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NEOSHIELD-2: OPTICAL NAVIGATION FOR NEAR-INERTIAL HOVERING AT CLOSE PROXIMITY OF VERY SMALL ASTEROIDS.

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ABSTRACT

Autonomous close-proximity operations (hovering, landing, touch & go …) in the low-gravity environment exhibited by asteroids and comets are particularly challenging. For very small bodies (d<300m), a stable gravitationally-bounded orbit is not existing and therefore an actively near-inertial orbit is adequate to keep a spacecraft close to the body with optimal illumination conditions. To perform close proximity observations under a low-gravity environment, accurate pose estimations are vital to ensure the data integrity and safety of the spacecraft. The optical navigation (OpNav) as part of the Guidance, Navigation and Control System (GNC) algorithms uses visual observation instruments such as a mono- or stereo camera to acquire imaging data to determine the relative spacecraft pose (position and attitude). The required input data for operation are a single image database, created in the characterisation stage of the rendezvous phase. The estimations are further improved using linear quadratic estimator techniques.
This paper describes the OpNav algorithms for a near-inertial hovering spacecraft using a monocamera at the close proximity of 2001QC34, a very small, irregular shaped NEO (d=230m, a/b = 1.4) including the scenario definition, the developed

near-inertial hovering GNC mode, the optical navigation link and the pose estimate performances.

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Comments:
Oral: This talk shall be planned after all NEOShield-2 introduction talks.