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GREY RELATIONAL ANALYSIS BASED APPROACH FOR CMAC LEARNING

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Abstract. *Fast Learning and accurate convergence are the two issues to be most concerned in the research area of a Cerebellar Model Articulation Controller (CMAC). This paper investigates to incorporate grey relational analysis with number of training iterations to obtain an adaptive and appropriate learning rate for each input state to improve the CMAC stability and convergence. Additionally, this paper also proposes that the amount of weight adjustment to a memory cell of an addressed hyper cube must be relational to the trained input area, grey relational grade in the current training iteration and the inverse of the number of learning times to minimize the learning interference. A credit apportionment approach is thus derived for implementing this idea to achieve fast and accurate learning performance. The results of the experiments conducted in this study clearly demonstrate that the proposed approach provides a more accurate learning mechanism and faster convergence.*

Keywords: CMAC, Learning interference, Credit apportionment, Grey relational grade

1. **Introduction.** Cerebellar Model Articulation Controller (CMAC) was first proposed by Albus in 1975 [1,2]. Similar to other supervised neural networks, CMAC is able to model nonlinear functions. Most supervised neural networks have slow learning process because of the nature of global weight updating. However, CMAC neural networks have faster learning convergence and are capable of modeling nonlinear functions quickly due to the nature of local weight updating. The CMAC model has good local generalization ability, a simple structure for hardware implementation [15], and an alternative to backpropagated multilayer networks [3].

In past years, several studies had been conducted to enhance the capability of CMAC. In the relational papers dealing with CMAC, Thompson and Kwon had proposed the policies of neighborhood sequential training and random training to improve the training