Article Abstract

Title:	Fault diagnosis for engine air path with neural models and classifier
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Abstract:	Fault detection and isolation (FDI) have become one of the most important aspects of automobile design. A new FDI scheme is developed for automotive engines in this paper. The method uses an independent radial basis function (RBF) neural network model to model engine dynamics, and the modelling errors are used to form the basis for residual generation. A dependent RBFNN model is a model which uses output data of a plant as a target output then use it to train the neural network, while, The independent RBFNN model is a higher accuracy than the dependent model and the errors can be detected by this model, because this model does not dependent on the output of the plant and it will use its output as a target, so if any faults in the plant will be not effect in the model and this faults will be detected easily and clearly. Furthermore, another RBF network is used as a fault classifier to isolate different faults from the modelling errors. The method is developed and the performance assessed using the engine benchmark, the Mean Value Engine Model (MVEM) with Matlab/Simulink. Five faults have been simulated on the MVEM, including three sensor faults, one component fault and one actuator fault. The three sensor faults considered are 10-20% changes superimposed on the measured outputs of manifold pressure, manifold temperature and crankshaft speed sensors; one component fault considered is air leakage in intake manifold; the actuator fault considered is the malfunction of fuel injector. The simulation results show that all the simulated faults can be clearly detected and isolated in dynamic conditions throughout the engine operating range.
Keywords:	Automotive engines, independent RBF model, RBF neural networks, fault detection, fault isolation.