University of Colorado

Department of Aerospace Engineering Sciences

VICON Flight Test Plan

12 December 2014

Drones Versus Zombies (DVZ)

Change Summary

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| --- | --- | --- |
| Revision | Description of Changes | Date Released |
| - | Initial Release | 2 December 2014 |
| Rev A | Power up and arming | 3 December 2014 |
| Rev B | Launch AMCL | 12 December 2014 |

**Team Contact Information**

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# Description

This test will serve to verify the localization and mapping requirements. This will be done through a combination of the data from the VICON cameras in addition to the onboard sensors. The VICON camera data will be used to fly the drone and serve as golden values for the onboard sensor readings.

# Location and Equipment

## Location

The test will take place at the Fleming Law building in the RECUV room. All flight will be conducted within the VICON space that is set out in the RECUV room. This space is defined by the floor to ceiling netting that is setup in a square in the main room. Setup and other preliminary functions may take place outside of this area.

## Equipment

* 3DR X8 Quad
* 3S Battery (Charged)
* Hokuyo Laser Scanner
* PX4 Flow Sensor
* Pixhawk
* Odriod
* Odriod Wifi Dongle
* Camera Simulated Mass
* Blade Guards
* Ground Station Computer
* VICON Camera
* VICON Computer
* VICON Markers
* Wood Walls
* Drone Cart
* RC controller

# Setup

## Assumptions

### All equipment is installed on the drone (PX4 Flow, Hokuyo, Camera mass, Odriod, ect.)

### No elements of the drone are damaged

### The correct gains have already been applied

### Map of VICON space has already been created

### Battery is fully charged

## VICON

### Power on the VICON computer

### Power on the VICON cameras

### Run VICON program

### Use the wand to calibrate the camera

### Place the markers on the drone

### Arrange walls based on the map

## Drone

### Power on ground station

### Test network connection

### Upload the map to the ground station.

### Run GUI on ground station

### Start with only the Wifi Dongle connected to the Odriod

### Connect power to the Odriod

### Connect power to the USB hub

### Connect USB cable from Hokuyo to USB hub

### Connect USB cable from PX4 Flow to USB hub

### Connect USB cable from Pixhawk to USB hub

### Connect the battery to the BEC

### Wait for chime from Pixhawk to confirm preflight check list completed

### Connect USB hub to Odriod

### Attach Drone to the cart

### On ground station open a terminal and type ***roscore***

### Open a new tab (Ctrl+Shift+t) and type ***rviz***

### Open a new tab (Ctrl+Shift+t) and type ***rosrun map\_server map\_server [mymap.yaml]***

### In RVIZ window, expand map options, set topic to /map

### On a new terminal, type ***wolverine***, password ***odroid***

### Type ***px4flow\_launch***

### Open a new tab (Ctrl+Shift+t), type ***wolverine***, password ***odroid***

### Type ***pixhawk\_launch***

### Open a new tab (Ctrl+Shift+t), type ***wolverine***, password ***odroid***

### Type ***hokuyo\_launch***

### Open a new tab (Ctrl+Shift+t), type ***wolverine***, password ***odroid***

### Type ***roscd odometry/scripts***

### Type ***./pub\_odom.py***

### Open a new tab (Ctrl+Shift+t), type ***wolverine***, password ***odroid***

### Type ***roslaunch amcl dvz\_amcl\_test.launch***

### In RVIZ, click add, then select Pose Array

### Expand Pose Array options, set topic to particle cloud

### In RVIZ window, click 2D Pose Estimate

### On map click on initial [x,y] position and drag to set initial yaw

### Perform simple movements with the cart and compare data with VICON

### Disconnect the drone from the cart and prepare for a pretest VICON flight

### Plan a simple straight line path into the drone

### Allow the drone to fly for a short period of time on the path

### Quickly look over the collected VICON data for issues

# Procedure

### Place drone at starting location in VICON space

### Upload path plan to drone

### Power on the RC controller

### Set flight mode switch to Stabilize

### To arm the drone, hold the safety button on the Pixhawk until the light goes from flashing to solid

### Wait for beep from Pixhawk

### On the RC controller, hold the throttle stick in the bottom right corner for 5 seconds

### At this point the flight system is armed

### Begin flight with GUI

### During the flight one team member is holding the RC controller who can take over manual flight at any time

### Observe data output on GUI

### At termination of flight confirm flight data is saved

### Return the RC controller to Stabilize

### On the RC controller, hold the throttle stick in the bottom left corner for 2 seconds

### Pixhawk LED will start flashing green

### On PX4 Flow press safety button until light starts flashing

### Disconnect battery from BEC

# Results

The results of this test will include that data that is collected from VICON in addition to the data that is collected from the sensors on board the drone. The data processing will center on the state values which will help characterize the localization. Orientation and position data will be compared directly to VICON and accuracy metrics will be calculated for each value. In addition acceleration and velocity data will be analyzed to help examine the quality of the algorithms that were used.