**Real-time 3D Mapping of Construction Sites**

**Using ORB SLAM and Stereo Cameras**

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***ABSTRACT***

In this paper, we developed a method to create a 3D map in real time using a stereo camera attached to the drone and ORB SLAM. ORB SLAM is a technology that simultaneously estimates self-position and generates 3D point clouds of the surrounding environment in real time. 3D point clouds generated by ORB SLAM are sparse and cannot be used to automate crane operations. Therefore, it is necessary to convert sparse point clouds into dense point clouds. MVS is generally used to convert sparse point clouds into dense point clouds. However, MVS often requires a large amount of time for computation and cannot be applied to this case, which requires real-time processing. This method consists of two processes. The first is the process of generating a dense 3D point cloud using a stereo camera at each time. The second is the process of integrating point clouds by complementing self-estimation of camera position and orientation. We used data taken from a drone moving on a simulator. The simulator includes buildings, cranes, and trucks to simulate a real construction site. The evaluation on about 4500 frames of moving images shows that our method achieves the following results with real-time and precision. It took 25 seconds to create a 3D point cloud and processed about 180 images per second. Also, we can correctly represent the unevenness of the sides of the building at the construction site, as well as the shape and scale of the entire box in the final generated 3D point clouds. It is necessary to develop system that accurately represents that ever-changing environment at construction site. In the future, we will be working on developing an algorithm to selectively update only objects whose positions have changed on a 3D map.

**Keywords:** photogrammetry, ORB SLAM, computer vision, three-dimensional mapping, ROS