

RULE-BASED COMPUTER CONTROL OF INDUSTRIAL PROCESS

USING FUZZY-LOGIC

ABSTRACT:

The availability of digital computers contributed to the development of what is called "modern control theory". Recently, modern control theory has been applied widely to design and analysis of controllers for different systems. In most industrial applications, the plant models are used to calculate the required control law, which requires complicated calculations and a large amount of computation time. Therefore, the requirement exists for an alternative approach which is the fuzzy-logic controller.

In this research, a rule-based controller that incorporates fuzzy logic has been designed and evaluated. The fuzzy control algorithm is implemented as a set of rules expressed by conditional statements. Employing such an algorithm avoids the need for a detailed mathematical model of the plant.

To verify the viability of the fuzzy controller, it has been applied in real-time to control the temperature of a process trainer. In addition, a comparison has been made between fuzzy and analytical controllers to test the effectiveness of these controllers on the behavior of a system under both transient and steady-state operations.

Simulation and experimental results indicated that fuzzy controller can give similar, if not better, results compared with a PID controller tuned to give nearly optimal response. However, the simplicity of the fuzzy controller makes it more suitable to many industrial processes that are difficult to model precisely.