

Digital Surface Modeling Using Stereo Imagery

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What is a Photogrammetric DSM?

- Not a true “point cloud”, just a grid with elevations
- Output data is typically .las, but can be raster
- Derived from stereo imagery



Creating a DSM from Stereo

Required:

- **Controlled, parallax free stereo imagery**
- **Software (Socet GXP using the Auto Spatial Modeler (ASM) module)**
- **Horsepower (Most DSM software takes advantage of GPUs, buy the best graphics card, then buy another...)**
- **Storage (2015 DSM for WA State = 100TB+)**
- **Learn coding (File management, batch processing)**
- **Patience (2015 WA = 9 months of processing)**



DSM Creation Process

Software preforms two steps:

1. Correlation (Pixel Matching)
 2. Interpolation (Filling in the holes)
- Correlation is directly controlled by the strategy file used to determine found points (the strategy file used will have the greatest effect on the quality of the output data, spend time getting this right. LOTS of testing, comparing output to first return LiDAR)
 - Interpolation is controlled by the strategy file as well, but can also output only found points (lots of holes)



Correlation Tips and Tricks

- **Water, shadows, wind = Bad Correlation**
- **Focal length of camera is important for forest applications (short focal length = looking at the side of the tree)**
- **No Parralax! (can't stress this enough)**
- **As much overlap as possible (ideally 80% in flight, 50% sidelap, but this is unheard of)**
- **Camera system used (WA 2015 = ADS100 series, pushbroom sensor)**
- **Change detection? Use the same camera and strategy file! Compare apples, oranges muddy the water...**



Correlation Tips and Tricks

- **Software Evaluations:**
- **Match every pixel?**
- **Access to “strategy” files (algorithm settings)?**
- **Manipulate settings for interpolation and correlation independently?**
- **Batch processing?**
- **File output options?**
- **Log/results file?**



Uses of DSM:

- **Beats me, I'm just the dumb data guy.**
- **DNR uses it for Forest Inventory mainly, but starting to get more interest in change detection and fire control.**
- **Did some testing for the USFS using Wyoming NAIP stereo imagery, good results!**
- **Lots of interest from UW students**
- **Just glad people are getting the word out about this technology**



Why even create a DSM, don't we have LiDAR?

- Lidar is very expensive! DNR purchased whole state stereo for fraction of the cost of whole state LiDAR (which we don't have, by the way...)
- While it may not be as accurate as LiDAR, it's close, and costs a fraction.
- Repeatable, lets be honest, it will be a while before LiDAR is reflown. The NAIP/HXIP imagery program is on a two year cycle lately.
- Complements, not replaces, LiDAR.
- Still need LiDAR for a good bare earth, allows for accurate tree/structure heights from the stereo DSM.



Questions? Want some sample data?

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