



## HIGH-ACCURACY POSITIONING OF LATHE SERVO SYSTEM USING FUZZY CONTROLLERS BASED ON VARIABLE UNIVERSE OF DISCOURSE

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*Abstract: A novel fuzzy controller is proposed here to improve the positioning precision of servo system of CNC lathes. To utilize the high-accuracy potential of the VUD fuzzy controller, a grating-ruler was used as a sensor to measure the displacement of work pieces. Designing the VUD fuzzy controller involved five steps, i.e., setting up universes of discourse and parameters, selecting membership functions, designing a differential circuit, constructing a base of fuzzy rules, and defining a set of contraction-expansion factors. The method of lookup table was applied to construct the base of fuzzy rules via four typical input instructions, and the method of maximum strength to settle the conflicting rules properly. The experimental results show that the VUD fuzzy controller can be effective in controlling the position of work pieces.*

**Index terms:** servo system, positioning of work pieces, CNC-lathe, fuzzy controller, fuzzy system, variable universe of discourse, contraction-expansion factor, approximation error.