

Air Flow Simulation Techniques Comparison for Architectural Design

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ABSTRACT

Simulation of indoor air flow in heating, ventilation, and air conditioning (HVAC) system in construction design is critical in order to control spread of volatile organic compounds (VOC) or germs and viruses in the case of a pandemic, as we witnessed 2019-2021. This paper presents the findings from comparing two types of fluid simulations: grid-based and particle-based methods. The former is widely used for scientific computation due to its precision, however, it is time consuming and requires designers to do pretreatment of the building model for airflow simulations in construction design using grid-based methods. The particle-based method is used in visual effects, games and other applications requiring real-time simulation. This paper presents a review of the literature on different methods of fluid simulation like finite volume method (FVM), smoothed-particle hydrodynamics (SPH), position-based dynamics (PBD) and provides a comparison of heat transfer between particle-based and grid-based methods in indoor airflow simulations with HVAC system.