

B. Genetic Algorithm for Optimization of Process Parameters for Height to Width Ratio and Application of Neural Networks for Prediction of Weld bead geometric parameters for TIG welding process

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This paper explains an integrated method of using genetic algorithm on the experimental data for optimizing the process parameters for height to width ratio and use of artificial neural network techniques for predicting the effects on the four weld bead geometric descriptors (front height, front width, back height and back width) by the five controlling weld process variables (welding speed, wire speed, cleaning percentage, welding current and arc gap) of Tungsten Inert Gas Welding (TIG) process. In this study, genetic algorithms are used for optimizing the process parameters was applied on the conventional experimental data available from a published work [1]. Experimental data were selected based on the results of design matrix of 2^{5-1} fractional factorial design of experiments technique. It was observed that genetic algorithms can able to optimize the process parameters for the desired height to width ratio of the bead.

The use of neural networks to model TIG welding process is also explored in this paper. Back-propagation neural networks are used to associate the welding process variables with the features of the weld bead geometry. The neural network is trained with the same welding experimental data used for optimization of process parameters using genetic algorithm. The results show that the proposed back-propagation neural network for estimating the weld bead geometric parameters can be effectively implemented, with small difference between the estimated and experimental results i.e., for about 92.2% of total outputs.