

Visual Surveillance of Natural Geography by means of UAV

HASEGAWA, Hitoshi^{1*} ; ISOGAI, Tatsuhiro¹ ; ONO, Isamu¹

¹Kokushikan University

Unmanned aerial vehicle (UAV) systems can lead to major advances in physical geography. We have obtained a high-resolution digital aerial photographs using UAV (Unmanned Aerial Vehicle). UAV can make an automatic flight under the GPS control and take aerial photographs repeatedly with the same flight route. In this study, UAV was flying at 50 to 100m altitude. We have taken aerial photographs at coral reefs ,mangrove forests and the trench site of active fault. The high-resolution aerial photographs, a detailed classification map could be created, and it would also allow the extraction of dynamical topographic and vegetation development temporal changes.

Keywords: UAV, High-resolution digital aerial Pjotograh, Proximal Remote Sensing Method

The acquisition of geospatial information by small UAV

TANAKA, Kei^{1*} ; KONDOH, Akihiko²

¹Japan Map Center, ²Center for Environmental Remote Sensing, Chiba University

The recent advances of MEMS devices(GPS, gyro and acceleration sensor) has made possible low-cost and miniaturization. Thereby, multi-copter mounted with these sensors have appeared. That it requires a high level of technology and knowledge in the handling of RC traditional helicopter, beginners to steer is difficult. To enable even beginners to get easily geospatial information of high-resolution by multicopter.

In this study, we examined method of acquiring geospatial information(orthophoto, DSM, NDVI, and temperature distribution) by using small UAV.

Keywords: UAV (Unmanned Aerial Vehicle), SfM (Structure from Motion), DSM, orthophoto, NDVI, temperature distribution

UAV application and possibility for disaster prevention.

SAITOU, Osamu^{1*} ; KUWAHARA, Yuji¹

¹Center for Disaster Prevention and Security, IBARAKI University

Videos of the tsunami taken from the airplane conveyed the horror of the recent great disaster which attacked the various places in eastern Japan, the Great East Japan Earthquake of 2011. Numerous engineers and researchers were shocked by the images. Moreover, many real-time movies and images of this disaster exist. Especially in the past several years, other disasters caused by extreme weather because of our changing climate, such as heavy typhoons, rain cataracts, flurries, and tornadoes, also cause widespread destruction. When these disasters or earthquakes occur, rapid situational assessment is crucially important, but it is difficult because transportation systems including roads and railways often shut down under those circumstances. Therefore, a monitoring system that provides information immediately when a disaster occurs is required. When a disaster occurs, monitoring from an airplane or satellite is effective but such systems are not easy to use. This study examines the possibility of disaster monitoring systems using uncrewed aerial vehicles (UAV).

Keywords: UAV, sensor network, sensor, disaster prevention

Proximity air measurement of the radiation by unmanned small helicopter

KAJIWARA, Koji^{1*} ; HONDA, Yoshiaki¹

¹Center for Environmental Remote Sensing, Chiba Univ.

The decontamination work of the radioactive material which dispersed in the accident of Fukushima nuclear power plant accompanying the Great East Japan Earthquake, is continuing to residential area, cultivated land, etc.

However, the still high dose is measured in the forest region.

It is a question whether safety can be guaranteed or not, even if it performs the roof of a house or building, and decontamination of only soil, when a forest is in living environment.

The radiation measuring instrument which enabled it to adjust the distance to the target for measurement with the winch attached to the small unmanned helicopter in this research is used, the dose of a tree crown from the position close to about 100m has been measured, and it was shown that field dose measurement in the forest is possible.

Moreover, even if it was the decontaminated place, it checked that a space dose in case it approaches and a forest exists changed with altitudes.

Keywords: UAV, Radiation Measurement, Forest Canopy

Generating three-dimensional models by a software that unifies SfM and multiview stereo (MVS)

UCHIYAMA, Shoichiro^{1*}

¹National Research Institute for Earth Science and Disaster Prevention (NIED)

In recent years, the software which unified Structure from Motion (SfM) and multi-view stereo (MVS) was developed. By this, construction of three-dimensional models and its Digital elevation models (DEMs) can be achieved with PC at easy and low cost. This paper shows a method for generating three-dimensional models by using with a SfM-MVS software and images captured by a handheld camera or an UAV's.

Keywords: structure from motion (SfM), three-dimensional model, digital surface model (DSM), unmanned aerial vehicle (UAV), geomorphometry, image acquisition for calculation

Safety measures for multicopter aerial photo survey

INOUE, Hiroshi^{1*} ; UCHIYAMA, Shoichiro¹ ; SUZUKI, Hinako¹

¹National Research Institute for Earth Science and Disaster Prevention(NIED)

Low-altitude aerial photographing using multicopters, radio-controlled multi-rotor helicopters, became easy for everybody because of their recent technical advancement and price declines of the equipment. The technology will become popular rapidly as one of the methodologies of field surveys. Multicopters, however, can crash into the ground. We have experienced crash or near-crash accidents through our surveys and test flights in the past. The causes are sometimes a simple pilot error, loss of a propeller, unexpected strong wind, and out of battery, and are sometimes unclear, like GPS signal loss and barometer error, and their combinations. The crashes could have made serious injuries if the multicopters hit humans judging from the damage to the equipment we experienced.

The measures we take are careful pre-examination of the flight plan, making propeller guards, knowing battery capacity-flight time characteristics, monitoring battery voltage during the flight, regular maintenance of the batteries, pre-flight equipment checks, acceleration and compass calibrations, communication between the pilot and copilot, full utilization of autonomous flight, training of manual control for emergency, and following the safety check list.

Multicopter survey could cause problems to the society if accidents occur often as the result of popularization. If the usage becomes too strictly regulated, we may limit or even lose the large potential of applying the multicopter technology to our field survey. We therefore need to establish the safety measures to be obeyed, and share experiences of accidents for wider recognition of its potential danger, clarify individual causes, in order to strengthen the measures. Compliance to the aviation and wireless communication laws and regulations are indisputable. We also have to buy an insurance to compensate the possible damage caused by an accident.

