Chapter 4
Fuzzy Logic PI Controller

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ABSTRACT

The term fuzzy logic has been used in two different senses. It is thus important to clarify the distinctions between these two different usages of the term. In a narrow sense, fuzzy logic refers to a logical system that generalizes classical two-valued logic for reasoning under uncertainty. In a broad sense, fuzzy logic refers to all of the theories and technologies that employ fuzzy sets, which are classes with unsharp boundaries. Fuzzy logic is all about the relative importance of correctness: How supreme is it to be exactly right when a rough answer will do?

INTRODUCTION

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Here is a list of general experience about fuzzy logic.

- Fuzzy logic is as simple to understand. The mathematical ideas behind fuzzy reasoning are straightforward. What makes fuzzy simple is the "naturalness" of its approach and not its far-reaching difficulty.
- Fuzzy logic is malleable. With any given system, it's simple to massage it or layer more functionality on top of it without starting again from scratch.

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- Fuzzy logic is based on unfocused data. Everything is unfocused if you look closely enough, but more than that, most things are unfocused even on careful examination. Fuzzy reasoning made this understanding into the procedure rather than tacking it onto the end.
- Fuzzy logic can model nonlinear functions of capricious difficulty. A fuzzy system can be developed to match any set of input-output data. This procedure is built particularly simple by adaptive techniques like ANFIS (Adaptive Neuro-Fuzzy Inference Systems), which can get in the Fuzzy Logic Toolbox.
- Fuzzy logic can be made on top of the experience of resource persons. In direct contrast to neural networks, which take training data and create cloudy, impenetrable models, fuzzy logic depends on the experience of people who already interpret your system.
- Fuzzy logic can be mixed with conventional control methods.
- Fuzzy systems don't necessarily change the conventional control techniques. In many cases, fuzzy systems increase them and simplify their implementation.
- Fuzzy logic is rested on natural language.
- The foundation for fuzzy logic is the foundation for human communication. This examination underpins many of the other statements about fuzzy logic.

Advantage of Fuzzy Logic For System Control

- Fewer values, rules, and decisions are required.
- More observed variables can be evaluated.
- Linguistic, not numerical, variables are used, making it similar to the way of humans thinking.
- It relates output to input, without having to understand all the variables, permitting the design of a system that may be more accurate and stable than one with a conventional control system
- Simplicity allows the solution of previously unsolved problems.
- Rapid prototyping is possible because a system designer doesn't have to know everything about the system before starting work.
- The fuzzy controller is cheaper to make than conventional controllers because they are easy to design.
- They have increased robustness.
- They simplify knowledge acquisition and representation.
- A few rules encompass high complexity.
- Fuzzy logic control is comparatively simple to implement since it does not require any mathematical model of the controlled system. This is attained by changing the linguistic control strategy of human experience and understanding into an automatic control strategy.
- Fuzzy logic control has been found to be excellent in dealing with systems that are imprecise, nonlinear, or time-varying. Management, Economic, and Telecommunications systems are examples.

Area of Fuzzy Logic Control System

There are five types of systems where fuzziness is necessary or beneficial.

- Complex systems are difficult or impossible to model.
- System controlled by human experts.