

Extensions and Applicability of the Membership Driven Reasoning Scheme

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In this paper we use sigmoid-like membership functions which take values in the open unit interval, and investigate the Membership Driven Inference (MDI) reasoning scheme. With sigmoid-like membership functions one can avoid the so-called indetermination part of the conclusion, which occur in reasoning with the Compositional Rule of Inference (CRI). Moreover, the MDI and the min and product based CRI are closed under such membership functions. The good axiomatic properties of the MDI reasoning scheme are shown, including not only the generalized modus ponens, but also the generalized modus tollens, the generalized chain rule, and more. As a special sigmoid-like function, we present the so-called squashing function by which piecewise-linear fuzzy intervals can be arbitrarily approximated. We show that by utilizing approximated fuzzy intervals in rules and premises, the MDI reasoning scheme can be efficiently calculated only by the parameters of the rule and premise memberships. In the second part of the paper we extend the original MDI reasoning scheme to multiple rules and multiple dimensions. We also investigate its applicability in fuzzy control i.e. with precise inputs and outputs.

References

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