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AERIAL PHOTOGRAPHY: MAPPING CAMPUS LANDSCAPING

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ABSTRACT

PSU's Facilities Management (FM) has a need for digital representation and inventory of the native vegetation in the landscape beds on campus property. This project aims to test which method of aerial photography, pole-mapping or drone footage, would work best to reconstruct the vegetation in digital form, an orthomosaic. We began by collecting drone footage, but as many of the campus beds are hidden beneath the foliage of taller trees, we needed to use pole-mapping as well. Data collected was substantial, the drone alone produced 679 photos, images needed to be reduced, eliminating irrelevant photos, as well as organized into individual landscaping beds. These images are then uploaded to the SfM software PhotoScan, which uses photogrammetric processing of digital images to generate 3D spatial data. Once in the software, each individual photo was masked to hide background objects from the final product and aligned to begin constructing the 3D image. The user builds a dense cloud, adds mesh, builds texture and then creates an exportable orthomosaic, for ArcGIS. The orthomosaics created from drone footage can be easily projected to state plane in GIS, due to GPS within aircraft. Before creating an orthomosaic from the pole mapping photos, the model must be rotated to align the (x, y, z) in PhotoScan. Once aligned, the orthomosaic can be created and uploaded to ArcGIS to be georefferenced with GCPs or building footprint, this project used the base map in ArcGIS. Once aligned in GIS, the plants can be identified by points or polygons, producing the deliverable for FM, a georefferenced and inventoried map of vegetation in the campus Landscaping Beds.

Key words: Aerial Photography; Drone; Pole Mapping; PhotoScan; Arc GIS; Orthomosaic; Georefference; Vegetation Inventory

RESEARCH QUESTION??

