Self Navigated Hex Copter

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The Project

- The goal of this project is to create implement and design a live camera system using raspberry pi and a Hex copter.

What is a Hex Copter ?

- Hex copter is a multi rotor copter exactly 6 rotors and is considered a UAV. (unmanned aerial vehicles)

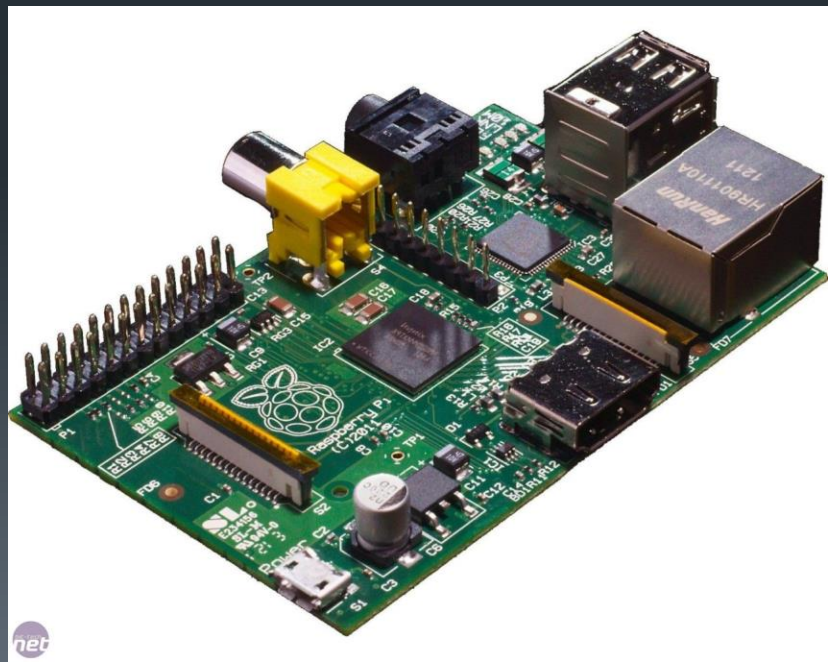
Applications

Drones are used in Multiple applications for example this Drone is used to create 3D mapping of the ground below.

What is Raspberry PI?

- Raspberry pi is a Linux base SOC. This System on chip is powered by an ARM 1176JZ Processor.

It has the capability to support
Multiple Linux Operating systems
And is used in a verity of projecs.



Installations

- First step is to Download the OS to the raspberry pi SD card.
- For this Project Raspian OS was used.
- After the installation and basic set up the following applications were installed (Sudo apt-get install)
- - Motion
- SSH
- -Nginx
- - Open CV
- Github Cores.

Once the applications were installed each needed to be configured.

Configuring motion

- Motion is a Webcam camera stream using the USB Camera.
- To configure this the following was changed.
- Daemon = on;
- Webcam_localhost = on;
- Webcam_port = 8088;
- Control_port 8089;

Configure Github

The first step is to create an account. Github.com/N02262410

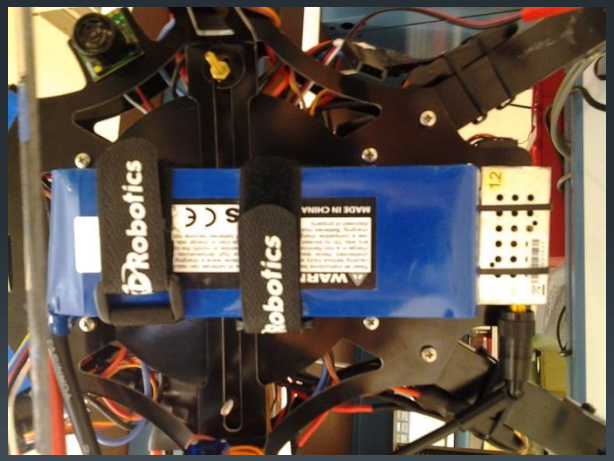
1) Generate SSH keys this will allow you to push files to the Repository.
2) Once you SSH key has been generated then using the Github (Git push command)
3) You can commit your files to the Repository,

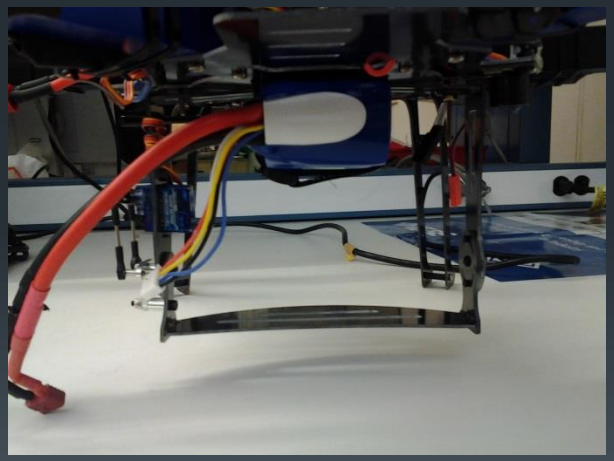
Camera and Raspberry PI Assembly

- The Following system is used to control and run the Raspberry Pi and camera for the copter.
- 1) Logitech Quick cam
- 2) Wireless dongle
- 3) Raspberry pi
- 4) 10000 Mah Battery pack
- 5) Verizon Wireless 4G LTE Mifi Device

Copter Assembly.

