Sprint Report #1

Team Overview

Name
Expeditus

Members
Jonathan Dixon, Dylan Geyer, Steven Huerta, Christopher Smith

Project Title
UAV Landing Pad

Sponsor
Dr. Larry Pyeatt, SDSMT MCS

Sponsor Overview

Sponsor Description
The Math and Computer Science Department of South Dakota School of Mines and Technology, in addition to providing ABET certified education to students, conducts software-side robotics research including autonomy, navigation, and computer vision.

Sponsor Problem
The capability of UAVs to rapidly search a large area, especially one that is difficult to traverse by foot or vehicle, would be invaluable to operations such as search & rescue. However, small UAVs have a very limited flight time. A system incorporating a UVG equipped with a landing pad that also serves as a charging station would allow the UAV to be delivered to areas of limited access. The UAV could then, being provided with waypoints by the user, autonomously take-off, and navigate through the waypoints. After moving through the waypoints, or when the UAV requires recharging, the UAV will return to the UVG and safely land in such a way that the charging unit can connect to the UAV.

Sponsor Needs

- Ability to communicate waypoints to UAV.
- UAV can autonomously take-off.
- UAV can autonomously navigate through waypoints.
- UAV can autonomously navigate back to landing pad.
- UAV can autonomously land safely and with the correct orientation.

Project Overview

Phase 1 First phase will focus on finalizing the autonomous take-off and waypoint navigation by the UAV. Previous development will be reviewed, implemented, and tested. Simulation environment will be created for the purpose of testing landing algorithms.

Phase 2 Second phase will focus on finalizing autonomous landing

Project Environment

Project Boundaries

- Project is constrained to the UAV autonomy problems of take-off, navigation, and landing.
- Autonomous landing is constrained by fixed position landing platform with ideal operating conditions.
- Autonomous take-off is constrained by taking flight from a fixed position platform, with ideal operating conditions.
- Autonomous waypoint navigation is constrained by absence of obstacles, and operating with ideal operating conditions.

Project Context

- Project will utilize stable ROS distribution
- Project simulations will utilize Gazebo 6.+ & ROS package Rviz
- Project will be developed in Linux environment compliant with ROS & Gazebo

Deliverables

Phase 1

- Requirements documentation
- Overview documentation

Phase 2

- Project software
- Log
- Refence manual (software documentation)
- User documentation
- System design documentation
- Testing documentation
- Deployment documentation

Product Backlog

Phase 1

- **O-1**: As an owner, I want the UAV to autonomously take-off from the landing pad
- **O-2**: As an owner, I want the UAV to autonomously navigate through a series of waypoints

Phase 2

- **U-1**: As a user, I want to communicate the waypoints to the UAV
- **O-3**: As an owner, I want the UAV to autonomously return to the location of the landing pad
- **O-4**: As an owner, I want the UAV to autonomously land on the landing pad without damaging the craft
- **O-5**: As an owner, I want the UAV to autonomously land on the landing pad with the correct orientation

Sprint Report

Completed Tasks

- Install Ubuntu 14.04 or some other ROS Indigo/Jade distro compliant OS.
- Setup Gazebo 6.+
- Download Rviz package
- Review previous iteration of project documentation
- Inspect current quadrotor configuration
- Identify parts needed for quadrotor

Tasks Carried to Next Sprint

- Acquire parts needed for quadrotor