WHICH METHOD OF **AERIAL PHOTOGRAPHY** WILL WORK BEST TO **RECONSTRUCT CAMPUS** LANDSCAPING BEDS IN **DIGITAL FORM?**





COLLECTING DATA

Drone

Pole-mapping

+ Fast+User Friendly+GPS on aircraft

- -Expensive
- -Lots of obstruction
- -Weather dependant

+Inexpensive

- -Heavy
- -Trick camera angles
- -Time Consuming
- Not georefferenced





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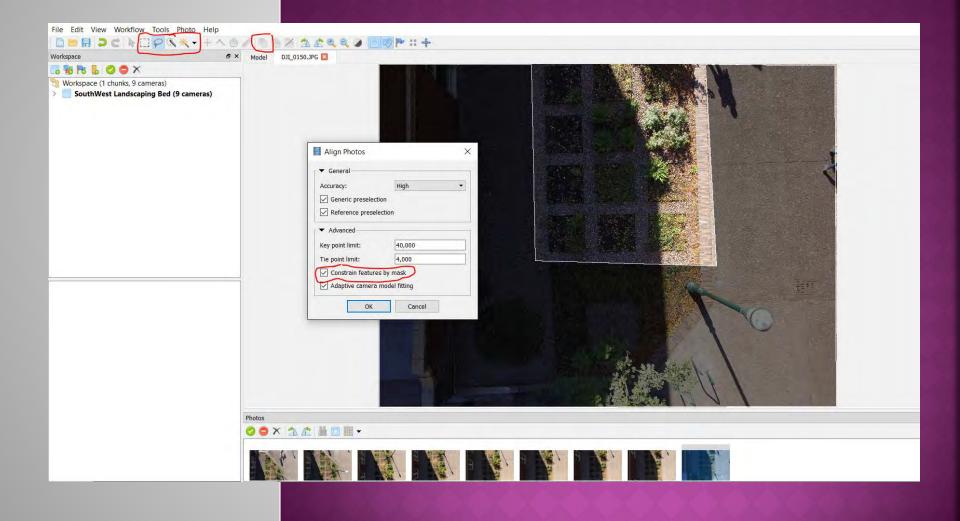
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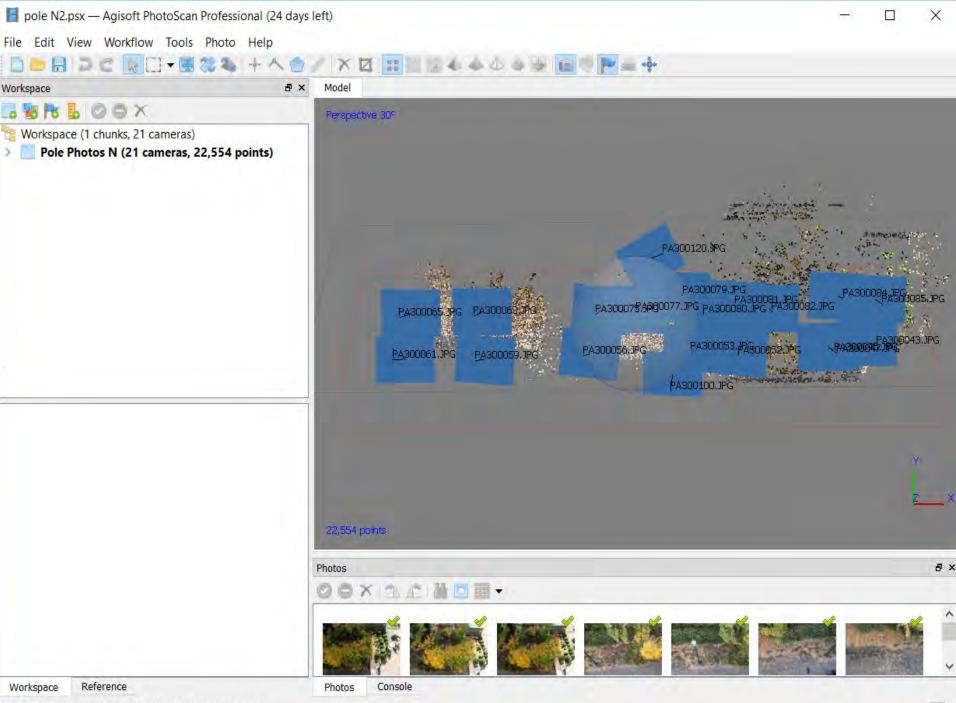


MASK PHOTOS mask all irrelevant elements on the source photos

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ALIGN PHOTOS

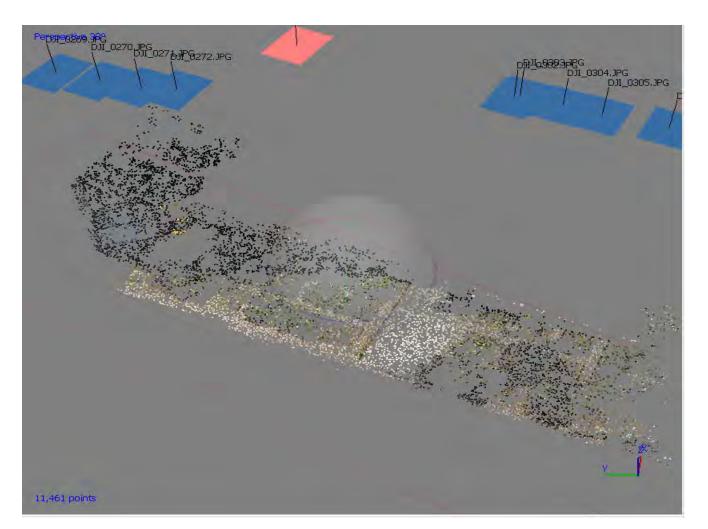




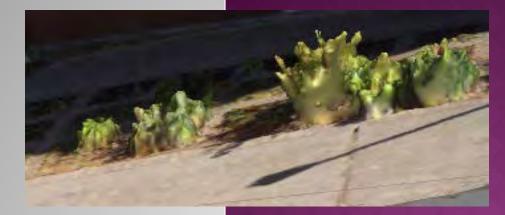
Display dense point cloud colored by point classes

