11.4 Sprint Report #4

Weeks Jan. 19, 2015 to February. 6, 2015: The focus of sprint four was to focus on implimentation of our components with existing ROS nodes and developing the autonomous ground vehicle.

1. Computational Stress Tests

   Alex Wulff has reworked stress tests for the new architectures. This was completed and led to the purchases of both two Odroid XU3-Lite modles and the addition of two PcDuino8 units for communication and API support.

2. Blob Detection

   At the beginning of Sprint 4, Julian Brackins started working on an object recognition and tracking program using a USB camera and OpenCv. The tracking system was intended to locate a triangular setup of LED lights, calculate the size of the triangle in relation to the camera feed, and determine the UAV's distance in relation to the known triangle size.

   The program contains an LED.cpp class. This class contains the HSV values needed to detect specific colours. HSV stands for Hue, Saturation, and Value, and is used to track specific colours in OpenCv, rather than the standard RGB model. This LED class allows for multiple lights to be instantiated and tracked, allowing this project to expand to tracking more or less than 3 coloured lights at a given time.

   A complication discovered in this tracking program was that the specific colour of an LED would vary too greatly for reliable tracking due to the nature of how colour is emitted from an LED. Therefore, the design of the landing pad will still use colours for the camera to track, but instead of LEDs, the colours will most likely be painted onto the landing pad. LEDs could still be used on the landing pad to illuminate the coloured circles in low light scenarios.

3. SLAM Research and Implimentation

   Charles Parsons has successfully calibrated the camera and compiled both Hector SLAM and LSD SLAM. He is currently working on getting the camera and slam algorithms to work together to build a map. Samuel Carroll was recently added to the Landing Pad team during Sprint 4. In order to get familiarized with the project, he has been setting up his ROS environment and calibrating SLAM components.

4. Common Communication and Control Nodes

   Alex Wulff has created a simplified API node and sub-node structure for the connectivity of new nodes needed for the UAV / UGV, and for all other general communication. This new structure enables a simple message passing interface left in a "Debug" mode for output. All that remains for this to be complete is a launcher file to spin up all nodes in the API and a common logger for the messages to be passed.

5. UGV - Construction & Design All design process for UGV and all the frame configuration for the ground vehicle have been completed. Under the supervision of Alex Wulff, the UGV has been designed and sent off to be constructed. Alex also secured a front differential for the ground vehicle. The external frame has been finished aside from additional structural support gussets and the connection to the powersupply and landing pad. Both of the latter should be finished within the next sprint.

6. UAV - Design Colter Assman has been tasked with working on the UAV. the FPV (First person view) camera is now working, using the camera currently situated on the quad rotor. The FPV is capable of streaming video to a ground computer. Soldering work was done on the camera wiring and it has been concluded that if the camera stops working in the future, it will need to be completely replaced.

7. UAV - Autonomous Flight Over the course of Sprint 4, Colter has been readying the UAV for autonomous flight. By changing settings on the UAV controller, the vehicle can switch from transmitter control to autonomous control. However, the propeller motors were not firing off in order to fly the vehicle to the intended destination. It was determined that the compass was not facing the proper direction.