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Whalen Abstract

Can Laser Scanners be used to Historically Preserve Buildings

Historic or significant buildings often fall prey to deterioration or natural disaster. It's with a Historic American Building Survey that these buildings can be preserved. Historic American Building Surveys are historic records, regulated by the National Park Service, that contain all information of a building, such as measurements of doors and windows (Burns, 2004).

My senior thesis examines the National Park Services (NPS) statements on the use of laser scanner collecting measurements for a Historic American Building Survey (HABS). The NPS states that laser scanners are not capable of measuring all surfaces of a structure, can't take measurements of dark surfaces, are not time efficient, and are lower quality than the current standard of taking hand measurements (National Park Service, 2016). I sought to determine if the laser scanners used by the Ithaca College Department of Physics, 3D Laboratory, run by Professor Michael 'Bodhi' Rogers, either agreed or disagreed with the NPS statements. The laser scanners owned by the laboratory are the Leica ScanStation C10 and the Leica ScanStation P40. If these laser scanners do not have any of the negative traits stated by the NPS, then it is fair to say that our laser scanners can be used on a HABS.

The technique accepted by the NPS to collect measurements for a HABS is called hand measurements. Hand measurements involves the use of a long metal measuring stick, a bubble level and ladders (if necessary), to collect dimensions of architectural features of buildings (National Park Service, 2011). Measurements of these features are collected by measuring the horizontal width, starting at the top of the feature moving down 5 inches at a time.

The C10 and P40 use a time of flight laser scanning technique to collect measurements of every surface the scanner can see in its line of sight (Leica Geosystems, 2017). The C10 and P40 create a point cloud when scanning that is representative of the surfaces that were scanned. From these point clouds measurements of the scanner architectural features can be made.

Data was collected at Grants Cottage and Schuyler House of a doors and windows. Of each door and window, hand measurements, C10 scans, and P40 scans were conducted. To ensure that the measurements were made at the same locations, painter's tape was placed where the widths of the door were to be collected. The use of painter's tape was not used to compare hand measurements and point cloud measurements previously. By adding the use of painter's tape I hoped to reduce the uncertainty of selecting the correct measurement location in the point cloud.

The result of previous testing using the C10 scanner, without the use of painters tape, was that the scanners measurements agreed with the low quality of data stated by the NPS. This meant that our scanners could not be used on a HABS because the measurements made in the point cloud were not similar to the hand measurements.

The result I found, for the C10 and P40 scanners, when using painters tape to mark where measurements should be made, was that both the C10 and P40 disagreed with the NPS statement, and therefore these scanners can be used on a HABS. The comparison of the hand measurements to the point cloud measurements showed that the measurements could not be distinguished as different measurements.

This research was significant two distinct ways. It showed that reducing uncertainty by adding painter's tape improved the measurements in the point cloud. This demonstrates how important evaluating your measurement method is, and how improving measurement methods can have an impact on results. This research also demonstrates that laser scanners are as accurate, if not more accurate, than hand measurements. This is especially significant because it can change the views that the National Park Service currently has towards laser scanners.

Works Cited

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