Paper ID: 40414
oral
student

MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Interactive Presentations (IP)

Author: Mr. Vinicius Piro Barragam
ITA-DCTA, Brazil

Dr. Ijar M. Da Fonseca
ITA-DCTA, Brazil
Dr. André Fenili
Instituto Nacional de Pesquisas Espaciais (INPE), Brazil

A BRIEF DISCUSSION ABOUT FORCE CONTROL OF ROBOT MANIPULATORS

Abstract

In this paper the dynamics implications due to contact forces between a robot manipulator's end-effector and the environment were studied. It is fundamental for successful tasks the ability of the manipulator to interact properly with other bodies. A high value of the contact force may compromise the task, cracking or stressing the manipulator or manipulated object. The hypothesis of plane contact was assumed. Firstly, the conditions involving kinematic quantities, that is, the relative position, velocity and accelerations are discussed. The geometric form of the bodies in contact imposes constraints to the system. Another source of constraint is the contact and friction forces that directly influence the dynamic analysis of the manipulator, discussed in the second part of this article. This study leads to a direct application of force sensing and control techniques. In the third part of this study, the classical strategies of force control are discussed. These can be classified in two groups: indirect and direct force control. The first aims to control the force and moment of contact, by corrections in the position and orientation errors in the end-effector position, that is, without force feedback; the later directly acts in the error between the desired and measured contact forces. Actions of indirect force control comprehends compliance and impedance control. Finally, some related research topics are presented: grasping and manipulation of objects and control force of lightweight flexible manipulators. This topic is of special interest for on-orbit operations, as collection of space debris, for example.