

## 3D Modeling in Nagasaki Port with UAV

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### 1. Introduction

Recently, UAV (Unmanned Aerial Vehicle) has been improving for the study such as environmental management. The authors performed the field study in the Nagasaki Port on June 8, 2016. In this study, 3D (three-dimensional) modeling for the Nagasaki port and Megami big bridge were conducted with Aerial imagery using UAV. Agisoft Photoscan was used on making a 3D model.

### 2. Methods

First, 500 imagery were captured by UAV (Phantom4) at the height of 140m. Aerial photo of the Nagasaki port and the Megami big bridge are shown in Figs. 1 and 2. Second, the imagery of the Nagasaki port and the Megami big bridge was edited with PhotoScan, and a 3D imagery was made. From the elevation data, orthophoto was obtained by changing a 3D imagery to tiff format.

### 3. Results

The resolution of Aerial imagery was 3cm per pix. The range of the imagery was  $280\text{m} \times 280\text{m}$  because the angle of view was  $90^\circ$ . Fig. 3 shows 3D imagery in the Nagasaki port. The distortion was occurred on the 3D imagery because of the characteristics of the wide-angle lens. Orthophoto is shown in Fig. 4. Then, as shown in Fig. 5, 3D imagery of Megami big bridge could not be reconstructed with PhotoScan.

### 4. Discussion

For Megami big bridge in Fig. 5, the 3D imagery could not be connected. For this major cause, it was estimated that PhotoScan cannot reconstruct a liner structure such as a bridge.

Next, the height of UAV should be higher for 3D modeling. But, the height of UAV is permitted by less than 150m in the civil aeronautics law without permission. If a researcher offers permission from Land, Infrastructure and Transportation Ministry, UAV can fly without limitation.

Finally, the distortion of imagery increased at the edge of imaginary. Because the software functions to reduce the errors in the center of imaginary.

### 5. Conclusions

UAV is efficient on the 3D modeling evaluation. The 3D modeling was yielded with PhotoScan at the high resolution. However, in case of liner structures, PhotoScan was not able to make the 3D model because the characteristic of the software functions. The distortion may occur in aerial photo because of the characteristics of the lens. This problem would be solved with Imagery-conversion software. The range of a photograph can be expanded if the permission was obtained by Land, Infrastructure and Transportation Ministry.

## References

S. Otsubo, S. Ogawa, H. Hidaka, G. Yamada,  
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Fig. 1 Aerial photo in Nagasaki port with UAV Fig. 2 Aerial photo in Megami big bridge with UAV



Fig. 3 3D imagery in Nagasaki port



Fig. 4 Orthophoto on the Nagasaki port



Fig. 5 3D imagery in Megami big bridge