BUILD DENSE CLOUD

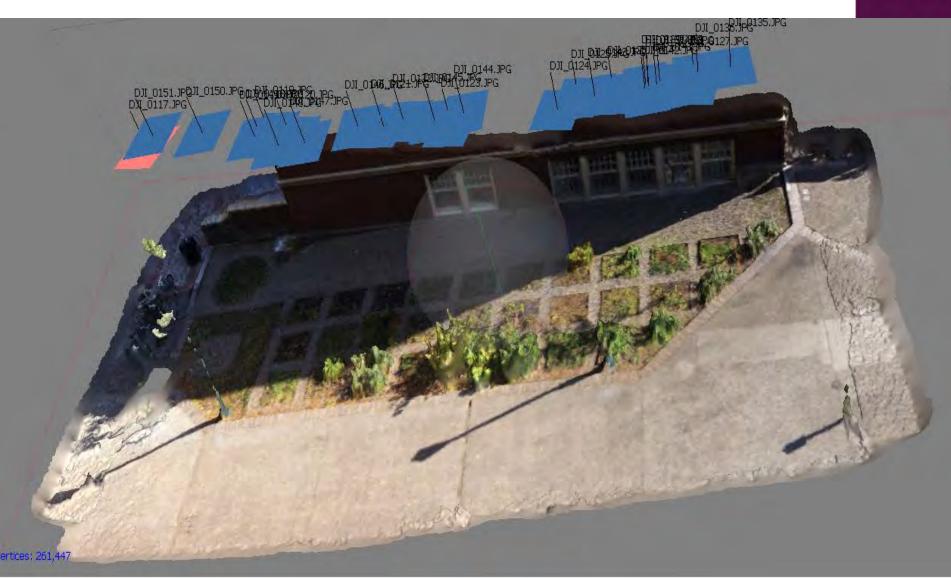
Based on the estimated camera positions the program calculates depth information for each camera to be combined into a single dense point cloud



