Hot Chicks Milestone Report

A. System Integration Team

Milestones for System Integration

- **MS 1 - Initial setup (week 4):**
  - Setting up EMLID RTK GPS Sensor configuration for dual sensor mode for centimeter GPS accuracy, flash to latest firmware
  - Setting up the Raspberry Pi, camera, SSH configuration, wifi network
  - Setting up the Ubiquiti Wireless radios, flash to latest firmware and sync them for real-time data access

  Deliverables:
  - Python code to save image files from the camera on the drone (Working)
  - Python code to save GPS + time metadata from Navio (Working)
  - Ping one Ubiquiti radio from the other (Working)
- **MS 2 - Obtaining GPS data and transmitting of data (week 6-7)**
  - Determine a methodology/process for obtaining raw GPS data from EMLID for future processing by the Pi
  - Configure necessary SW for porting the GPS raw data to the Raspberry Pi
  - Establish connectivity with Ubiquiti Wireless Radios from both ends
  - Set up RSync, and mirror data from drone to ground-station computer.
  - Transition: Switch from Raspberry Pi board to Up board

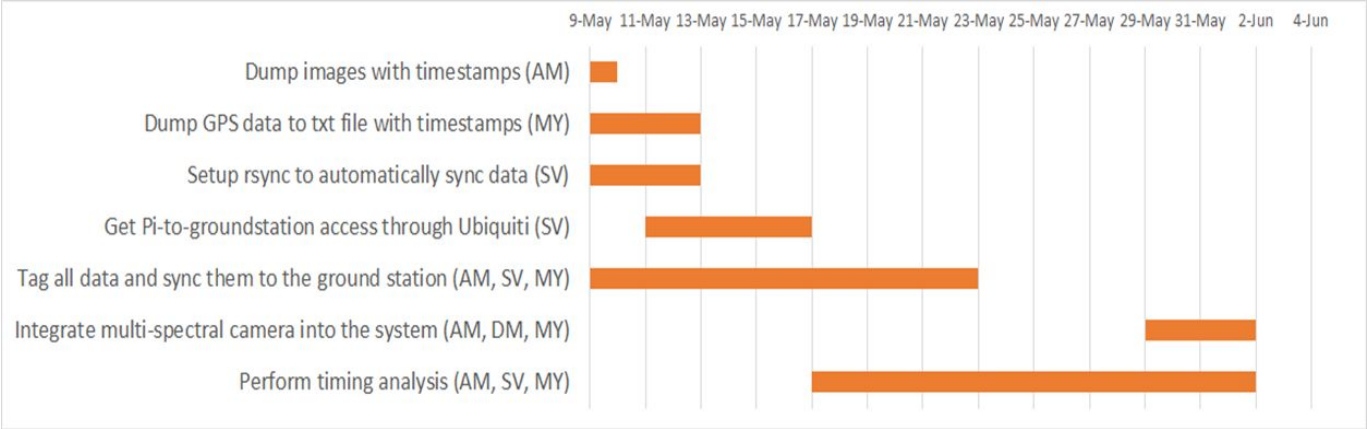
  Deliverables:
  - Demo to show real time transfer of image + GPS data from drone to ground station (Partially working - we are able to transmit altitude and accelerometer information + images to the ground station as of 5/18. We need to get more information about attitude, pitch, yaw etc. from the GPS module)
- **MS 3 - Embedding GPS data and Data Sync (week 8)**
  - Perform timing analysis to make sure all equipment can operate at a specified frequency
  - Taking real-time GPS data and time-sync with camera data

  Deliverables:
  - Demo to show that the timing information from the different datum is correct. (In progress)
- **MS 4 - Integrating Multi-spectral camera (week 9)**
  - Obtain data from the multi-spectral camera as well, and transmit to ground station

Deliverables:

- Demo to show images from all cameras and GPS information reaches the ground station with correct time information, so that they can be processed to obtain results. (Planned for week 9)

