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Estimation of Welding Distortion Using Neural Network

[Yasuhisa Okumoto](#) and [Shigeo Eguchi](#)

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Summary: The residual deformation induced by welding processes becomes a cause of repair work at the subsequent process. Therefore it is necessary to manage the assembly of welded structures by estimating accurately the welding deformation considering welding conditions, welding length, and structural dimension, etc. Until now, theoretical, experimental and practical studies have been carried out widely, and then the prediction of the welding deformation can be done accurately by using FEM analysis now. However, technical knowledge is required for the analysis, and long hours are necessary to calculate the deformation, because thermal elasto-plasticity FEM analysis is usually required in order to ensure the accuracy of the estimation.

Though the elastic analysis is applied generally in order to predict the welding deformation easily and practically, in this study simplification of the prediction was done using neural network model. At first, thermal elasto-plasticity FEM analysis was carried out for the fillet welding of a T-type build-up structure, and the relationship between welding conditions and welding deformations (transverse shrinkage and angular distortion) was studied. Next the neural network by back propagation method was programmed by C language, and the FEM analysis results were given into the program as the teacher data. Then, the transverse shrinkage and angular distortion can be output by this program, if the welding conditions and member dimensions are input. This program would be able to estimate the welding distortion of joints with different dimensions and welding conditions in a simple manner.

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