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NAVIGATION GUIDANCE AND CONTROL ALGORITHMS VALIDATION OF RENDEZVOUS AND DOCKING USING ROBOTIC MANIPULATORS

Abstract

Validation of NGC algorithms is complex and precise motion is required to demonstrate the RVD of two satellites. The facility uses two industrial robots of six DOF robotic systems. The dynamic motion system is also incorporating collision alert and safety limits of the environment. In this paper mainly, kinematics, Dynamics, implementation of stereo vision techniques and validation of the aforementioned in a six DOF simulation environment are addressed. Stereo camera based relative position and orientation estimation is implemented for navigation using Unscented Kalman Filter (UKF). To improve the precision and accuracy in relative position measurement, UKF is used in stereo vision and RANSAC method to estimate the relative position. In the validation process, the trajectory generated from the nonlinear relative dynamics and the performance of developed NGC algorithms has been demonstrated using kinematic and dynamic models along with the stereo vision in six DOF simulation environment.