3d modeling from photography and LiDAR
What technologies are needed?

• Photogrammetry
  • Merging multiple photographs to create 3d information.

• LiDAR
  • Combining an active laser and sensor to measure distances.

• 3d Modeling
  • Using software to create vectorized polygon data in a 3d environment.
Current state of technology

• Still more of a hobbyist application.
• Smart phones, 3d cameras, integrated apps with desktops.
• Cloud computing offers more availability to a wider audience.
Applications?

- Capture real world 3d models.
- Depending on hardware used, can be anything from simple objects like a car, to a base model for future advancement (like in this presentation).
Autodesk 123d Catch

- **Smart Photo limits**: Maximum of 40 images.

- **Downsized photos**: Scaled down for faster upload to cloud, and merged into conglomerate texture for final model.

- **Limited texture map size and polygon count**: No control over variables. You get what you get.

- **Lightweight by design**: Autodesk’s 123D app isn’t meant to be a professional solution or replace professional solutions.
How does it work?

- **3d Parallax**: The solver needs depth information from imagery. If you circumnavigate around the object of interest, taking pictures every 10-20 degrees, a library of 3d information will help create the geometry.

- **Overlap**: Try to collect as many photographs from around the object as possible, and at various elevations. The more pictures the less post production.

- **Scale**: Getting an accurately scaled model directly from 123d catch is difficult, use either reference points or aerial LiDAR data to line the model up to.
How does it work?

- **Limit the motion of the subject**: The design of the software expects that everything in the scene is stationary. If objects do move around, the features identified in the scene will generate incorrect distances, essentially building a ‘globular’ 3d model.

- **Textures are required**: The exterior textures on the object are needed for realistic aesthetics. They will also reduce the need for extra geometry, as a picture of a window takes less geometry than an actual 3d modeled window.
Example of 123d Catch
123d photo examples
123d Catch

- Uploading process takes a few minutes
- Processing time can take more than a few minutes
- Once finished simply download textured model from Autodesk website, link is provided in email
123d Catch Website
123d model example
Alternatives to 123d

- Open source photogrammetry
- ARC3d
- Hypr3d
- StereoScan
- My3dscanner
- Phov
- Python Photogrammetry Toolbox
- Vissim
LiDAR terrain

- Separate out veg vs bare earth
- Created .5m dsm
- Convert to mesh
- Texture with aerial imagery
Imagery / Aerial + Terrestrial

- High resolution imagery required for 3d animations.
- Create a vectorized bounding box around aerial imagery, convert to polygon / used as UV map.
- Use camera with exposure and f-stop settings for high resolution texture capture.
LiDAR terrain example
3d modeling process

• Zero data
• Make sure all same units (ft vs M)
• Import UV from aerial imagery
• Align Lidar terrain texture to UV texture
• Post production as needed
3d model example
Conclusions

• Easy

• Minimal Hardware Requirements

• Licensing Issues

• No substitute for LiDAR .... At least not yet ☺
Other free software

- Blender
- Meshlab
- Gimp
- Cloud compare