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An intelligent fuzzy theory for ocean structure system analysis

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Abstract. This paper deals with the problem of the global stabilization for a class of ocean structure systems. It is well known that, in general, the global asymptotic stability of the ocean structure subsystems does not imply the global asymptotic stability of the composite closed-loop system. The classical fuzzy inference methods cannot work to their full potential in such circumstances because given knowledge does not cover the entire problem domain. However, requirements of fuzzy systems may change over time and therefore, the use of a static rule base may affect the effectiveness of fuzzy rule interpolation due to the absence of the most concurrent (dynamic) rules. Designing a dynamic rule base yet needs additional information. In this paper, we demonstrate this proposed methodology is a flexible and general approach, with no theoretical restriction over the employment of any particular interpolation in performing interpolation nor in the computational mechanisms to implement fitness evaluation and rule promotion.

Keywords: intelligent control function; fuzzy rule interpolation (FRI), interpolated rules

1. Introduction

In recent years, fuzzy logic control (FLC) has been used in many successful practical control applications. Despite the success, it has become evident that many basic issues remain to be further addressed. The idea is to design a compensator for each rule of the fuzzy model. Since each control rule is individually designed from the corresponding rule of the T-S fuzzy model, the linear control design techniques can be employed to design the PDC fuzzy controller (see Omidi and Lotfi 2017, Dinachandra and Raju 2017, Loria and Nesic 2003, Panteley and Loria 1998, Panda *et al.* 2011, Chu and Tsai 2007, Pardhan and Panda 2012, Wang *et al*. 2012, Lam 2009, Liu and Zhang 2003, Park *et al*. 2003, Wang *et al*. 1996).

Fuzzy rule interpolation (FRI) offers the most effective reasoning mechanism to perform fuzzy reasoning offers the most effective reasoning mechanism to perform fuzzy reasoning based on a sparse rule base. The classical fuzzy inference methods cannot work to their full potential in such circumstances because given knowledge does not cover the entire problem domain. However, requirements of fuzzy systems may change over time and therefore, the use of a static rule base

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