Designing of Batik Pattern Using Hybrid Sliding Mode Fuzzy Neural Network Controller for NURBS-CNC

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ABSTRACT

Batik is an Indonesian cultural heritage and has been recognized internationally by the United Nations. Cultural development and preservation by utilizing mathematical models without changing meaning is a solution that is needed now. The objective of this study is to design batik patterns using mathematical models, called *Non-Uniform Rational Basis Spline* (NURBS). The design of the pattern is not only carried out theoretically, but It is realized in the form of images on sheets of cloth, wood or glass using a Computer Numerical Controller (CNC) machine. To obtain a reliable line of batik pattern with high precision, adaptive control is employed with appropriate control algorithm. This CNC control uses the hybrid Sliding Fuzzy Neural Network (SMFNN) algorithm which is a combination between Fuzzy Neural Network (FNN) and Sliding Mode Controller (SMC). To evaluate the performance, four different batik patterns are employed on the controller by simulation, including flower, flower plant, garuda, and parang. The average tracking error and standard deviation measures the error results to assess the controller and the product quality. Based on the results, the batik pattern can be realized perfectly with better performance.

Kata Kunci: *Batik Pattern, Mathematical Modelling, NURBS, Sliding Mode Controller, Fuzzy Neural Network*