UAS assisted pipeline modeling and inspection

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Main Objective

This project was awarded to University of Nebraska-Lincoln in order to develop technologies that enable high-efficient and low-cost autonomous inspections of pipelines and tanks using unmanned aerial system (UAS).

Figure 1. Aerial inspection of gas pipe system

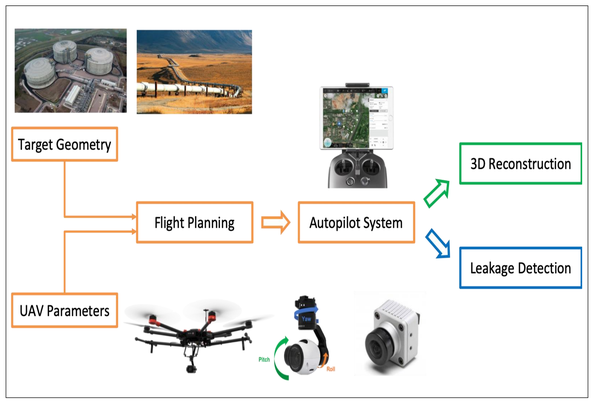

Figure 2. Overview of autonomous aerial inspection.

Project Approach/Scope

We proposed a holistic approach to integrate UAS inspection data acquisition and web-based data management tool to achieve high-efficient and low-cost UAS inspections. The scope of work includes: (1) to develop high-quality autonomous UAS inspection technologies; (2) to develop web-based inspection data management systems to store the chronological inspection data; (3) to develop an autonomous close-range gas leak detection technology using UAS-based infrared thermography.

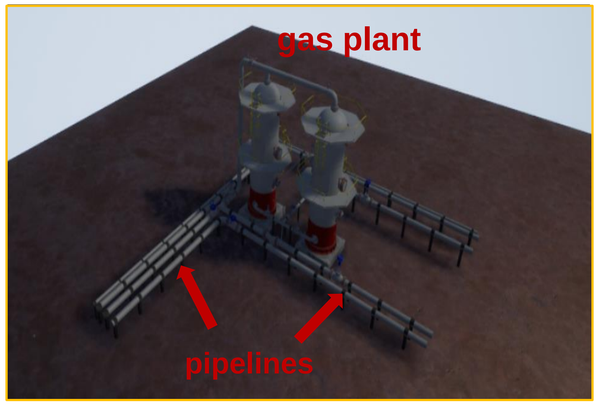

Figure 3. Target of inspection in the game engine.

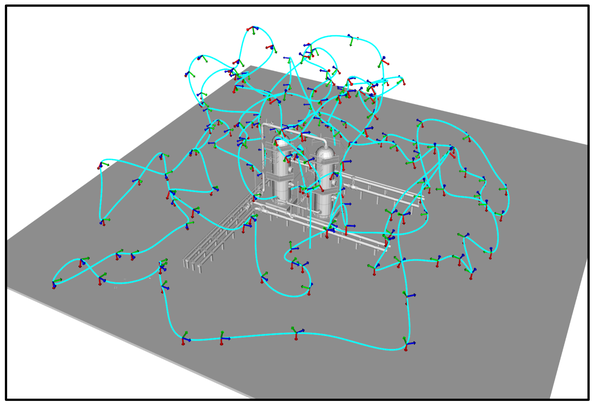

Figure 4. Computed 3D views and paths for autonomous aerial inspection.

Results to Date

The reconstructed 3D dense-point cloud model by the developed autonomous high-quality coverage flight planning algorithm is benchmarked against ground-truth 3D model data to evaluate its performance in geometry accuracy and RGB texture. The presented case is a gas plant inspection. Close-range images are acquired to fully cover the target surfaces with high levels of details (LoDs). The photogrammetric dense point cloud is reconstructed after flight through a standard structure-from-motion (SfM) pipeline.

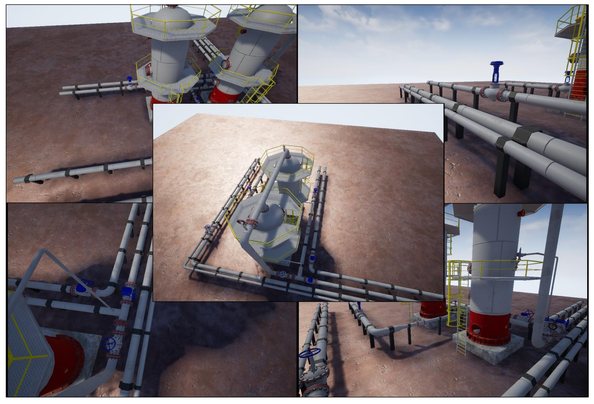

Figure 5. Ground truth images

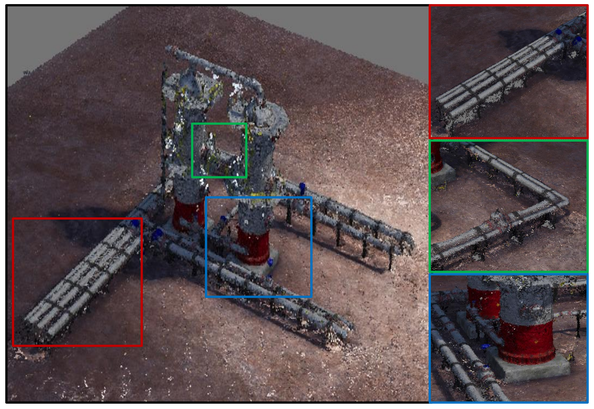

Figure 6. Reconstructed dense point cloud model with the detailed views at the selected regions of interests (ROIs)

Acknowledgments

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References

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