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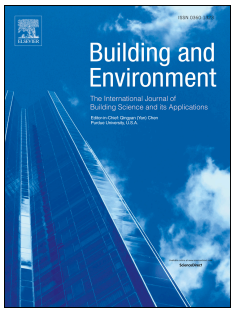

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Optimization of Air Distribution Mode Coupled Interior Design for Civil Aircraft Cabin

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Abstract

The airflow distribution and thermal comfort of human beings in civil aircraft cabin are influenced by many factors such as the ventilation mode, ventilation air volume, and supply air temperature and so on. Among these factors, the choice of ventilation mode in the civil aircraft cabin is also restricted by the interior and aesthetic designs. Yet few researches noticed the impact of these designs on cabin air distribution. In this paper, an optimization design method for the air distribution mode of civil aircraft will be discussed based on Computational Fluid Dynamic (CFD) method and Micro-Genetic Algorithm (Micro-GA). Two interior design structures with different luggage bin and light band will be used to investigate their influence on the design of air distribution mode. In this optimization, the position of air supply inlets and the supply air angle are defined as the optimization variables. The Predicted Mean Vote (PMV) and the air age are specially chosen as the objective functions. The relevant regulations for cabin temperature uniformity are determined as the thermal constraint conditions. The study results show that the presented method can ensure the convergence of optimization process. The Pareto Optimal Frontiers (POFs) can be obtained from this multi-objective optimization. The POFs can present the relationship of two objective functions. The preferred air distribution mode coupled different interior designs can be efficiently recommended from the optimization