Asociación Argentina de Mecánica Computacional

Mecánica Computacional Vol XXXIII, págs. 1889-1889 (resumen)
Graciela Bertolino, Mariano Cantero, Mario Storti y Federico Teruel (Eds.)
San Carlos de Bariloche, 23-26 Setiembre 2014

A PROBABILISTIC MODEL FOR THE DYNAMIC ANALYSIS OF ROBOTIC ARMS WITH UNCERTAIN PARAMETERS

Danilo Yeste Balbarrey[a] **and Marcelo T. Piovan**[a,b]

[a]*Centro de Investigaciones en Mecánica Teórica y Aplicada, Universidad Tecnológica Nacional - F.R.B.B., 11 de Abril 461, Bahía Blanca, BA, B8000LMI, Argentina, mpiovan@frbb.utn.edu.ar, http://www.frbb.utn.edu.ar*

[b]*Consejo Nacional de Investigaciones Científicas y Tecnológicas (CONICET)*

Abstract. Mathematical models that represent the kinematics and dynamics of linked robotic arms normally have parameters with different levels of uncertainty. This leads to an uncertain response due to the variability of such parameters.

In the present research work, the authors employ the parametric probabilistic approach in order to evaluate the propagation of uncertainty, associated to given parameters, in the dynamics of linked robotic arms.

A deterministic model with n degrees of freedom is deduced by means of Hamiltonian methods. In this model the dynamics of the arms as well as the DC motors (and their mechanics) are incorporated. Some parameters of this model, such as the friction of the bearings, the effective inertias and/or damping properties among others, are assumed uncertain. The probabilistic model is developed from the derived deterministic model considering that the response of the deterministic model is the mean response of the probabilistic model. In this way, m random variables, associated to the uncertain parameters, are defined in terms of their means and dispersion properties. The probability distribution functions of the random variables can be selected from known information or derived according to the Maximum Entropy Principle.

The Monte Carlo Method is employed to simulate independent realizations of the dynamic response of the probabilistic model. The influence of the adoption of different probability distribution functions in the selected random variables is evaluated and compared. Finally the effect of the practical constructive tolerance in the random parameters is evaluated by means of several test cases.