Gantt Chart



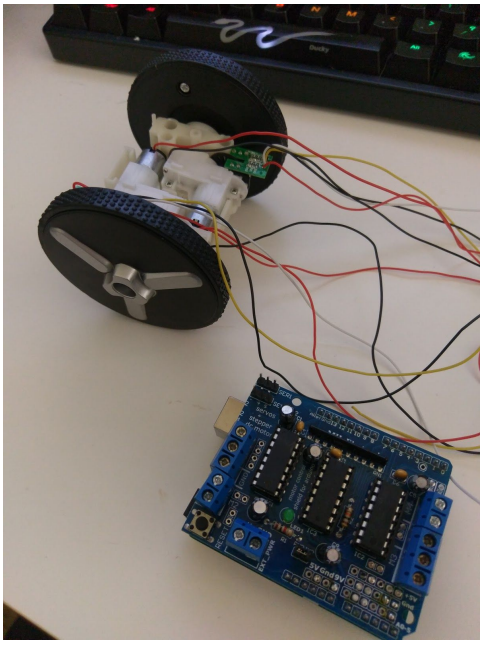
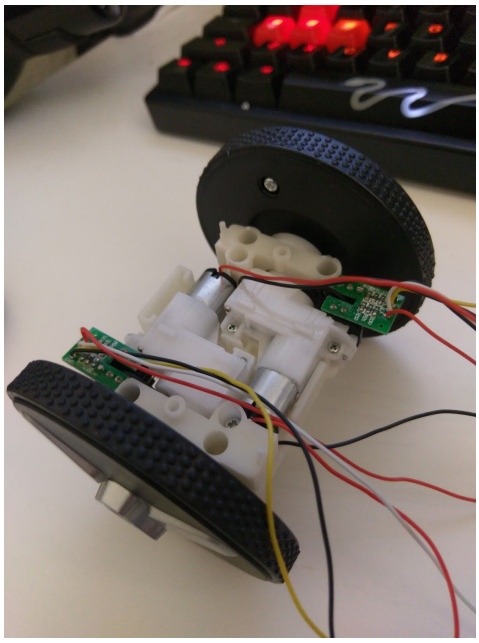
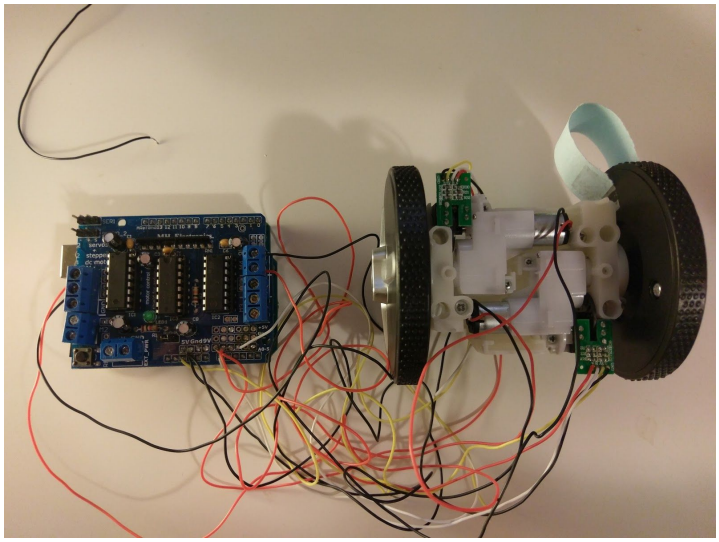
B. Multispectral Camera Team

The milestones for the multispectral camera team are below. We are currently on track for our milestones. At this rate we should be able to complete the planned tasks, combine the multispectral camera with the drone, and potentially add additional features. Most of the milestones have been untouched, but a few have been modified such that our sub-tasks are more clearly defined. Otherwise the main tasks for each milestone are the same.

Milestones for Multispectral Camera

- **MS 1 - Multispectral camera part selection (Week 4):**
  - Research possible motors (brushed, brushless, etc), motor controls, encoders (magnetic, optical, etc), system control systems (PID, etc)
  - Deliverables: Select pieces/implementations for each, order parts
    - Completed: We researched motors, motor controllers, encoders, and different control systems. We thought that brushless motors, integrated motor controller, capacitive encoders, and PID speed control system would be optimal. But we chose to use optical encoders instead (cheaper) combined with the other parts mentioned. Parts can be seen built in MS2.
- **MS 2 - Build test system and combine testing parts (Week 5):**
  - Build test system with possible pieces in Dom's lab?
  - Deliverables: Have a working platform with which we can test our control algorithms

- Completed: Dom scrounged up parts from his lab and gave us the pieces for a test system. This included a two wheel, two motor, two encoder test base as well as an Arduino and an Adafruit motor controller shield. We spent the week putting the system together, learning how to use an Arduino, and figuring out how pin I/O worked.

- **MS 3 - Implement working camera control feedback system (Week 6):**
  - Using test platform, write control feedback loop algorithms for closed loop filter/motor/camera control
  - Deliverables: Create working control loop system
    - Completed: We devised a simple PID control algorithm to maintain speed of the spinning wheel. Currently our algorithm is set up such that we can give it different wheel rotation per second speeds and the script will ramp up/down the motor until the desired speed is reached.

- **MS 4 - Build final pieces system/select best filters (Week 8):**
  - Finalize parts: filters, encoder disk, and camera
    - In progress: Dom is still deciding on what camera and filters would be best for the multispectral system. In addition, he is designing the encoder disk on CAD and will 3D print it out once it is finalized.
  - Move final code algorithm to the Raspberry Pi 3
    - Integrated camera, speed, and encoder disk communication.
    - In progress: We are currently moving over our PID speed control algorithm to the RPI3. We are looking up ways to be able to combine the speed control, the camera, and the encoder disk readings. We will attempt to use multithreading so that the constant flow of encoder readings will dictate speed and camera control.
  - Build final product using ordered parts
    - In progress: Dependent on the two bullet points above
  - Deliverables: Build final camera/control system which will be used on drone
    - In progress: See above
- **MS 5 - Combine with systems integration team (Week 9):**
  - Combine final multispectral camera product with drone
  - Deliverables: Final drone complete, total control of multispectral camera
    - In progress: See above

Gantt Chart