16th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (D3)
Novel Concepts and Technologies to Enable Future Building Blocks in Space Exploration and Development (3)

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VALIDATION OF THE I3DS: SUITE OF SENSORS FOR ORBITAL AND PLANETARY MISSIONS

Abstract

The Integrated 3D Sensors (I3DS) project aims at providing future space missions with a multi-purpose suite of sensors, with a standardised interface to the platform and sensing solution that can be customised in terms of sensors and software.

I3DS intends to develop a modular suite composed of a central processing element interfaced with the platform, called Instrument Control Unit (ICU), and a collection of sensor building blocks that can be added or removed. In order to make the suite as generic as possible, I3DS sensors have been selected from a wide range of devices suitable for different scenarios. Two main subsets are defined for two different applications: rendezvous with a space robot for servicing or a planetary exploration by an autonomous rover.

I3DS sensors suite aims at covering orbital scenarios beyond the rendezvous and capture of a cooperative target spacecraft, like the on-orbit servicing with module replacement refuelling, the assembly of complex structures, and to explore the limits for challenging missions like the space debris removal. Two main scenarios are foreseen for the planetary use-case with the Mars Sample Return (MSR) and the Lunar Volatiles Prospector (LVP) missions for autonomous sample characterisation. From the sensing point of view, I3DS is made up of:

1. Inertial Sensors

- Star Tracker (STR)
- Inertial Measurement Unit (IMU)

1. Relative Sensors

- Radar
- LIght Detection And Ranging (LIDAR)
- Time-Of-Flight (TOF) camera
- Stereo camera
- High-Resolution camera
- Thermal Infra-Red (TIR) camera
- Force/Torque sensor and tactile sensors

1. Illumination Devices

- Wide-angle torch illumination device

- Pattern Projector

The hardware design of the suite will be presented in terms of mechanical and electrical integration and the sensor inputs/outputs. Accuracy and performances results will be presented following tests realised in a Mars Yard for the planetary track and in closed loop testing on a robotic test bench for the orbital track. This project brings together the following companies throughout Europe: THALES ALENIA SPACE, SINTEF (Norway), TERMA (Denmark), COSINE (Netherlands), PIAP Space (Poland), HERTZ Systems (Poland), and University of Cranfield (UK).

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