DESIGN AND CONSTRUCTION OF A SMALL-SCALE HVAC SYSTEM WITH A DIGITAL CONTROLLER

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ABSTRACT

The objective of our project is to improve currently available control strategies to reduce operating and energy costs for hospital heating, ventilation, and air conditioning (HVAC) systems while improving the indoor environment quality. Our focus will only be on the air-handling unit (AHU).

In this project, a prototype AHU with a room model was designed and built. A digital control system consisting of controller, sensors, and controlled devices was designed and installed with the prototype AHU and room model.

After investigating current control strategies of an actual hospital, we have developed a new control strategy intended to improve the performance of the HVAC system. We defined a performance index that takes the amount of energy used in the HVAC system and the ventilation level considering the amount of CO2 in the air. The performance index was then used to evaluate the new control strategy from both energy consumption and the comfort level of the occupant's viewpoints.

The new control strategy is implemented in the AHU control system and compared with a traditional one using simulation obtained by the prototype AHU system.

All the mechanical equipment in this project was donated by Johnson Controls, Inc and Air Monitor Corp.

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