

Game of Drones

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A [Top Secret] Northrop Grumman Project



Our Project

Our goal is to use a drone and third-party components to build a tool that is capable of creating a 3D model of a specified area.

The essential hardware components of our project include:

- Matrice 100 developer drone by DJI
- Sweep V1 360° Laser Scanner
- Raspberry Pi 3



Hardware Analysis (SWaP-C Analysis)

Size - Limited space on DJI Matrice 100

Weight - max 3600g payload = ~600g components

And

Power - Battery must support Raspberry Pi, sensor, and drone.

Cost - As cost efficient as possible while maintaining quality.
(biggest bang for your buck)

System Architecture

- DJI Guidance:
- Weight: 64g (core) + 43g x 4 (sensors) + 11.6 (VBUS cable) = 247.6g
 - Power: 12W Max power, 11.1 ~ 25V

Note: If we fly in clear skies with no obstructions we should be fine w/o

- Weight:
- Max takeoff = 3600 Grams
 - Weight
 - 1755 = drone
 - 428 = parts
 - 45 = expansion bay
 - 160 = battery compartment
 - 600 = battery
 - Total = 2988

Not yet implemented

- DJI comes with:
- Dual parallel CAN ports for DJI compatible components
 - Dual parallel UART ports for 3rd party components
 - 3 XT30 ports for power
 - 26V / 10A

DJI Guidance Sensors

DJI connector Kit

\$80

DJI Matrice 100 and battery
- Best SDK out there

Raspberry Pi 3 B

WiFi

Laptop or Mobile

Power & USB

Power & USB

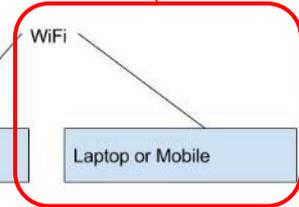
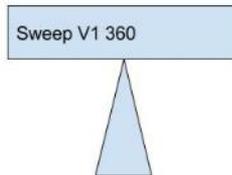
Control

- Raspberry Pi 3 B
- 5V / 2A
 - Has Wifi & 4 USB ports
 - \$35
 - 60 Grams

- Lidar Sensor
- 5V / 400mA
 - USB connection
 - 40 meter range
 - 120 Grams
 - \$349

Sweep V1 360

Second battery is an option for 675 grams





Software Tools

Currently Used

TeamViewer - To control Raspberry Pi with a mobile device

Scanse Sweep SDK - Retrieve sensor data and create 3-D coordinates

Mobile Point Cloud Visualizer (Open Source) - Displays the sweep data for viewing on mobile

Future Tools

DJI Onboard SDK - Telemetry data

DJI Mobile SDK - Integrate viewer with app to fly and control drone mapping

WS (Node.js websocket server) - Websocket connection for sending real time data to android app

Google Testing - Test framework for transformations

Demo

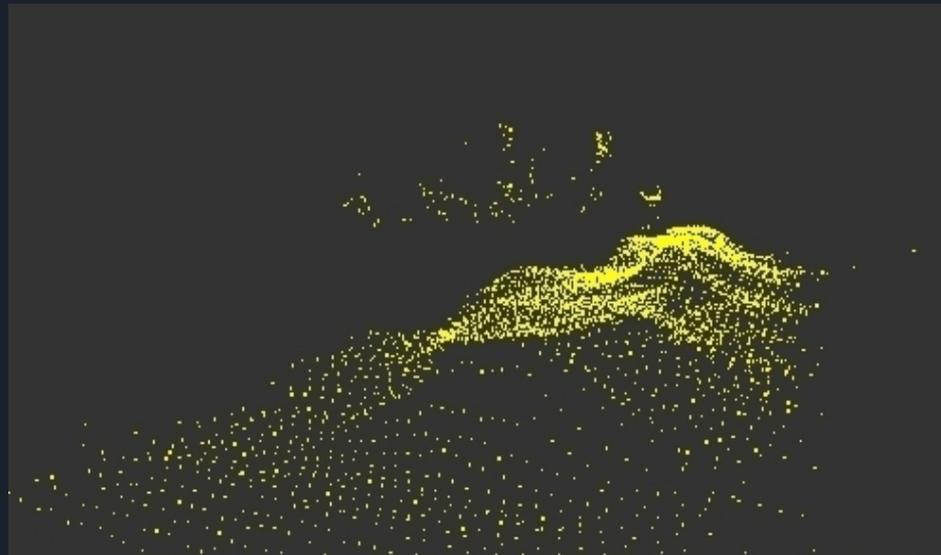




Demo

<https://www.youtube.com/watch?v=a0cjhDRETx0>

Demo





Future Goals

- Transformations based on telemetry data
- Real-time modeling for User
- User defined flight path

```
Counter = 1980:
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Flight Status           = 1
Position                (LLA)   = 0.600617, -2.09206, -60.8525
RC Commands             (r/p/y/thr) = 0, 0, 0, 0
Velocity                (vx,vy,vz) = -0.00211503, 0.000305255, 0.00302825
Attitude Quaternion    (w,x,y,z) = 0.0494436, -0.0222339, 0.0176209, -0.998
374
-----

Counter = 1985:
-----
Flight Status           = 1
Position                (LLA)   = 0.600617, -2.09206, -60.8525
RC Commands             (r/p/y/thr) = 0, 0, 0, 0
Velocity                (vx,vy,vz) = -0.00211503, 0.000305255, 0.00302825
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374
-----
```