AUTODESK UNIVERSITY

TR20540

A Case Study: Huntington West Virginia- Collect, Extract, and Visualize Assets with Mobile Mapping

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Learning Objectives

- Learn how to collect asset- and survey-grade data with Mobile Mapping
- Learn how to extract intelligence from Mobile Mapping using InfraWorks
- Learn how to export Mobile Mapping data for design process
- Visualize assets across the enterprise

Description

West Virginia Department of Transportation (WVDOT) and Transcend Spatial Solutions completed a pilot project to collect mobile LiDAR (light detection and ranging) for 281 miles of roadway in Huntington, West Virginia. The imagery and LiDAR data were collected in 5 days and processed to point clouds and corresponding video in 40 hours. Features were extracted by bringing the point clouds into InfraWorks software, where the terrain was processed, vertical features were classified, and feature modeling was used to extract features. The extracted features were loaded into a geodatabase and made accessible through WVDOT's existing straight-line diagramming application called Road Analyzer. Other existing roadway characteristics and Highway Performance Monitoring System (HPMS)-related attributes are also available through the Road Analyzer interface. This class will outline the project objectives, approach, results, and next steps. We will include a demonstration of the imagery and point cloud viewer, as well as the straight-line diagramming environment. This session features InfraWorks 360 and AutoCAD Civil 3D

Your AU Expert(s)

Bradley Adams
Brad has been actively involved with Departments of Transportation for 29 years implementing technology innovations from InRoads, GEOPAK, Civil3D MicroStation and AutoCAD Engineering Design software to Terrestrial Laser Scanning to Aerial Mapping and LiDAR to Mobile Mapping. Currently Brad is integrating Mobile LiDAR Mapping for Asset and Survey deliverables to provide exceptional data across the entire enterprise.

Ramesh Sridharan

Ramesh has been working with reality capture point clouds, image processing, and machine learning based software development since 2001. With over 15 years of experience, he has successfully driven programs in research and development, technical sales, partner marketing,

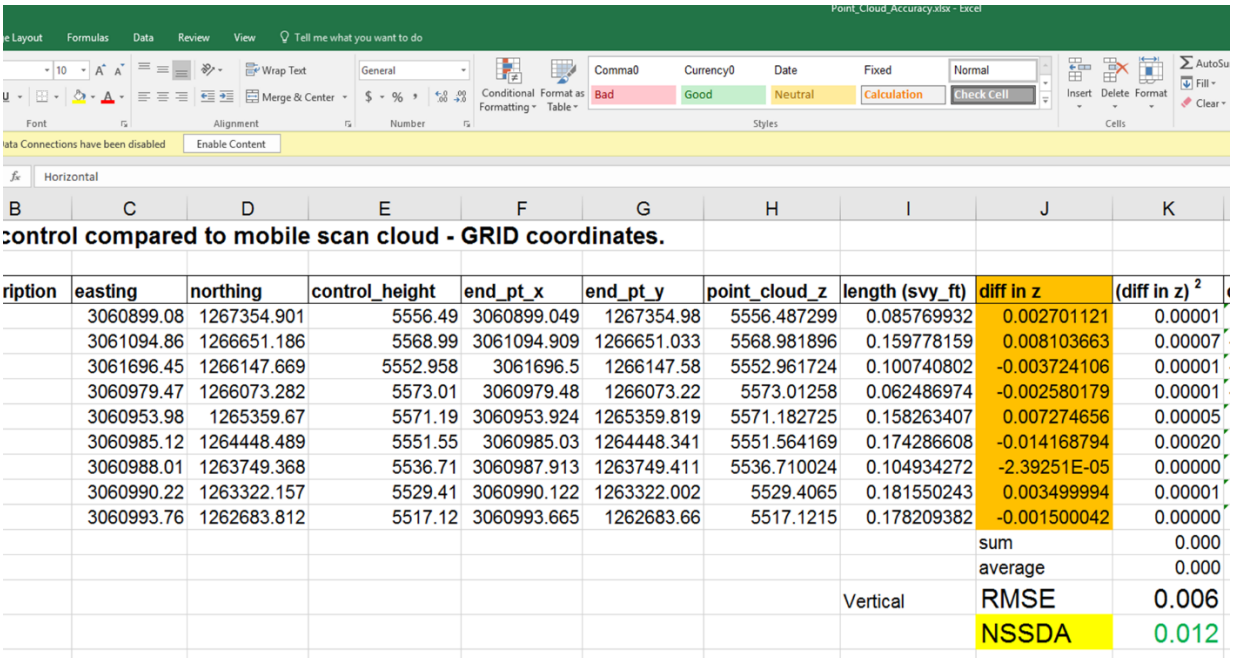
and customer analysis He is a pioneer in the field of reality capture point cloud product development that can handle and extract information from a large number of 3D datasets. As a Principal Product Owner in the Product Development Group (PDG) since he joined Autodesk in 2014, Ramesh is responsible for information extraction from Reality Capture for AEC applications.

