

# Ziegler–Nichols Based Intelligent Fuzzy PID Controller Design of a SPM System with Parameters Variation

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## Abstract

This research is to extend Ziegler–Nichols based PID controller design method to the intelligent fuzzy PID controller design of a Scanning Probe Microscope (SPM) system, thus the relative stability can be reserved. In addition, one can see the hysteresis and parameters variation effects of the force actuator can be reduced. This improvement had been verified by practical implementation. Comparing the results with the design with the Ziegler–Nichols based PID controller, one can see that the proposed system is more robust.

Keyword : Ziegler–Nichols PID Controller; Intelligent PID Fuzzy Controller; SPM; Hysteresis Effect; LVT; Parameters Variation; Root–Locus Plot; Bode Plot