

Special Techniques for Airborne Laser Scanning Using Unmanned Helicopters

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1. Introduction

In case of using the unmanned helicopters, we can scan elevation point data high frequency from 50-150m height. This practical method is developed a small unmanned helicopter owned by the Hokkaido Regional Development Bureau, through industry-university-government collaboration. Through these studies, we were able to verify the feasibility of all of these methodologies. In this paper, we discuss the special techniques that we employed with regards to airborne survey technologies, namely, installing antennas using a lift type vehicle, laser scanning from the air as well as discuss the equipment used and specific methods for performing these tasks.

2. Small unmanned helicopter specifications and survey location:

In this study, an autonomous unmanned helicopter (Yamaha RMAX-G1) owned by the Hokkaido Regional Development Bureau was used. During flight, the helicopter's remote controls were connected to the base station by radio, the flight route can be changed, the camera on the helicopter can be operated and the winch used to hang the sensor can be moved up and down when necessary. The helicopter's maximum flight time is roughly 90 minutes with a range of up to a 5 km radius from the base station. Its payload capacity is 10 kg at an elevation of 0 meters at 20°C. It has actual track records of performing studies at an elevation of roughly 1,300 m carrying observation equipment of roughly 5 kg in weight.

In this study, the survey location was the Tottabetsu river, and set up a takeoff/landing 6 period(2018.6) and 20 period(2018.10).

3. Installing antennas using a lift type vehicle:

Wireless transmission between the base station and the small unmanned helicopter consists of a 2.4 GHz data communication band for operations, and an analog 1.2 GHz band for camera images. Both bands require good visibility. In particular, when waves for the control system are blocked, the automatic return function will be activated and the survey will be discontinued. Trees may often not have a blocking effect, but we used a lift type vehicle to install both antennas higher than the tree. The lift type vehicle is the so-called "super deck" with a platform of approximately 2.5 × 1.5 m. It allows two people. With the use of this, we were able to assign both the antenna operator and visual helicopter watchperson at the high platform, and the antennas could be attached to the handrails.

4. Laser scanning from the air:

We scan elevation point data using SkEyesBox owned by Yamaha Motorcycle co., Ltd, while flying 50-70m height, 3-5m/s. We corrected position of the elevation point data using the method by the static data from Geographical Survey Institute.

5. In closing:

In order to implement studies using unmanned helicopters, we will need to have command of these special techniques as part of our know-how and it will be important to implement regular training for staff involved in these studies.

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