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最新レーザースキャナを用いた無人ヘリによる超高精細 3D 計測の試み
The development of ultra-high resolution 3D measurement system by a multicopter using the latest laser scanner

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In recent years, unmanned helicopters, especially multicopters which have multiple rotors, have been developed rapidly and the compact laser scanner which can load on them have been also developed. RIEGL VUX-1, ultra-lightweight compact laser scanner, was released in 2014. This scanner is assumed to load on unmanned aerial vehicles. The specifications of the scanner are as follows: weight 3.6kg, size 227∗180∗125mm, a large field of view (330 degrees) and a high measurement rate of 500,000 points / seconds. The scanner also corresponds to multiple targets processing by the waveform analysis.

In this study, at first a multicopter that can be loaded with this latest laser scanner was newly developed. In the second, attempts to ultra-high-definition 3D measurement will be done by the new multicopter with the scanner.

The accuracy verification test was done by the unmanned helicopter YAMAHA RMAX L18 with a gasoline engine. This test was done by Nakanihon Air Service CO.,LTD, RIEGL JAPAN LTD and KoHaTa Inc. in Oct. 2014. As a result of horizontal direction verification, vertical direction verification and small object identification verification, it was revealed that the system can grasp the small step of the relative height 1cm unit as Fig.1.

The influence of the vibration of the engine was concerned, but the effect of vibration was relatively small comparing with the actual aircraft. This may be because the high frequency vibration was dominant. The newly developed multicopter moved by the motors for reducing the vibration, it is considered to be able to ensure the accuracy with the smaller and lighter IMU.

The new multicopter is designed to be able to exert maximum performance of the sensor. Considering the VUX-1 transmission and reception of the laser, the shape of the multicopter around the sensor was specially designed so that be able to acquire the 330 degree wide viewing angle data from low altitude flight. This makes it possible to create a wide area and high speed ultra-high-resolution 3D model of terrain and structures from the sky to the same extent of the accuracy by ground-based laser scanner measurement.

This new measurement system is considered as effective where measurements from the ground level are difficult, such as the landslide disaster. Various applications, such as early condition ascertainment, prevention of secondary disaster and recovery and reconstruction planning are expected by this system.

It is planned to upgrade the system to retrieve data in various weather conditions and to view and print the measurement results in real time in disaster area. After upgrading, the system will be used in the activities of ”Tokyo Metropolitan University Disaster Investigation & Assistance Special Team by Unmanned Aerial Vehicles” in a real disaster field.

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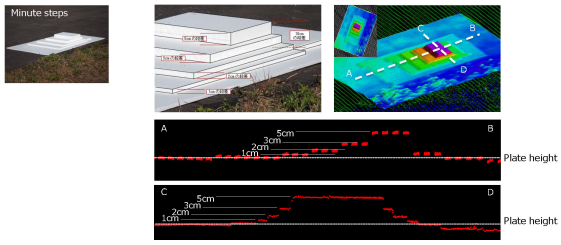

Fig.1 Result of the accuracy verification test