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FUZZY LOGIC CONTROL BASED ON RECONFIGURABLE MEMBERSHIP TABLES

When complete knowledge of a process eludes us, we build models in order to obtain some measure of control over the process. A model is never entirely correct but it is a powerful tool if it enables us to explain and predict system behavior within the bounds of the validity of the model. Unfortunately, the creation of a mathematical complete and proper model for the automation and optimization of some technical processes represents a highly difficult problem. This paper deals with the fuzzy logic-based control when the knowledge and control strategy cannot be completely represented by a human operator. In the paper, an approach to construct fuzzy knowledge-based control structure to improve the behavior of a complex industrial plant is proposed. The main objective is to capture on-line the human expert's knowledge, in order to generate appropriate membership functions and to create a reconfigurable membership base. The membership for process variables is defined for each linguistic term of the corresponding linguistic variable. The determination of the matching of the process variables with the linguistic terms is based on the RAM tables.

1. INTRODUCTION

Fuzzy control is a practical alternative for a variety of challenging control applications since it provides a convenient method for constructing nonlinear controllers via the use of heuristic information. Such heuristic information may come from an operator who is acting as a "human-in-the-loop" controller for a process. Since fuzzy logic is dealing with linguistic information, it can be used as a basis for knowledge-based systems. Fuzzy control means the control of industrial processes, including the processing of measured real variables, which is based on the use of fuzzy rules and their processing with the help of fuzzy logic [1], [2].

The rule base contains knowledge concerning the operation of a particular process under consideration. To represent the knowledge of a human operator, linguistic rules are used. The fuzzy logic-based system provides a useful tool for converting the linguistic control strategy from the expert knowledge into control rules. However, proper control rules cannot be obtained easily for complex industrial plants.

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