- The Copter assembly consists of 3 levels, The motors and propellers, battery holder and bottom mounting brace.





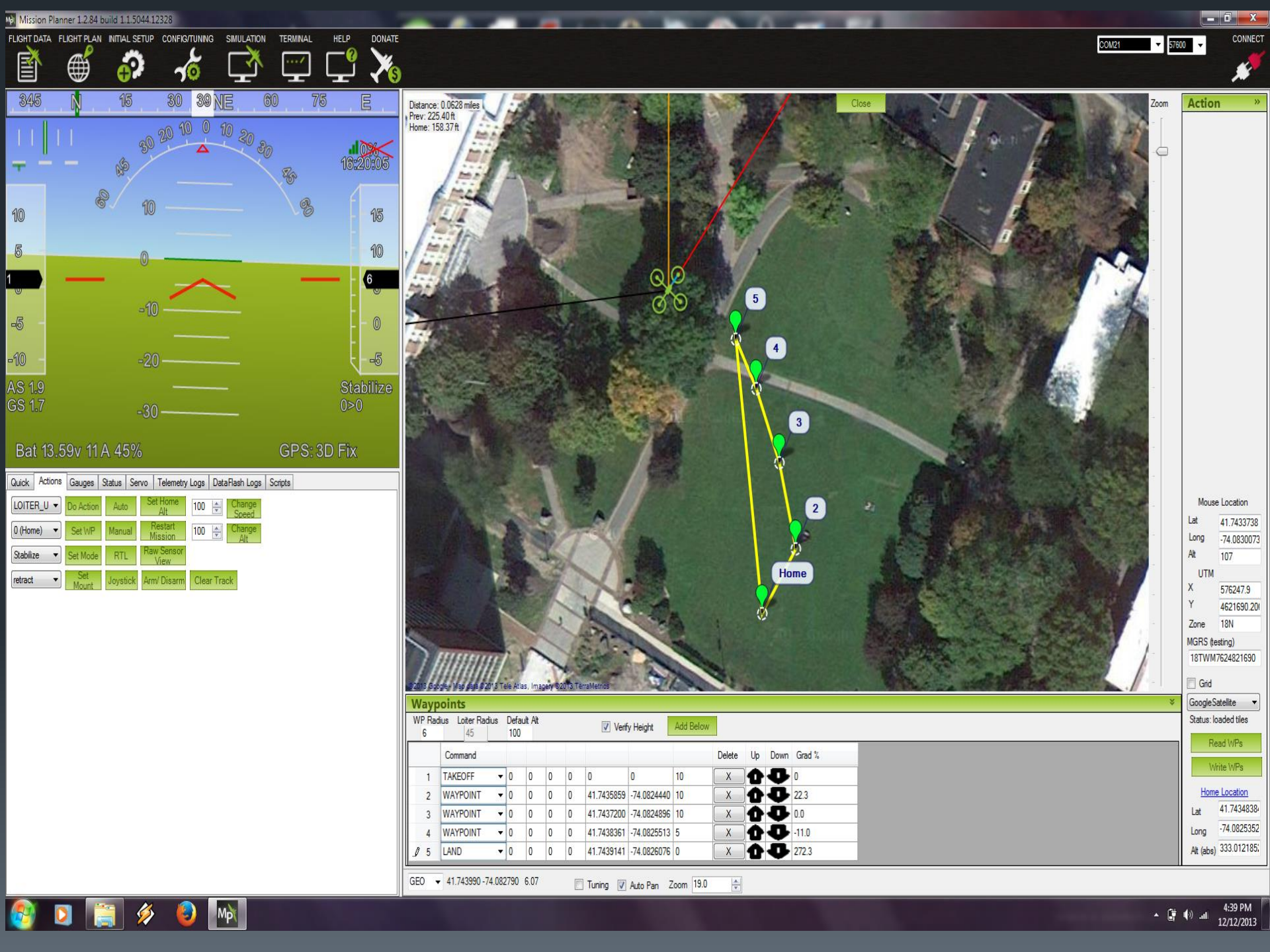
Copter Specifics

- Arducopter
  Model:
  Hexa C
  Maximum height: 11,000 feet
  Max weight capacity:
  4lbs
  Processor:
  ARM:2.5
- Battery: 5000 Mah

