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Algorithmic optimization of super-smart shells With the aim of reducing energy consumption

Case Study: Energy Consumption Analysis in high-rise buildings

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Abstract

Energy is undoubtedly one of the most important factors regarding the sustainable development of human societies, and its production, distribution, and demand is considered as the greatest cause of environmental destruction and pollution. The limitation of traditional energy sources and environmental issues have attracted global attention towards efficient use of energy. These traditional sources such as fossil fuels are non-renewable, costly, and have adverse effects on the environment therefore, it is necessary to utilize alternative and renewable sources of energy. One of them is solar energy which has become increasingly popular in recent years due to the development of environmental approaches and effective strategies in using such renewable sources. Since buildings are one of the main consumers of energy, it is essential to optimize them in order to reduce energy dissipation. Furthermore the building facade, as the first line of contact with environmental factors, is one the influential parameters that effects energy transfer and demand. The main goal of this research is to design a smart shell that is compatible with the existing climate and reduces energy demand in high-rise residential buildings. This is achieved through determining the parameters which effect thermal comfort and measuring them afterwards in proposed models in order to reduce the heat load during different seasons. In this regard, the algorithm for the proposed models of smart shells is presented (dynamic shell), designed models are optimized, and all of the related parameters have been analyzed and maximum efficiency in samples has been determined.

Key words: energy optimization; algorithmic design; smart shell; building heating load;