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Angularly Unbounded Three-Axes Spacecraft Simulator

Tech ID: 23776 / UC Case 2013-653-0

BACKGROUND

Satellite rotational dynamics on a three-degrees of freedom (DOF) spacecraft simulator has always been limited by the maximum angle of rotation allowed by the spherical air bearing. All three-axes spacecraft simulators developed so far allow only ~10-50 degrees of rotation along pitch and roll axes and 360 degrees along the yaw axis. This limits the effectiveness of the experimental validation of spacecraft dynamics. For instance, large angle maneuvers or de-tumbling cannot be fully tested using a standard spacecraft simulator. Eliminating the limitation on the maximum rotation angle can allow for a complete ground testing of the spacecraft attitude determination and control technique.

TECHNOLOGY DESCRIPTION

UCSC researchers, in collaboration with Naval Postgraduate School researchers, have developed a new spacecraft simulator. For the first time, this scalable new technology will make it possible to simulate spacecraft rotational dynamics completely so that the altitude determination and control techniques can be fully experimentally certified. Several different spacecraft simulators have been developed in the past. However, no spacecraft dynamics simulator developed so far enables full experimental validation of the spacecraft rotational dynamics along the three axes without angular limitations. This new development is an important evolution of ground testing equipment for satellites.

APPLICATIONS

- Satellite simulator for ground testing validation

ADVANTAGES

- Complete simulation of the spacecraft rotational dynamics
- Investigation of different altitude control techniques for nonlinear maneuvers, de-tumbling, spin and three-axes stabilization
- Investigation of low cost high accuracy attitude determination/validation ground system

INTELLECTUAL PROPERTY INFORMATION

| Country | Type | Number | Dated | Case |
|--------------------------|---------------|------------|------------|----------|
| United States Of America | Issued Patent | 10,621,883 | 04/14/2020 | 2013-653 |

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OTHER INFORMATION

KEYWORDS

Satellite, simulation, simulator, three-axes, satellite rotation, rotational dynamics, three-axes stabilization, non-linear maneuvers, altitude control, altitude control technique, spacecraft, aerospace, rotational dynamics, Cat4

CATEGORIZED AS

- **Sensors & Instrumentation**
 - Other
 - Scientific/Research
- **Transportation**
 - Aerospace
- **Engineering**
 - Robotics and Automation

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