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# EXPERIMENTAL VALIDATION OF ALGORITHMS USED TO CONTROL THE DYNAMICS OF TWO FLOATING ROBOTIC MANIPULATORS DURING AN OPERATION OF RENDEZVOUS AND DOCKING/BERTHING ON A GLASS TABLE

**Abstract**

This paper presents the development of the mathematical model for the dynamics of two floating robot manipulators mounted on air supported platforms. The air supported platforms aims to approach the scenario of orbital rendezvous and docking/berthing, where the spacecraft float and move without friction in a microgravity environment. It is not possible to obtain the microgravity environment in labs but for a few seconds. However it is possible to reproduce almost the frictionless condition with the robots floating on a thin cushion of air provided by the air supported platform. This work is developed in two phases. First the mathematical model of two spacecraft like robot manipulators is obtained and simulated by using the MatLab software in a scenario of orbital operation, i.e. the space environment is considered for the computer simulations where the two robot manipulators experience the weightless scenario of microgravity. The model considers the relative translational and rotational motion (one degree-of-freedom) for the system of space vehicles. The controller is a PID. The actuators are thrusters. The software is the MatLab package. Secondly the same scenario is tested in the lab but replacing the actuators by a system of small turbines aiming the control of the translational and the rotational one degree-of-freedom. A Kinect One device is used to play the role of a sensor in tracking the motion of the robots (x, y, and z axis) on a glass table. A PID is the controller. The lab experiment comprises one glass table, two robot manipulators, one representing the chaser and the other the target spacecraft. The experiment also includes a Kinect One device to track the motion of the robots on the glass table. The communication system to implement the experiment comprises one notebook, arduinos, and a wireless system. The results of the computer simulations are compared with those of the experiment for the sake of algorithm validation