Application of Grasshopper Optimization Algorithm for Design and Development of Net Zero Energy Residential Building in Ahmedabad, India

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Abstract : This paper aims to apply the Grasshopper-Optimization-Algorithm (GOA) for designing and developing a Net-Zero-Energy residential building for a mega-city like Ahmedabad in India. The methodology implemented includes advanced tools like Revit for model creation and MATLAB for simulation, enabling the optimization of the building design. GOA has been applied in reducing cooling loads and overall energy consumption through optimized passive design features. For the attainment of a net zero energy mission, solar panels were installed on the roof of the building. It has been observed that the energy consumption of 8490 kWh was supported by the installed solar panels. Thereby only 840kWh had to be supported by non-renewable energy sources. The energy consumption was further reduced through the application of simulation and optimization methods like GOA, which further reduced the energy consumption to about 37.56 kWh per month from April to July when energy demand was at its peak. This endeavor aimed to achieve near-zero-energy consumption, showcasing the potential of renewable energy integration in building sustainability.

Keywords : grasshopper optimization algorithm, net zero energy, residential building, sustainable design

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