

Comparison of PCA-ANN and POD-ANN for CFD result of Mixing Elbow with Double Inlet Configuration

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CFD is one of the most prospective method for understanding complex flow phenomenon. It also can be applied for soft sensor because it solves Navier-Stokes equations using FEM or FVM, that is, we can get the information of whole area of system in discretized form. But computational cost of CFD is very high so it is hard to use for online monitoring or control. So the reduced order model based on PCA and POD with artificial neural network can be a good alternative for CFD mathematical model. In this work, the target system is mixing elbow with double inlet configuration. The input variables are cold inlet temperature, inlet flowrate and each of the input variable are set with 5 intervals. We collect the time series data at every 0.1s from 0.1 to 1.0s. Number of principal component is set to 14 owing to result of SVD variance plot which cumulative variance is over 99% of total variance. Number of hidden layer is 2 and there are 20 and 10 nodes for each layer. With this soft sensor model, we can predict the total information of target system varying with inlet temperature, flow rate and time. It is very useful for monitoring, fault detection and control for real time scale.