Testing

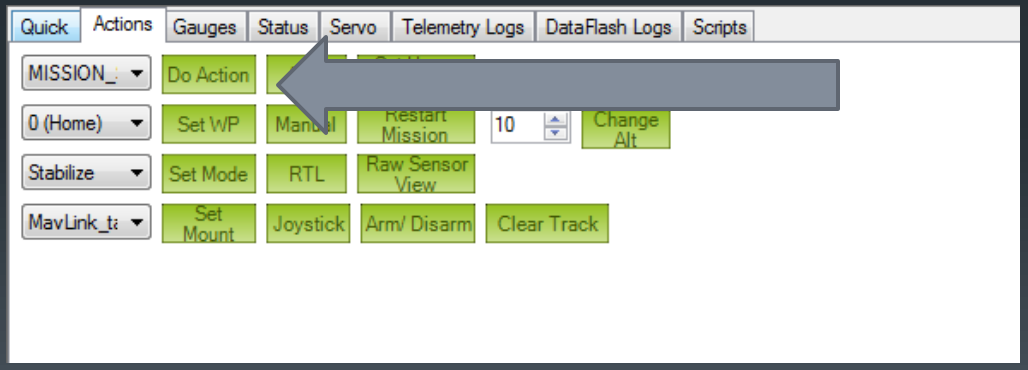
Creating Flight paths

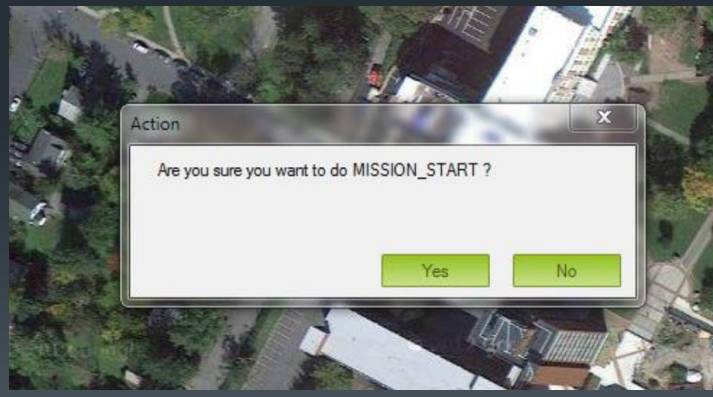
- To create flight paths you need to select different GPS waypoints in a specific order and give the copter commands to do at each way point. Once you have selected the waypoints you will have a flight plan that looks like this.


Mission Planner 1.2.84 build 1.1.5044.12328
FLIGHT DATA
FLIGHT PLAN
INITIAL SETUP
CONFIG/TUNING
SIMULATION
TERMINAL
HELP
DONATE
COM21
57600
CONNECT
AS 1.9
GS 1.7
Stabilize
0>0
Bat 13.59v 11 A 45%
GPS: 3D Fix
Distance: 0.0628 miles
Prev: 225.40 ft
Home: 158.37 ft
Close
Zoom
Home
Action
Mouse Location
Lat 41.7433738
Long -74.0830073
Alt 107
UTM
X 576247.9
Y 4621690.20
Zone 18N
MGRS (testing)
18TWM7624821690
Grid
GoogleSatellite
Status: loaded tiles
Read WPs
Write WPs
Home Location
Lat 41.7434838
Long -74.0825352
Alt (abs) 333.012185
Waypoints
WP Radius 6
Loiter Radius 45
Default Alt 100
Verify Height
Add Below
Command
Delete
Up
Down
Grad %
1 TAKEOFF 0 0 0 0 0 0 10 X 0
2 WAYPOINT 0 0 0 0 41.7435859 -74.0824440 10 X 22.3
3 WAYPOINT 0 0 0 0 41.7437200 -74.0824896 10 X 0.0
4 WAYPOINT 0 0 0 0 41.7438361 -74.0825513 5 X -11.0
5 LAND 0 0 0 0 41.7439141 -74.0826076 0 X 272.3
GEO 41.743990 -74.082790 6.07
Tuning
Auto Pan
Zoom 19.0
Quick
Actions
Gauges
Status
Servo
Telemetry Logs
DataFlash Logs
Scripts
LOITER_U
Do Action
Auto
Set Home Alt
100
Change Speed
0 (Home)
Set WP
Manual
Restart Mission
100
Change Alt
Stabilize
Set Mode
RTL
Raw Sensor View
retract
Set Mount
Joystick
Arm/ Disarm
Clear Track
4:39 PM
12/12/2013

