Abstracts of the Papers Published in Journal of the Japan Society for Aeronautical and Space Sciences (Vol. 64, No. 5, Oct. 2016)

FULL ARTICLES

1. Naohiko KIKUCHI and Shin-Ichiro NISHIDA: Pose and Motion Estimation for Space Debris: Fast Pose Estimation by Application of the Eigen Space Method. No. 5, p. 253 (Oct.) The number of space debris increases by mutual collision. For this reason, the large-sized space debris with high collision probability needs to be removed as early as possible. We are studying the active removal system of space debris from low earth orbit. The satellite system captures a space debris from a suitable direction by measuring its pose and motion from the near. Then, we propose a technology which measures the pose and motion of target space debris by reduced quantity of required memory data and calculation, by using of single camera images and the eigen space method. Moreover, the result of having verified the technique to propose by the experiment which simulated the lighting environment on orbit using the scale model of the space debris is described.

2. Shinsuke SAKAMOTO and Takashi SHIMOMURA: Simultaneous Optimal Design of Structural Topology, Shape and Control Systems for Truss Structure Combining Successive LMI and Branch and Bound Method. No. 5, p. 261 (Oct.) A hybrid method combining successive LMI optimization with the branch and bound method is used in simultaneous optimization of structural topology, shape and control such that simultaneous optimization can be applied to more general class of truss structures. A numerical example of somehow complex structure is provided to demonstrate the effectiveness of the proposed method and to analyze the characteristics of the optimum structural configuration.

3. Hirokazu MASUI, Yuki SERI, Akimitsu HAMADA and Mengu CHO: Thermal Design and Verification Method and Orbit Data Analysis of Horyu-2. No. 5, p. 270 (Oct.) This paper describes the thermal design method of Horyu-2. Horyu-2 was developed by Kyushu Institute of Technology. The project started in 2010 and Horyu-2 was launched by H-2A of JAXA on May 18 2012. At present, Horyu-2 is carrying out many missions and transferring on-orbit data. Horyu-2 orbits 680 km with sun-synchronous polar orbit. Feature of Horyu-2 are lightweight (7.1 kg) and large surface (30 cm cube) compared with a conventional cube-sat. Thermal design is needed to keep the temperature within the safe range. We conducted thermal analysis in a step-by-step in each phase. This paper reviews the thermal design processes and discusses on-orbit data acquired after launch.

4. Shinsuke SAKAMOTO, Takashi SHIMOMURA and Sayaka KANATA: Gain-Scheduled Control of Large Antenna Servo Systems using LMIs. No. 5, p. 276 (Oct.) This paper considers controller design of large antenna servo systems, which is given by a new integral-type servo controller with $H_2$ optimal control and $H_2$ optimized gain-scheduled control for LPV systems. An example of application is provided to demonstrate the effectiveness of the proposed method.

5. Seigo KOGA, Rie TAGAI, Akiko HIDAKA, Eiichiro NAKANO and Shinji NAGAI: Investigation of Dynamic Characteristics of a Reentry Lifting Capsule by Free Rotation Tests in Transonic Speed. No. 5, p. 281 (Oct.) For a design of a reentry capsule and its flight, one of the most important problems is an assessment of the dynamic stability in transonic speed. In this study, dynamic stability tests for a lifting capsule were conducted with the 1-DOF free-rotation test method in the JAXA 2 m × 2 m Transonic Wind Tunnel. In this test method, the reduced frequency and time history of the angular motion in non-dimensional time could be matched between the wind-tunnel test and the actual flight. Effects of flow conditions, location of center of gravity, an ablated shape, surface roughness and model MOI were discussed with the obtained time-series angular data and schlieren photographs. Furthermore, a new data processing method was developed for calculating the damping coefficients. The obtained amplitude and frequency of the oscillations, and the estimated damping coefficients give helpful information for the project planning.