

Intelligent predictive control for thermal comfort and energy savings in public buildings

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Topic: *Intelligent and soft computing techniques*

This talk addresses the problem of controlling a heating ventilating and air conditioning system with the purpose of achieving a desired thermal comfort level and energy savings. The formulation uses the thermal comfort, assessed using the predicted mean vote (PMV) index, as a restriction and minimises the energy spent to comply with it. This results in the maintenance of thermal comfort and on the minimisation of energy, which in most operating conditions are conflicting goals requiring some sort of optimisation method to find appropriate solutions over time. In this work a discrete model based predictive control methodology is applied to the problem. It consists of three major components: the predictive models, implemented by radial basis function neural networks identified by means of a multi-objective genetic algorithm [1]; the cost function that will be optimised to minimise energy consumption and provide adequate thermal comfort; and finally the optimisation method, in this case a discrete branch and bound approach. Each component will be described, with a special emphasis on a fast and accurate computation of the PMV indices [2]. Experimental results obtained within different rooms in a building of the University of Algarve will be presented, both in summer [3] and winter [4] conditions, demonstrating the feasibility and performance of the approach. Energy savings resulting from the application of the method are estimated to be greater than 50%.

References

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