Sensor Monitoring Using a Fuzzy Neural Network with an Automatic Input Selection and Rule Generation Algorithm

Man Gyun Na, Young Rok Sim, and Kyung Ho Park
Department of Nuclear Engineering, Chosun University
375 Seosuk-dong, Dong-gu, Kwangju 501-759, Korea

Abstract

The performance of fuzzy neural networks applied to sensor signal estimation strongly depends on the selection of input signals. In estimating sensor signals for sensor failure detection, there are usually a large number of input signals related to output signal estimation. As the number of input variables increases, the required training time of a fuzzy neural network increases exponentially and also there is much possibility which it has wrong information. Thus, it is needed to reduce the number of inputs to a fuzzy neural network and moreover, to select the optimum number of mutually independent inputs that are able to clearly define the input-output mapping. In this work, to automatically select important input signals, an automatic input selection routine that combines the correlation analysis and genetic algorithm is got in a fuzzy neural network which estimates a specific relevant signal. Also, since the number of fuzzy inference rules depends on that of selected inputs, the number of its rules is decided automatically according to the number of inputs. Whether the sensors fail or not is determined by applying the sequential probability ratio test to the residuals between the actually measured signals and the signals estimated by the fuzzy neural network. The proposed sensor monitoring method was verified by using various sensor signals acquired in Yonggwang unit 3&4 pressurized water reactors.