CMPE 195A

August 6, 2017

Update for Project ARD

Group Updates: Collectively came to the decision to implement the CrazyFlie drone. Decision was made based on the ability to integrate various modules such as lights, sensors, and signal receivers. The CrazyFlie will be beefed up in order to compensate for the additional weight of a Raspberry Pi and additional sensors.

From meeting with our advisor, we were presented with the idea of implementing two different projects. One project would be done using the Parrot drone and then implementing that code on a CrazyFlie drone implemented by another member or two on our team. While this possible solution provided us the ability to have one successful project, it would also divide the efforts of our team. This would potentially have us fail at two projects than work cohesively and successfully on one project. With that being said, we collectively came to the conclusion that adding more hardware to the CrazyFlie would be a better route than developing an algorithm that could utilize the parrot camera for object detection. We have now ordered the relevant parts to optimize the CrazyFlie as well as the appropriate sensors. The coding for this project has begun as well which can be tested on the CrazyFlie supplied by the instructor.

Anahit

* Got drone from Ali.
* Starting to integrate rpi to drone
* Giving Brian hardware specification for modification to drone chassis

Ali

* Got Crazieflie drone to work with mobile app
* Updated firmware on Crazieflie drone
* Installed BitcrazeVM
* Connected to Crazieflie using Playstation 3 controller
* Did research on CrazieFlie since we decided to switch drones

Max

* Met group members to discuss future drone options
* Decided on CrazyFlie instead of two drones or Parrot drone
* Read various journal articles for research and implementation purposes

Brian

* Police Lights will be a custom designed PCB fitted for mounting onto the drone central assembly within the chassis. It consists of Blue and Red LED’s, some EE circuit components, and is controlled via 555 timer chip, and GPIO signal from the RPi as an enable.
* Police Siren circuit will be embedded with the Police light PCB. It will be activated via the same GPIO signal from the RPi and an enable.
* The environmental sensing will be done by the crazyflie board which contains each of the following sensors: Barometric pressure sensing for altitude chosen because IR sensor boards did not give us the range we required (2m vs 9000m), accelerometer for 3 axis tilt sensing, gyro for 3 axis rate sensing, and 3 axis digital compass for heading / direction finding. This board will interface with the RPi via I2C bus.
* The ESC will be a RacerStar 4-in-1 20A Brushless ESC 2-4S for Quadcopter Drone. It will interface the Rpi, 4 motors, and Battery. The RPi will be connected to its own low current battery supply. We are going to try interfacing this so that we can use a larger chassis.
  + If we cannot get this ESC to work with the crazyflie controls, we will have the development done for the Big Quad deck which offers us control over the same chassis, but at lower currents which means the drone may operate slower.
* The module being used for the RPi battery and real time clock after power down is the DS1307 RTC Module with Battery for Raspberry Pi. It will interface using the I2C address 0x68.
* The chassis for the drone will be supported by the XIRO Xplorer Aerial UAV Drone Quadcopter -- Standard Version. We will need to remove its built in ESC / Controller attachment and install our own assembly. The assembly will be roughly laid out in SolidWorks first in order to ensure proper fitment for installation.
* The RPi job will be to handle all video and extra peripheral controls
  + There may be a need to add IR sensing for object avoidance if video detection cannot do the job.
* The Crazyflie boards STM32F4 and nRF51 will handle all on board sensing, communication, and flight controls. It will be programmed with the latest firmware, and then modified by the team to give the autonomous functionality it needs. It should be able to send PWM signals to the ESC, and if that is not feasible, it will for sure send its PWM signals to the Big Quad deck. It will also communicate with the RPi telling it when to use the camera control. This can be a single GPIO output that just tells the RPi “Yes” and the RPi takes over from there.
* This should cover all the hardware for now. Anything else will need to be added later on. The goal is to get each individual module working on its own using a simple breadboard, wires, circuit, and Crazyflie controller. Once these are working correctly, the custom circuits will then be designed in DipTrace, and sent to fabrication. Once returned, they will be assembled, tested, and ultimately installed onto the drone in the proper configuration.