Abstract

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A Multivariate Regression to Predict Daylighting and Energy Consumption of Residential Buildings within Hybrid Settlements in Hot-Desert Climates

ver recent decades, Egypt has experienced unprecedented growth of urban residential regions causing deterioration to indoor environmental quality. This research is a part of an ongoing study of building performance with different physical configurations and façades. It aims to quantify the daylighting and energy consumption of residential buildings in the hot-desert hybrid settlements of Alexandria. The methodological approach involves performing computational simulations to construct a dataset covering several influencing factors, which are exploited to develop multivariate linear regression models. This yields five equations used as proxies for predicting building performance in the early stages of the design. The developed models are validated and the predicted data, accompanied by insignificant errors, are found to be in a good agreement with simulation results, indicating that these models can explain the variation in the building performance. These measures, supported by an additional analysis of residuals, confirm the strength of Selected variables and suitability of developed models to fit the dataset. This can aid architects and decision makers to assess a preliminary building performance by considering factors of heavily obstructed environment and façade configurations without the need to perform exhaustive analysis.