Module Design Proposals

Module Title: Command/Control Module

People Involved: Lawrence, Ben, Joe

The Command and Control Module is responsible for the main functions of the device, running the main PID control loop and interfacing with the gyroscope and accelerometer. The program loop is designed to be short enough to allow regular updating of motor speeds through PWM control of the ESCs. The base for this module is the ATMEGA32u4 of the Arduino Leonardo, chosen for its plethora of 4 16-bit timers to allow enough graduation in motor speeds for fine control of the device. This will communicate with the comms module through the UART protocol to receive the user input and will return the motor speed and orientation for logging. The ESCs will take the PWM from the Arduino and produce higher current PWM from the battery to control the 4 motors.

Module Title: Communications Module

People Involved: Joel, Mohammed

The Communications module is based around the ATMEGA644p microcontroller on an ‘Il Matto’ breakout board. It functions as the main communications hub of the system, interfacing with the RFM12B-S2 transceivers over SPI to provide the uplink and downlink to the base station and controller. It will perform some basic processing of the instructions from the controller, passing them through to the command module to create a new setpoint for the controller. This interfacing will be done overt UART, and will receive logging data from the IMU. This logging data will be periodically logged to an SD card through an SPI interface and back to the base station as telemetry information. The communications microcontroller will also be responsible for reading from the IR proximity sensors through its onboard ADCs and controlling the servo-powered cargo hook.

Module Title: Ground Control

People Involved: Mohammed, Joel

The Base Station of the system is formed around the core of another Il Matto ATMEGA644p. It will take input from the user through a combination of potentiometer voltages from joysticks being fed into the onboard ADCs and digital inputs from switches and push buttons on the controller. There will also be a UART connection to a host PC to be able to update PID constant values without needing to reprogram the command module, as well as to make the display of telemetry and debug information easier to implement and use. The base station will be connected to a RFM12B-S2 radio transceiver module over SPI bus to allow it to communicate with the quadcopter wirelessly while in flight.