

SVC050-P02

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Development of a small unmanned aerial vehicle with GPS-guided automatic navigation for volcano observation

Kazuto Saiki^{1*}, Mitsuhiisa Sanemasa¹

¹Graduate School of Science, Osaka Univ.

An unmanned aerial vehicle (UAV) named "Sky-1 Stonefish" with GPS-guided automatic navigation system was developed as a tool that the researchers and the staff of the municipality who investigate volcanic field were able to operate easily and at low cost. Sky-1 Stonefish was developed from a radio-control (RC) UAV "Sky-1". RC Sky-1 had shown good performance at volcanic fields, but the actual control range is limited to ~400 m by human ability. To overcome this defect, GPS-guided autopilot system Ardupilot was added to Sky-1. Ardupilot is a low-cost autopilot system based on the Arduino open-source hardware platform. It uses 3 axis accelerometer and three gyro sensors for stabilization and GPS and Pitot tube for navigation. The strong points of Sky-1 Stonefish are as follows: "An electric ducted fan is employed to secure the safety", "Portable on one's back because of the new design of the airframe division", "The payload that reaches 300 g is reserved", and "Achievement of the high flight performance against the strong wind around 10 m/s", etc. RC Sky-1 was tested at Kusatsushirane volcano, Aso volcano, and Izu-Oshima, and Autopilot Sky-1 Stonefish was tested at Izu-Oshima and Kansai Mokei Airport (Uji, Kyoto). The design and performance of SKY-1 Stonefish will be presented.

The specification of Sky-1 Stone Fish is listed as follows;

Name: Osaka University Sky-1 Stonefish,

Maximum length: 90 cm,

Maximum width: 90 cm,

Airframe Material: Expanded polypropylene (EPP),

Weight: 500 g (with a battery),

Payload: 300 g maximum,

Battery: 11.1V Lithium-polymer battery,

Propulsion: Ducted fan with brushless motor,

Thrust: 500 gf, Control: 3 ch (motor, aileron, elevator) by GPS waypoint navigation,

Flying range: 3~4 km (with a standard battery)

Keywords: UAV, robot, GPS, volcano, airplane, arduino