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FUZZY MARKOV MODELLING IN AUTOMATIC CONTROL OF COMPLEX DYNAMIC SYSTEMS

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A novel modelling technique for automatic control purposes is discussed. A fuzzy Markov system is proposed to describe both determined and random behaviour of complex dynamic plants. The main advantage is high computational speed. Another benefit of this method is its flexibility and applicability to both linear and nonlinear systems.A Markov chain can be considered as a fuzzy system with a rectangular membership function. The output is the probability distribution, not a variable value. This approach represents an attempt to overcome the primary difference between nonrandomness of fuzzy sets and Markov chain theory which deals with random phenomena. This method has been applied in test-bed facilities. The results of experiments with testing equipment are discussed in the full paper. The proposed fuzzy Markov modelling techique is able to easily describe any form of probability distribution. In addition to conventional stages of fuzzy modelling (fuzzification, inference and defuzzification) Markov modelling includes also randomisation. This last stage transforms the defuzzified "crisp" probability distribution into the output value. Application areas for the proposed fuzzy Markov modelling methodology include simulation of complex systems, stationarity and stability analysis, systems identification and optimal control.

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