LiDAR Experience

Mr. Adams has worked with LiDAR from the very beginning starting with terrestrial scanner #24 in the world in the early 2000s and has grown with the technology to the Mobile Mapping System of today. The technology currently provides exceptional data collection at rapid speeds with full video log. This data is suitable for infrastructure asset collection and survey data collection. Systematic

Analysis of Mapping Data

Mobile Mapping is still a relatively new technology so the results must be analyzed and refined to meet the specific needs of the users and produce the anticipated accuracies. Multiple projects have been checked against standard survey control. The results generally produce absolute accuracies closer than 2 centimeters with relative accuracies of 5 millimeters.



Point_Cloud_Accuracy.xlsx - Excel

Layout | Formulas | Data | Review | View | Tell me what you want to do

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Horizontal

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control compared to mobile scan cloud - GRID coordinates.									
ription	**easting**	**northing**	**control_height**	**end_pt_x**	**end_pt_y**	**point_cloud_z**	**length (svy_ft)**	**diff in z**	**(diff in z) ²**
	3060899.08	1267354.901	5556.49	3060899.049	1267354.98	5556.487299	0.085769932	0.002701121	0.00001
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	3061696.45	1266147.669	5552.958	3061696.5	1266147.58	5552.961724	0.100740802	-0.003724106	0.00001
	3060979.47	1266073.282	5573.01	3060979.48	1266073.22	5573.01258	0.062486974	-0.002580179	0.00001
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	3060985.12	1264448.489	5551.55	3060985.03	1264448.341	5551.564169	0.174286608	-0.014168794	0.00020
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	3060990.22	1263322.157	5529.41	3060990.122	1263322.002	5529.4065	0.181550243	0.003499994	0.00001
	3060993.76	1262683.812	5517.12	3060993.665	1262683.66	5517.1215	0.178209382	-0.001500042	0.00000
								sum	0.000
								average	0.000
							Vertical	RMSE	0.006
								NSSDA	0.012

