

# UAV Autonomous Landing

Team Expeditus

SDSMT MCS

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## **UAV Autonomous Landing Project**

### **Team Expeditus**

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### **Sponsor**

Dr. Larry Pyeatt

## Goal

- receive a set of waypoints
- autonomously take-off
- navigate through waypoints
- return to launch pad
- land on the pad with the correct orientation

## Limitations

- landing platform is a fixed position
- landing platform is a stable, horizontal surface
- environment is ideal(no wind, gps available, no obstacles)

# User Stories

- **User 1(U-1):**  
As a user, I want to communicate the waypoints to the UAV.
- **Owner 1(O-1):**  
As an owner, I want the UAV to autonomously take-off from the landing pad.
- **Owner 2(O-2):**  
As an owner, I want the UAV to autonomously navigate through a set of waypoints.
- **Owner 3(O-3):**  
As an owner, I want the UAV to autonomously return to the location of the landing pad.
- **Owner 4(O-4):**  
As an owner, I want the UAV to autonomously land on the landing pad without damaging the craft.
- **Owner 5(O-5):**  
As an owner, I want the UAV to autonomously land on the landing pad with the correct orientation.

**As a user, I want to communicate the waypoints to the UAV.**

Task No.	Task
1	Review previous method/interface for communicating coordinates
2	Review code that communicates with quadrotor
3	Review code that allows a user to input waypoints

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# Hardware Requirements

- ODroid XU4
- Pixhawk Flight Controller
- GPS peripheral
- Camera
- Battery
- UAV(Frame, Motors, ESCs, Power Distribution Board)

# Software Requirements

- Mavlink
- OpenCV
- Robot Operating System(ROS) Indigo/Jade Distro
- Ubuntu 14.04

## **Sprint 1 - Successes**

- Revised project scope
- Product Backlog - User Stories
- Setup Development Environment
- Review previous years hardware and software

## **Sprint 1 - Setbacks**

- Previous years UAV unusable
- Previous years flight code unusable

## **Sprint 2 - Successes**

- Visual Homography Code repurposed
- Created simulation environment
- Ordered parts for new Hex-copter

## **Sprint 2 - Setbacks**

- Simulation only supports manual control

## **Sprint 3 - Successes**

- Many SITL simulations
- Working image homography code
- Assembled Frame, Motors, ESC's

## **Sprint 3 - Setbacks**

- Pixhawk delayed 2 weeks, build not completed
- SITL simulations rejected waypoint files



PLACE HOLDER FOR THIS STUFF: Architecture, Design,  
Technical Aspects, Data structures, Data flow, Communications,  
Tools

# UAV Design & Tech Specs

# Visual Homography Design & Tech Specs

# Simulation Design & Tech Specs

PLACE HOLDER FOR THIS STUFF: Unit or Component Testing, System Testing, System Integration, Remaining backlog, Revised goals and Revised Deliverable

Manual Flight  
Autonomous Flight

# Visual Homography Landing Testing

# Integration



# Remaining Backlog

# Revised Goals

PLACE HOLDER FOR THIS STUFF: Successes (goals met), Issues or problems (goals not met), Risk Analysis, Risk Mitigation, Timeline, Budget/costs, Intellectual Property Aspects, Licensing

Parts are now in!!

Parts are now in!! (Our UAV build has been delayed by a semester)  
Simulation integration issues  
Large Dependencies (If someone's awesomely helpful interface fails or is buggy, we need to address how we can work around it).

# Risk Analysis

# Risk Mitigation





PLACE HOLDER FOR THIS STUFF: Demos!!

# END