

Fuzzy Logic for Control and Automatic Operation of Natural Ventilation in Buildings

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Abstract : Global energy consumption has been increasing steadily over the last half - century, and this trend is projected to continue. As energy demand rises in many countries throughout the world due to population growth, natural ventilation in buildings has been identified as a viable option for lowering these demands, saving costs, and also lowering CO2 emissions. However, natural ventilation is driven by forces that are generally unpredictable in nature thus, it is important to manage the resulting airflow in order to maintain pleasant indoor conditions, making it a complex system that necessitates specific control approaches. The effective application of fuzzy logic technique amidst other intelligent systems is one of the best ways to bridge this gap, as its control dynamics relates more to human reasoning and linguistic descriptions. This article reviewed existing literature and presented practical solutions by applying fuzzy logic control with optimized techniques, selected input parameters, and expert rules to design a more effective control system. The control monitors used indoor temperature, outdoor temperature, carbon-dioxide levels, wind velocity, and rain as input variables to the system, while the output variable remains the control of window opening. This is achieved through the use of fuzzy logic control tool box in MATLAB and running simulations on SIMULINK to validate the effectiveness of the proposed system. Comparison analysis model via simulation is carried out, and with the data obtained, an improvement in control actions and energy savings was recorded.

Keywords : fuzzy logic, intelligent control systems, natural ventilation, optimization

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