Pattern Recognition of Discrete Robot Motions Based on Fuzzy–Logic Multi–Assessment

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ABSTRACT

In modern industries, robot manipulators have been highly integrated with other manufacturing machines in production processes. As an essential part of manufacturing systems, potential robot malfunctions need to be closely monitored so that catastrophic failures can be prevented and scheduled maintenance be performed. In this paper, diagnostic monitoring procedures for robot operations using time series based multi–assessment techniques are presented. Time series models of standard robot motions are first defined. Dissimilarity measures of sample time histories are calculated based on the cross entropy minimization method, the improved Euclidean distance method, the variance analysis, and the normalized residual squared sums method. Application of the general procedures to monitor and diagnose discrete robot motions are demonstrated in case studies.
Fig. 2 An IBM 7535 industrial robot and sensor locations.
Fig. 3-a Time history of a 60° roll motion.

Fig. 3-b Time history of a 120° roll motion.

Fig. 3-c Time history of a 180° roll motion.
Fig. 4-a Spectrum of a 60° roll motion.

Fig. 4-b Spectrum of a 120° roll motion.

Fig. 4-c Spectrum of a 180° roll motion.