Article Abstract

Title:	Prediction of the weld pool geometry of TIG arc welding by using fuzzy logic controller
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Abstract:	The present paper describes fuzzy logic simulation of tungsten inert gas welding (TIG) process to predict the weldment macrostructure zones' shape profile characteristics. The prediction of the weld pool geometry together with the shape of the heat affected zone (HAZ) was accomplished taking into account of TIG welding process parameters such as arc traverse speed, welding current and arc length. Structural steel plates of 8 mm thickness were used for the experiments. Full factorial design of experiment methodology was followed while selecting the input process parameters (control factors). These control factors were having three levels. The TIG weld pool geometry profiles' (boundaries of thermal cycle zones) like the weld bead reinforcement, penetration and heat affected zones were the responses from the experiment. A series of 27 experiments were carried out for collecting the data. The experimental data were then used for building a fuzzy logic model to predict the effects of control factors on the responses. A graphical mapping scheme was employed for the graphical representation of the macrostructure zones' shape profiles including that of HAZ. The model was also tested for a number of test cases to establish it's adequacy. The fuzzy logic modeling technique employed in the present investigation can be used for online prediction of the TIG weldment shape profiles. The methodology adopted in the present investigation indicated adequacy of fuzzy logic model for predicting the TIG weld-pool geometry and HAZ.
Keywords:	TIG welding, weld width, weld penetration, depth of HAZ, Fuzzy-Logic Controller.