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Detection of coolant leakage in thermal management system of fuel cell vehicle with fault-detection algorithm

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As an alternative candidate of internal combustion engine, fuel cell vehicle has been actively studied. Compared with internal combustion engine, fuel cell vehicle is more sensitive to the operating temperature that is coupled with water management. Additionally, the durability of fuel cell is also very sensitive to operating temperature. Different from internal combustion engine, the operating temperature window of fuel cell is very narrow, it is necessary to control active control of cooling system. In this study, the control algorithm of fuel cell cooling system is developed that facilitate thermal management strategy. With non-linear comprehensive simulation model of fuel cell system, the analytic redundancy model is developed. The analytical redundancy algorithm is used to determine fault of thermal system by diagnosis of residuals. The sensor errors such as stuck offset and scale of measured value was investigated in terms of change of residual. Result shows that analytic redundancy fault detection algorithm provides decision making information of cooling module. The control algorithm is then readjusted to determine proper operating conditions so that the cooling system is effectively maintained the fuel cell temperature.

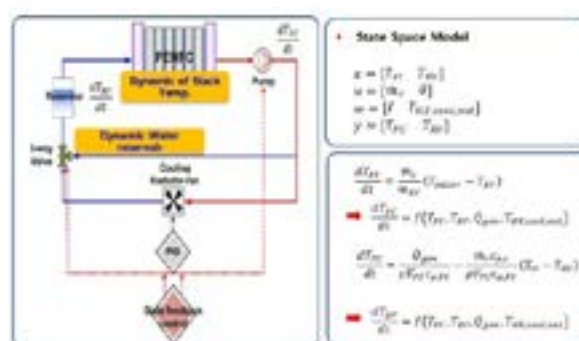


Figure 1: Conceptual model of fuel cell thermal management system

Biography

Sangseok Yu is a Professor of Mechanical Engineering at CNU who is an expert in modeling and simulation of energy system. He was majoring transient heat and mass transfer and dynamic modeling of automotive fuel cell system at University of Michigan Ann Arbor. In particular, he has special interests in control and fault detection of automotive fuel cell system. Recently, he extended his research scope to modeling and simulation of various energy systems.

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