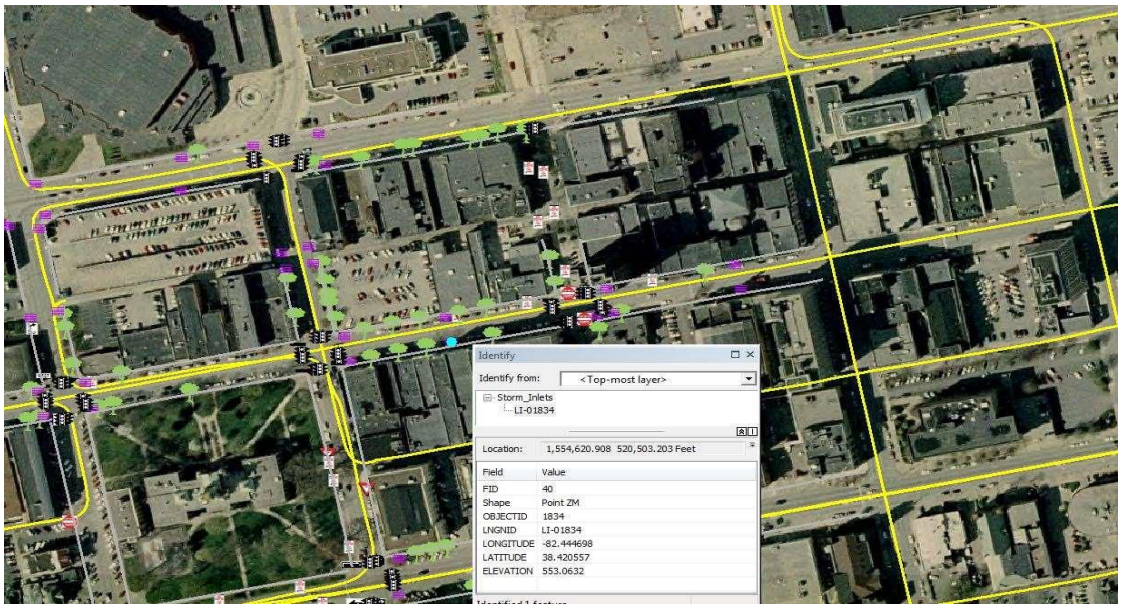
Asset Inventory and Publication

All 281 miles of the city of Huntington West Virginia was driven with the Pegasus Mobile Mapping system to capture high quality point clouds and full video log. The project took 5 days to collect, 40 hours to post process, and 8 man weeks to extract.

The project called for the extraction of local signs, signals, storm inlets, trees in planters, and the centerlines of sidewalks. Below are the project specifics.

- Local Signs- 10,336
- Signals- 1,064
- Storm Inlets- 3,374
- Tree Planters- 259
- Sidewalks- 964,358 feet

All the features were collected in an ARCGIS format as point features and shape files for the sidewalks and the features contain appropriate attributes for the features providing exceptional intelligence coupled with survey grade accuracy.



Finally, all the features are visualized in the mapping environment such that the client can see exactly what has been collected.

Autodesk Point Clouds Feature Extraction

Point clouds are a great dataset for Infrastructure projects, however they can be challenging to work with efficiently. As these types of projects can be quite large, the point cloud files become even more difficult to handle due to the file sizes. The point cloud itself is considered non-intelligent (only a mess of 3D points), it is necessary to extract usable data from the point cloud for design purposes. Currently users have to go through the painful task of either removing noise (or non-ground) points manually, or extracting/digitizing breaklines to create a terrain (which is not as information rich as point cloud data). In either case, it is not easy to generate terrain with point clouds and then there is the additional process of triangulating a large number of points.

The InfraWorks 360 Point Cloud Terrain generation tool takes care of these pain points by filtering noisy data to deliver thin (information rich) point clouds and extract terrain raster. These point clouds can then be used for design in Civil 3D to create triangulated terrain directly or enforce breaklines for more detail. With these thin point clouds, sharing and using point cloud data is no longer science fiction to the point cloud industry.

The InfraWorks 360 Point Cloud Modeling tool, enables user to create 3D virtual worlds from reality capture data by intelligently replacing features in point clouds with models in real world. All the extracted information are stored in geo-located coordinates so that users can export lists of assets, terrain and other information in proper geo-coordinate systems maintaining the consistency and resolution meant for the intended project.

These tools and others will be discussed in more detail in course TR18477-L:
Using Large Point Clouds for Infrastructure Projects. However, these topics, techniques and tools will be highlighted in this course in less detail. As an additional source of reference, the handout for TR18477-L is provided as an addendum to this course.

Next Generation Products

In addition to the features that were collected for this project, a full suite of features are available from Mobile Mapping data including:

- Survey Deliverables
- Intensity Images
- Contours
- Edges of Pavement
- Lane Lines
- High Definition DEMs
- Pavement Slope Analysis
- Flow Aspect Models
- ADA Ramp Compliance
- CADD Deliverables
- GIS Deliverables