

STUDY OF EXPERIMENTAL SIGNALS DURING IMPACTS AND VIBRATIONS OF A ROBOTIC MANIPULATOR

Miguel F. M. Lima¹, J.A. Tenreiro Machado² and Manuel Crisóstomo³

¹Dept. of Electrical Engineering
Superior School of Technology
Polytechnic Institute of Viseu
3504-510 Viseu, Portugal
lima@mail.estv.ipv.pt

²J.A. Tenreiro Machado
Dept. of Electrical Engineering
Institute of Engineering
Polytechnic Institute of Porto
4200-072 Porto, Portugal
jtm@isep.ipp.pt

³Manuel Crisóstomo
Institute of Systems and
Robotics
University of Coimbra,
Polo II
3030-290 Coimbra, Portugal
mcris@isr.uc.pt

ABSTRACT

Robotic systems use different types of sensors, both for control and for environmental perception. Those sensors can be digital encoders, tachometers, accelerometers, force sensors, current sensors and many others. In order to acquire the signals an experimental setup was developed. The system acquires data from the sensors, in real time, and, in a second phase, processes them through an analysis package. The analysis package runs off-line and handles the recorded data. This program allows several signal processing algorithms such as, Fourier transform, windowed Fourier transform, correlation, time synchronization, statistical tools and several other features. This paper presents a study about the signals captured during impacts and vibrations of a mechanical manipulator.

References

- [1] Miguel F. M. Lima, J.A. Tenreiro Machado, Manuel Crisóstomo, Experimental Set-Up for Vibration and Impact Analysis in Robotics. WSEAS Transactions on Systems, Issue 5, vol. 4, pp. 569-576, 2005.
- [2] Miguel F. M. Lima, J.A. Tenreiro Machado, Manuel Crisóstomo, Fractional Order Fourier Spectra In Robotic Manipulators With Vibrations. Second IFAC Workshop on Fractional Differentiation and its Applications, Porto, Portugal, 2006.
- [3] Miguel F. M. Lima, J.A. Tenreiro Machado, Manuel Crisóstomo, Windowed Fourier Transform of Experimental Robotic Signals with Fractional Behavior. ICCS 2006 - IEEE International Conference on Computational Cybernetics, pp. 21 – 26, Tallinn, Estonia, 2006.
- [4] Lew, J.Y., Trudnowski, D. J., Evans, M. S., and Bennett, D. W. Micro-Manipulator Motion Control to Suppress Macro-Manipulator Structural Vibrations. Proc. IEEE Int. Conf. on Robotics and Automation, Vol. 3, pp. 3116-3120, 1995.
- [5] Mattias Nordin, Per-Olof Gutman, Controlling mechanical systems with backlash – a survey, Automatica 38, pp. 1633-1649, 2002.
- [6] I. Trendafilova and H. Van Brussel, Non-Linear Dynamics Tools for the Motion Analysis and Condition Monitoring of Robot Joints. Mechanical Systems and Signal Processing, pp. 1141-1164, 2001.