis accelerometers, and multiple IR sensors.

Resources

We have elected to buy the Crazy2Fly base kit to serve as our chassis and actuators. We will program the Arduino Uno to be our flight controller. We will be using XBee radios to implement communication between the user and the quadcopter. Sensors we hope to incorporate are a 3 axis accelerometer, 3 axis gyroscope, and a number of IR proximity sensors. If we have time, we will use a Logitech gamepad as an alternate input method.

Schedule

- October 21: Project Charter
- October 28: System architecture decided; Parts ordered
- November 04: Project review with GSI
- November 11: Build flight dynamics model; Radio communication between UAV and user
- November 19: *Mini Update*: Send commands to hover
- November 25: Project Milestone Report; Copter should be able to move freely
- December 02: Collision avoidance using IR sensors
- December 09: Gamepad support
- December 16: Practice presentation
- December 17: Project presentation
- December 18: Record demonstration video
- December 19: Project Report and Video turned in

Risk and Feasibility

Electing to purchase a chassis kit immediately put us over budget and we are paying out of pocket for this expense. Furthermore, a crash during a test flight is almost guaranteed to damage components, most likely the propellers, which would need to be replaced.

We also anticipate that the equations modeling the flight dynamics will not be easy to derive and recognize that they are critical to being able to even lift off. We have observed that several demo videos of previous quadcopters did not show successful lift off. By the time we achieve flight, we may not have time to implement collision avoidance and gamepad support.