Starting the mission

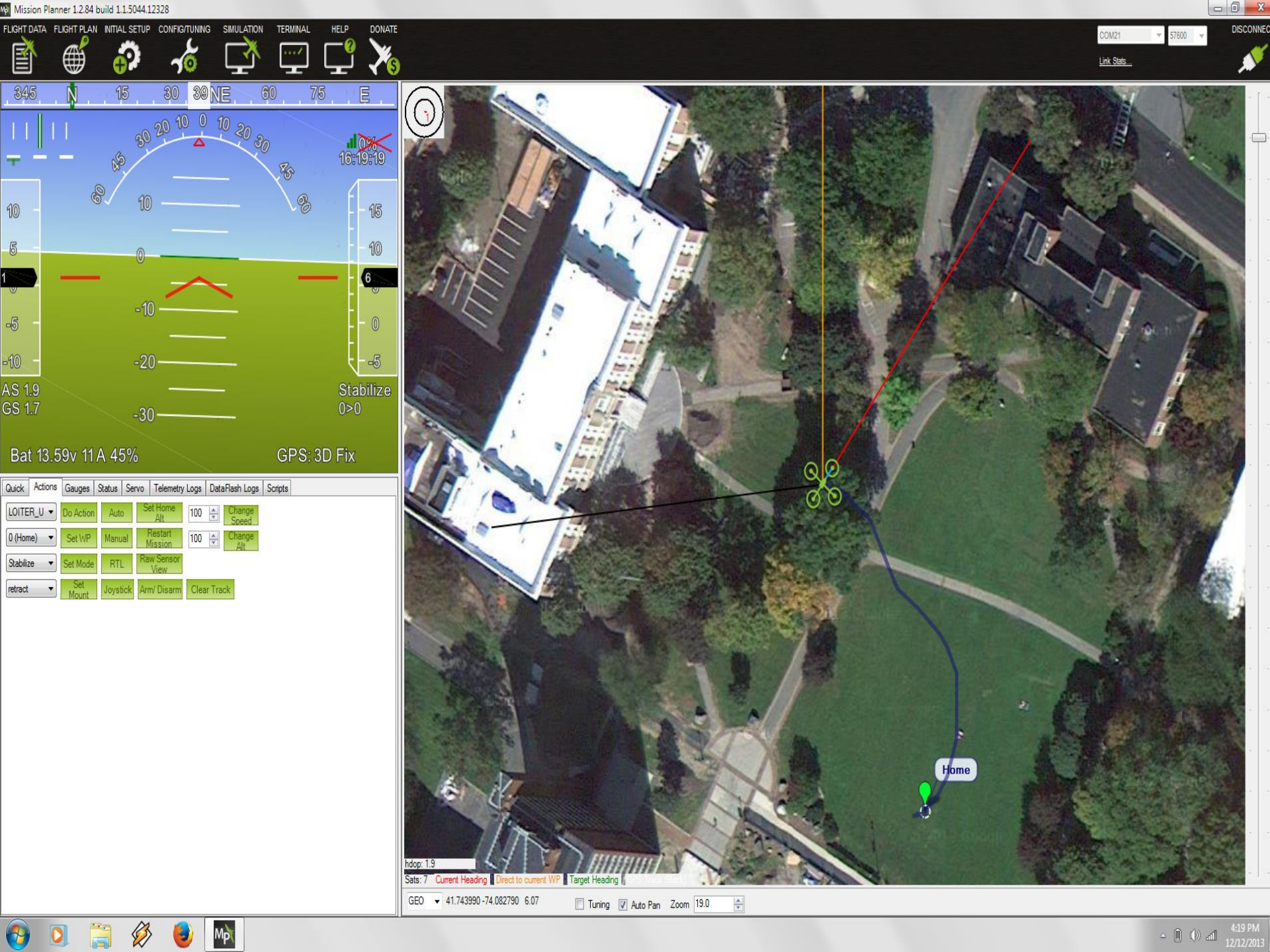
- To Start the mission in the flight data menu and selecting the action tab
- To “DO Action” this will then prompt you to start the mission.





The Take off.

The Flight Path Taken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Link Stats...
345 N 15 30 39 NE 60 75 E
0%
16:19:19
AS 1.9
GS 1.7
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0>0
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Raw Sensor View
retract
Set Mount
Joystick
Arm/ Disarm
Clear Track
Home
hdop: 1.9
Sats: 7
Current Heading
Direct to current WP
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GEO
41.743990 -74.082790 6.07
Tuning
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Zoom
19.0
4:19 PM
12/12/2013

Results

- The Copter was able to fly and follow the different GPS points given to it.
- The Camera system is able to give a moderate not high quality stream to from the camera to the ground station.

Future Results

- For this project there are may different direction to be taken
- 1) using open CV to navigate and maneuver obstacles
- 2) poling sensors that will be able to provide information about the environment around it .
- 3) Using IR and 3D modeling to create images of unknown environment's
- 4) Senior Design
- 5) possibly deliver some pizzas.

Questions?