

Experiment Description: High density LIDAR for change detection

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Support Crew: 1-2 people to help move target objects and mark locations before collection. Time required should be minimal.

Short Title: High density LIDAR

Objectives: This experiment will examine the detectability of object movement when partially obscured by foliage. The objective is to capture high-density LIDAR over an area containing multiple objects under trees that will be moved between flightlines. The study area will be small, on the order of 0.5x0.5 km, and require multiple flightlines to achieve the required total density of 250-350 pulses per square meter. Objects will be moved after half the flightlines have been collected.

The high pulse density will allow for detection of targets under trees and is required because of low foliage penetration. The final dataset is intended to be used for voxel-based change detection.

Reflectance targets will allow for calibration of the LIDAR intensities, and VNIR imagery will provide partial truth data.

Deployments: One or two cars will be under groups of trees in different areas, ideally in places with little to no sub-canopy foliage. Several large (2-3 m) boxes or tents will also be deployed nearby. Cars and some objects will move by at most 30 feet to new locations after half the data has been collected (see below). Canopy obscuration for all these objects should be roughly 30-90%.

Reflectance calibration targets at least 2m in size should be placed within the study area, but without obscuration. Panels should be at least 10m from obscurants and ideally in sunlight (though not required). Standard black and white diffuse canvas tarps are fine, and may be shared with other experiments. See Figure 1.

Flight Lines: Target area is a subset of the main Avon site. Position and size of study area will depend on possible object placements and LIDAR parameters used. The study area will be 0.5x0.5 km at most. Overlap of the study area with other experiments is fine as long as other targets remain at least 20m from target objects.



Figure 1. Approximate study area and target deployments.

Flight Constraints:

LIDAR should be collected from as low an altitude as possible to maximize the return signal strength. The flight pattern should be divided into 2 sections with identical flight tracks, for collection before and after object movement. Flightlines for each half must be arranged such that the number of angles each part of the scene is sensed from is maximized, including nadir and at least 20 degrees off-nadir. Time between flightlines should be minimized, with approximately a 5-10 minute gap between halves to move targets. Number of flightlines should be chosen to achieve 200-350 pulses per square meter total.

Time of day does not matter. Low-lying fog must be avoided. Clear sky and low-wind conditions are ideal, but not required.

WASP VNIR imagery should be collected during all the same flightlines as LIDAR. Ideally images are captured with 30-50% overlap and cover an area larger than the swath width. Ground resolution should be better than 0.25m GSD. These images are not absolutely critical to

the experiment success, but are desirable for good ground truth and possible future experiments.

Ground Truth Required:

GPS positions of targets before and after movement are required. Reflectance spectra of targets and calibration panels are required, but may be taken after the experiment is complete (within days). Wind speed in or near target area sometime during collection would be nice. Photos of targets should be taken before and after movement, but not during collection.

Equipment:

GPS for before and after collect measurements (not during).
Radio
15-20 small metal stakes to hold down light objects
20-30 small stakes or flags to mark object locations
Camera and photographer to document object positions
1 roll duct tape of any color
Several large boxes or tents (TBD)