

Fault Detection and Diagnosis with Modelica Language using Deep Belief Network

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The air handling unit (AHU) is the main component of heating, ventilation and air-conditioning (HVAC) systems, and irregular faults in AHUs are major sources of energy consumption. Most researches accomplished FDD through simple amounts of sensors or regardless of real control logic of AHU in HVAC system. However, Modelica can make the AHU and HVAC system like as a real system. Modelica carried out the modeling for AHU in HVAC system of a building as shown in Figure 1.

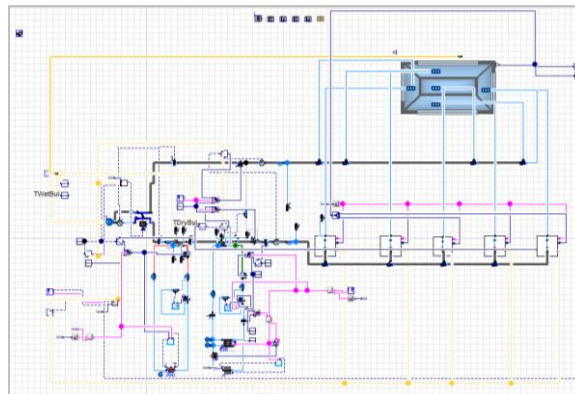


Figure 1. AHU system accomplished by Modelica

For energy efficient operation of HVAC, this paper aims to detect and diagnose three abnormal states in the AHU. After the application of results with Modelica as the normal and abnormal data, the fault detection and diagnosis process using machine learning is achieved as shown below. Data are filtered through the pre-process procedure, machine learning with a classifier procedure, and fault detection and diagnosis accomplished by the post-process procedure. In this research achieve with the popular deep learning model, called Deep Belief Network (DBN), where we train it using various data generated by Modelica.



Figure 2. Process of FDD

References

Geoffrey E. Hinton, Simon Osindero, Yee-Whye The, A fast learning algorithm for deep belief nets, Neural Computation, 1527-1554, 2006