

Title: Vision Navigation using the ISS Selfie video data.

#### Presentation Abstract

The ISS Selfie[1] project was an on-orbit activity which used the ISS Mobile Servicing System (MSS) to “fly” a camera on a predefined trajectory in a variety of on-orbit lighting conditions to the International Docking Adapter 2 (IDA-2). The main purpose of the ISS Selfie activity was to obtain imagery and trajectory data of the last few meters of a spacecraft’s final approach to a docking system that meets the new International Docking System Standard (IDSS)[2]. Using this dataset, we evaluate a vision navigation algorithm, SAVANT [3], towards the purpose of vision-aided autonomous rendezvous and docking. SAVANT is a monocular vision only method that can leverage apriori known global information. The method uses ad-hoc (opportunistic) features, globally known features and template matching features. Correspondences are established between 2D image locations and 3D inertial/absolute locations and a least squares minimization is solved to recover the pose. This optimization is done over a window of frames in a bundle adjustment further refining poses and feature locations. The results of applying this method to the ISS Selfie data is presented.

1. Woffinden, David, et al. “The development and testing of vision navigation for proximity of operations and docking using the ISS Selfie”, Advances in the Astronautical Sciences Guidance, Navigation and Control 2017, volume 159 (AAS 17-076).
2. “International Docking System Standard (IDSS) Interface Definition Document (IDD), Revision D,”. <http://www.internationaldockingstandard.com>, 30 April 2015.
3. R. W. Madison et al, “Soldier-Affixed, Vision-Aided Navigation Technology (SAVANT), Part 1,” 36th Joint Navigation Conference (JNC), Colorado Springs, CO, JNC, 27-30 June 2011.