

UTC Project Information	
Project Title	UAS Image-Based Point Clouds to 3D BrIM: 3D As-is Bridge Model Generation
University	Oregon State University
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Total Project Cost	\$80,000
Agency ID or Contract Number	69A3551747110
Start and End Dates	August 16, 2019-February 15, 2022
Brief Description of Research Project	<p>This study developed a framework that enables to convert image-based point clouds to a Bridge Information Modeling (BrIM) in an efficient manner. The framework implements camera-based Unmanned Aerial Systems (UAS) along with multiple computer vision algorithms to collect bridge information, generate a point-cloud model, and place created BrIM components in the point cloud scene. An illustrative case study was conducted on an existing bridge in Corvallis, Oregon using the proposed framework to test its feasibility and efficiency. The results of the case study demonstrated the feasibility of rapidly generating BrIM using the proposed framework. The proposed framework showed potential to address some of the problems associated with the current BrIM generation process in terms of cost-efficiency and effectiveness.</p>

Describe Implementation of Research Outcomes (or why not implemented)

To demonstrate the feasibility and efficiency of the proposed framework, an illustrative case study was conducted on an existing bridge located in Corvallis, Oregon. The data collection was conducted over two consecutive days in good weather conditions. With respect to the UAS imaging process, 1237 high-resolution images of the studied bridge were collected and used to create the point-cloud model. The generated point-cloud model for the studied bridge is shown in Figure 1. In the next step, the point clouds were processed using Dynamo in Autodesk Revit software to place and combine the created BrIM components. Figure 2 shows the point clouds in project coordinate system in Dynamo interface and Figure 3 shows the generated BrIM model of the studied bridge.

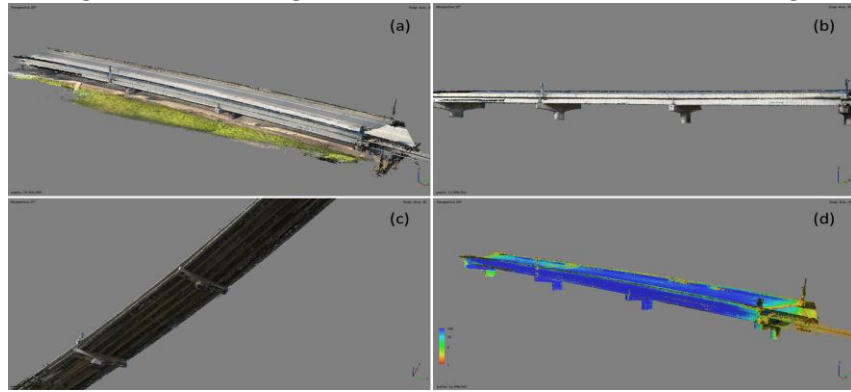


Figure 1. (a) Overview of the generated dense point-cloud model (ground points included); (b) side view of the point-cloud model; (c) bottom view of the point-cloud model; and (d) confidence map of the generated dense point-cloud model.

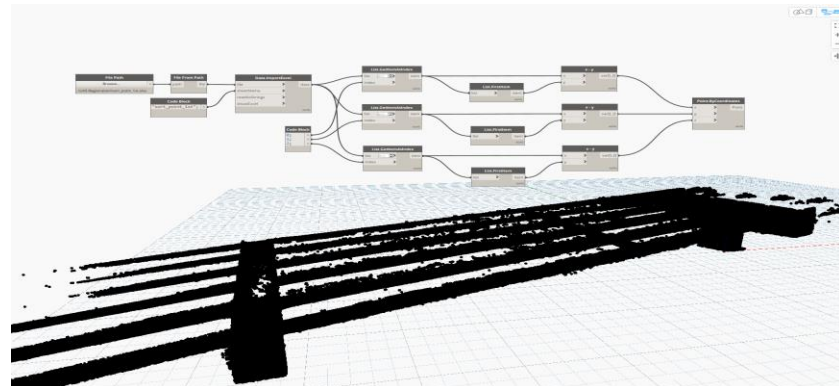
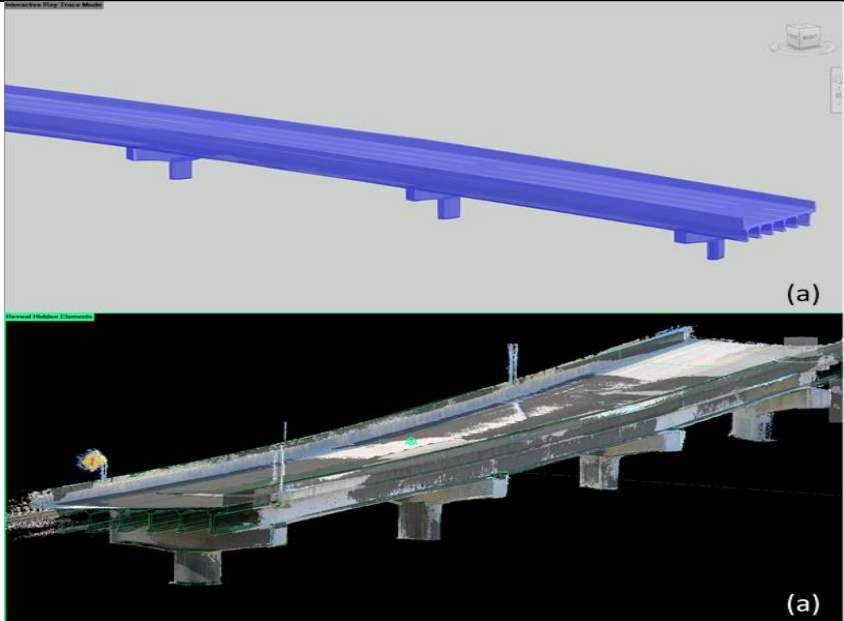


Figure 2. Point clouds in project coordinate system in Dynamo interface.

	 <p>Figure 3. (a) BrIM that was developed in Revit using the proposed framework, (b) Developed BrIM overlaid over the dense point cloud (BrIM model is in green color)</p>
<p>Impacts/Benefits of Implementation (actual, or anticipated)</p>	<p>The results of the case study demonstrated the feasibility of rapidly generating BrIM using the proposed framework. The proposed framework showed potential to address some of the problems associated with the current BrIM generation process in terms of cost-efficiency and effectiveness.</p>
<p>Web Links</p> <ul style="list-style-type: none"> • Reports • Project Website 	<p>http://depts.washington.edu/pactrans/research/projects/uas-image-based-point-clouds-to-3d-brim-deep-semantic-segmentation/</p>