Reality Capture

What is it?

Reality Capture describes the digital processes for **acquiring site data and creating 3D models of physical objects** and can combine several alternative data sources including **LIDAR**, **photogrammetry** and **GIS**.

Reality Capture

How is it done?

Drone Photogrammetry

What is it?

Drone Photogrammetry is the **science** of taking measurements from photographs.

It's commonly used in surveying and mapping applications, as well as in 3D modeling.

Process calculates measurements between each pixel in the photo by triangulation

Photogrammetry in Real Life – Your Eyes!

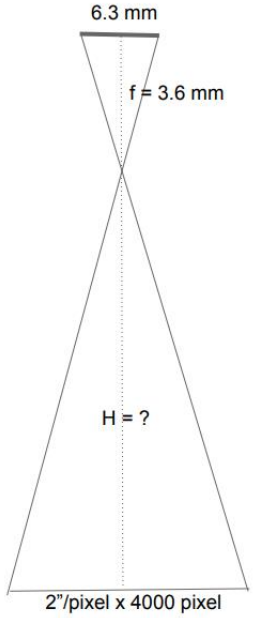
- **Your eyes are like two cameras**, constantly processing a live feed of your surroundings.
- Your eyes are spaced to provide two inputs at slightly different angles.
  - Your brain knows how far apart your eyes are **(two known points)**
  - Turns both “feeds” into a single perspective with depth perception
  - “Finger in Front of your Nose” example
- This is similar to the processing of drone flight data

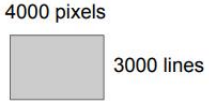
Drone Photogrammetry

Mission / Planning

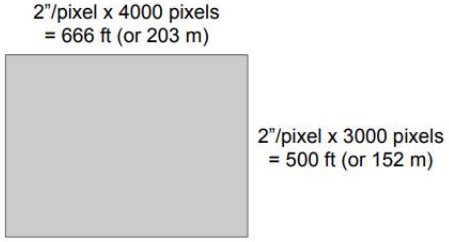
Drone Photogrammetry

Mission / Flight Planning





If we want each pixel to cover about 2" by 2" ground size, the flight height is about 380 ft (or 116 m)



Flight Height Calculations

From the scale calculation formula, we know that UAS photos captured at 380 ft cover an area of 666 x 500 ft (or 203 x 152 m)

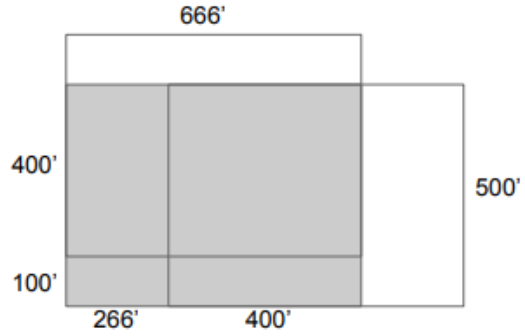
Photo width: 4000 pixels x 2 inches/pixel = 666 ft (or 203 m)

Photo height: 3000 pixels x 2 inches/pixel = 500 ft (or 152 m)

Overlapped length between neighboring photos:

Forward (along flight path) 80%: 500 ft x 80% = 400 ft (or 122 m)

Side (between flight paths) 60%: 666 ft x 60% = 400 ft (or 122 m)



Flight Path Overlap Calculations

Drone Photogrammetry

Mission / Flight Planning

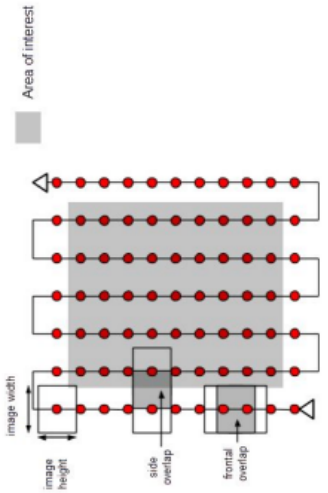
Distance between photos: 100 ft (or 30 m)

Distance between flight paths: 266 ft (or 81 m)

If fly speed is 10 mph, then the photo caputre rate is: 100 ft / 10 mph = 6.8 seconds.

If the caputure rate is 5 seconds per photo, then the fly speed is: 100 ft / 5 sec = 13.6 mph.

Flight Speed Calculations



If the study area is 1 mile by 1 mile and the image capture rate is 5 seconds per photo, then:

1) the total number of photos is:

5280 ft / 266 + 2 = 22 (flight paths)

5280 ft / 100 + 2 = 55 (photos per path)

55 x 22 = 1210 photos

2) the total flight time is:

1210 photos x 5 seconds = 100 minutes

3) the total file size is:

1210 photos x 11.5 MB = 13.5 GB

Final Flight Plan Loaded into Drone

Drone Photogrammetry

Survey / Ground Control

Ground Control Targets are
Set in Field Throughout
Flight Path Area

Control Target Coordinates are
Determined by Survey Grade GPS
or Traditional Survey Equipment

Drone Photogrammetry

Regulatory Requirements

- Pilot license / certification required
- Drone registration with FAA required
- Flashing beacon required on drone for flights after dusk
- Approved flight plan required in certain areas based on proximity to airports and other sensitive locals
- Remote ID tag broadcasting location is a new requirement later this year.
- And don’t forget insurance!!

Now we are ready to fly and get our data!

How is this information used?

Drone Flight Deliverables

- **Digital Surface Model**
  - Used by surveyors to create topographic surfaces and spot grades
  - “Virtual Surveyor”
- **Orthophoto (Demo)**
  - High Resolution Aerial Photograph that is scalable and used for mapping by surveyors
- **Point Cloud (Demo)**
  - Contextual Model that can be used by Architectural / Engineering Design and Visualization Software

Design and Visualize in Context

Example Project

Design and Visualize in Context

Example Project