LIDAR Seminar at OSU – Taylor Key Words / Summary Notes
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LIDAR – Light Detection and Ranging

Premise: Aerial survey of Earth's surface using laser pulses, traveling at speed of light, from aircraft to ground surface and back. If aircraft position and 2-way travel time of laser pulses are known, land surface elevation and land cover can be derived.

EM spectra – typically using near Infrared wavelengths

Pulse rate: ~100 kHz = 100,000 laser pulses per second

Point Density 2 / sq m to 8 per sq. m

Key Concepts and Terms

Land Classification
Ground
Point Cloud
First Returns
Last Returns
Post-Processing Algorithms
1-m DEM; 10-m DEM
Land Cover Model vs. Bare Earth Model
Accuracy – position vs. correction
50% sidelap in flight lines = typical
TIN = triangular irregular network (a grid model)
Grid matrix
Nadir – center point vertically below aircraft
Higher altitude flights = less expensive (less data to process, longer pulse travel times)
Lowe altitude flights = more expensive (more data to process, shorter pulse travel times)
Data Correction: aircraft gyroscope, roll-pitch-yaw
Leaf-on vs. Leaf-off data collection
Leaf-off = more ground returns
Oregon Lidar Consortium
Puget Lidar Consortium
Fog / Clouds absorb radiation, make flights difficult, effects point density and intensity (avoided)
Lidar point density vs. Lidar intensity (strength of return pulses; absorption vs. reflection)
Absorption reduces intensity; Black objects absorb, white reflect, Lidar does not penetrate water

Flight planning factors: pulse density, flight line overlap, accuracy/position needs, flight time, air conditions, mobilization costs/location, GPS satellite schedule, GPS coverage quality

Wing tipping – reduces reception, signal loss

Monitoring pulse returns and intensity to assess absorption, reflection; pulse rate, returns, point density
Water < reflection
Real-time swath monitoring and raw data visualization
“returns” of pulses: percentage of initial signal
Frequency = pulse rate per second
Deliverables: GIS Maps/databases, DEMs, survey/engineering reports, raw ASCII x-y-z data files
Ground elevation point data: x,y,z; raw vs. filtered
LIDAR covers a lot of ground, more robust and accurate over larger areas compared to ground surveys

Applications:
Watersheds, geomorphology, landslide/fault detection, firs-return vegetation models, bare-earth models, vegetation rendering/modling, first-return models allow land cover classification, DEM-based hydrologic modeling

John Day Basin example given

modeling of woody debris, forest inventory, land change studies, mapping power lines, 3-D urban footprint models

can fly at night

Lidar types: discrete (typical), full wave form, ground based lidar, mobile lidar, “green lidar” for penetrating water and bathymetric mapping

Cost: for Oregon Lidar Consortium, flying areas over 250,000 ac = $0.78 / ac; for small projects less than 60,000 ac, highly variable based on needs/conditions up to $30-40/ac.