BUILD MESH



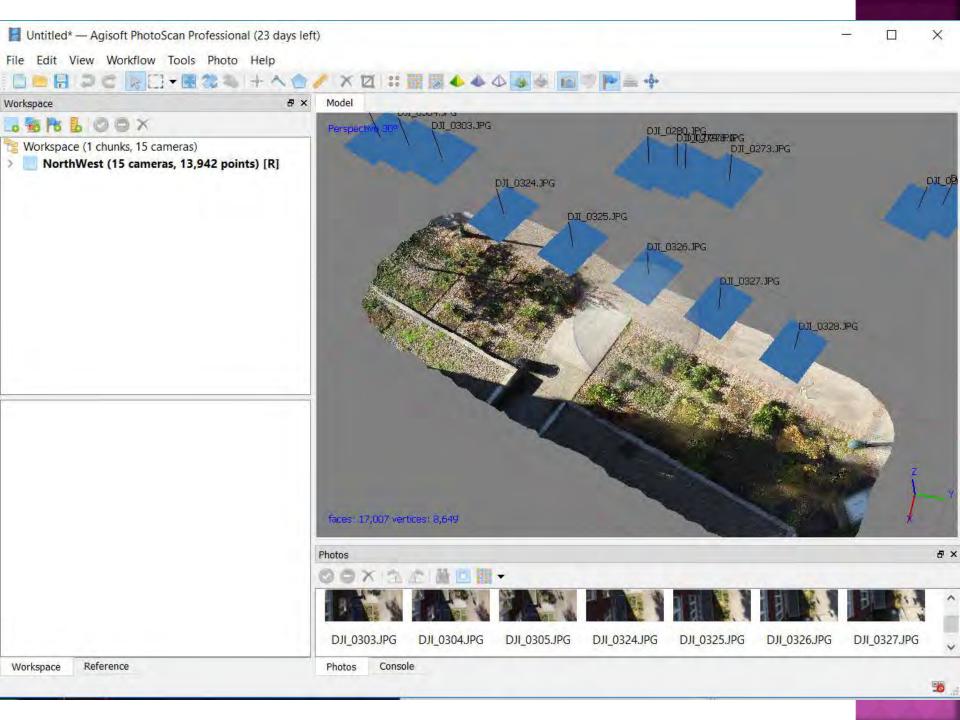




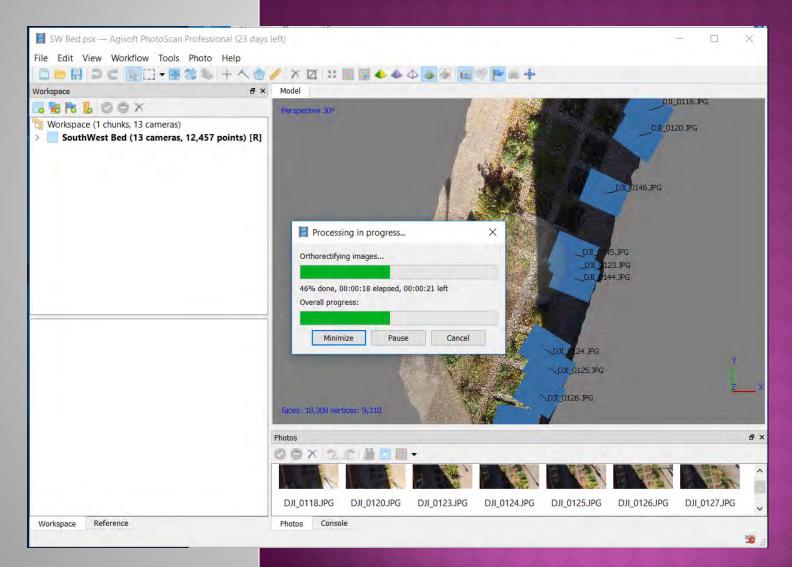


BUILD TEXTURE





CREATE ORTHOMOSAIC





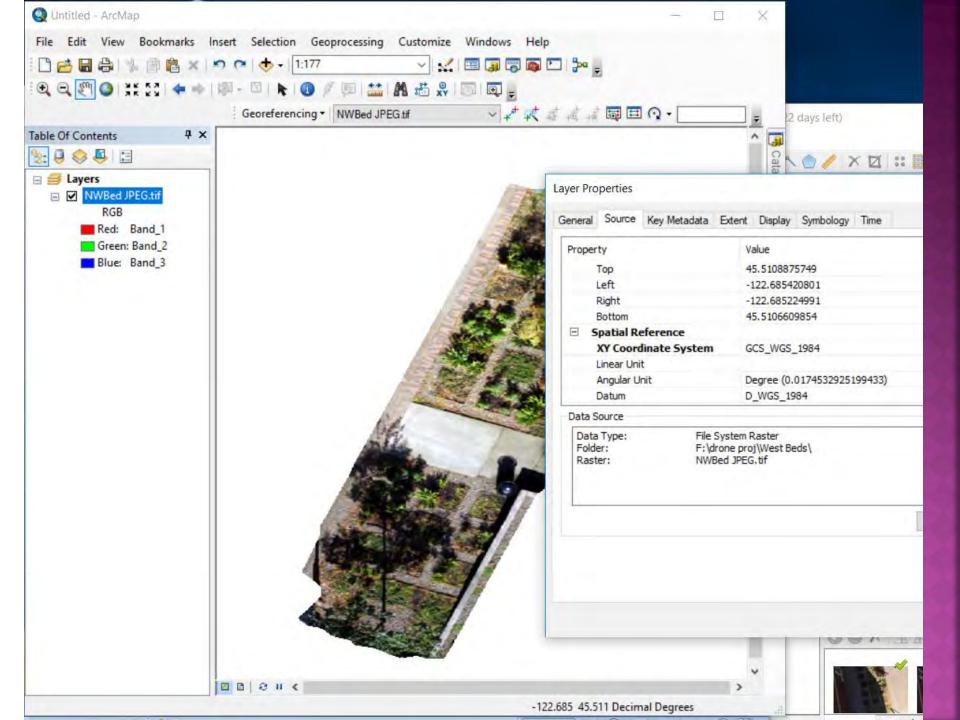
EXPORT TIFF-> UPLOAD TO ARCMAP

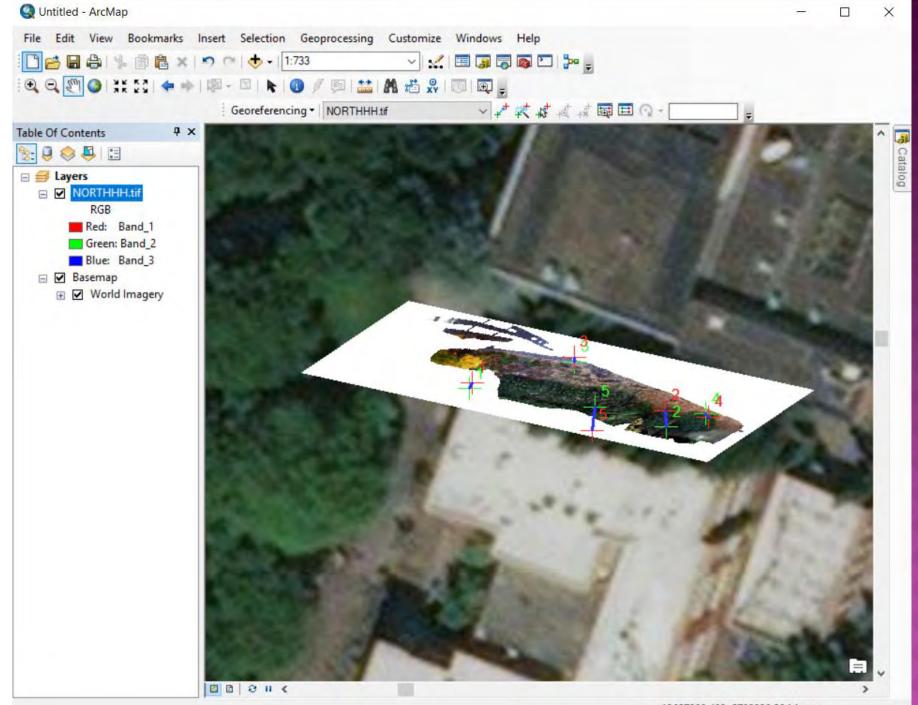
DRONE-

- Export ortho in TIF
- Open in ArcGIS
- Project to state plane
- Adjust to align with map
- Oreate Features

Pole-Mapping

- Use tool to rotate model (align x,y,z)
