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Adaptive neuro-PMV model for thermal comfort control in office air-conditioning systems in a tropical climate

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An adaptive Neuro-Predictive Mean Vote (Neuro-PMV) model is developed as a part of the Nanyang Technological University-Jurong Town Council Industrial Infrastructure Innovation Centre (NTU-JTC I^3C) research initiative to realize a comfort-centric and energy-efficient air-conditioning system in commercial buildings. A learning algorithm based on the proposed model is implemented using intelligent concepts of Artificial Neural Networks (ANN) and fuzzy logic, to control and optimize the thermal comfort of the indoor occupants in an air-conditioned environment. In order to predicate this algorithm, a test bed facilitating real-time monitoring and control has been established at NTU Singapore using a multi-agent system supported by state-of-the art Z-wave technology. The proposed model is validated in the test bed using research intensive experimental analysis and questionnaire-based survey. The mathematical model, computational design and experimental results achieved using the proposed model of thermal comfort control are discussed in this paper.

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Development of future distribution networks in the UK with low carbon technologies and smart solutions

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The most comprehensive study into the future real-life distribution networks in the UK has been recently completed. A full set of studies was done on four represantive UK distribution networks. They are classified as urban, rural, interconnected and Central London and they tend to model diversities in the UK distribution systems. Quantities of forecast new low carbon technologies– LCTs (wind, solar, electric vehicles and heat pumps) that are connected to the four representative networks were obtained from the national DECC forecasts using the top-down approach. Annual profiles of the new LCTs were developed in the next step and associated with new LCTs, enabling sequential studies using the half-hourly granularity. Development planning of the representative networks was done using the decision tree approach and horizon year planning concept. Development paths were obtained based on 'pathfinding' studies that involve sequential power flows, voltage and fault level assessment. Once the individual development plans up to the horizon year–2034 were found, 'impact' studies were run–they involve, reliability, harmonics, electromagnetic transient processes and frequency response of future distribution networks. Some of the smart solutions investigated are demand side management, real-time thermal ratings, dynamic network reconfiguration, network meshing, energy storage, voltage regulator, voltage compensation devices, co-ordinated voltage control, etc. Comprehensive planning results and generalised conclusions are presented. For example, smart solutions can be an effective means to deffer investment, but combination of traditional and smart solutions is the best (and probably the only) way forward. Smart solutions for voltage problems last longer compared to solutions for thermal overloads.

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