- Export ortho in TIF
- Open in ArcGIS
- Rectify with GCP or building footprint (base map)
- Add Control Points
- Oreate Features





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Add Control Points

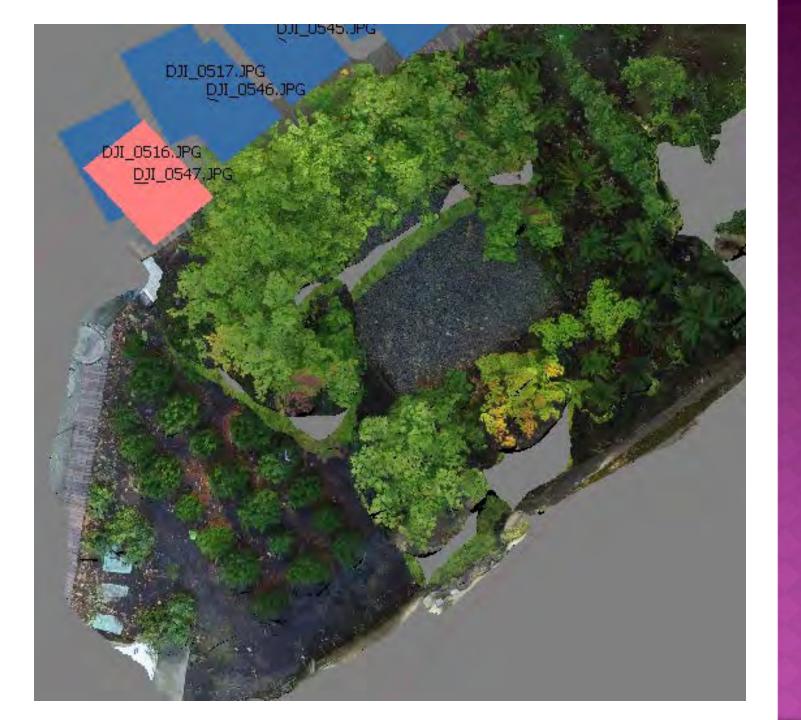
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OBSTACLES AND LIMITATIONS









Conclusion

ACKNOWLEDGEMENTS

Geoffrey Duh, Andrew Daws, Facilities Management, PhotoScan, ArcGIS