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Abstract

The energy efficiency is one of the most important issues nowadays; the problem with the buildings heating is especially relevant for Ukraine. The aim of the paper is to develop a convenient tool for analyzing building energy performance based on regression model for internal air temperature prediction, depending on a number of internal and external influential factors. The external climatic factors, such as outside air temperature, wind speed and direction, solar heat gains depending on building surfaces orientation, are considered. Internal factors include heating load, number of floors, air exchange rate etc. In order to achieve the goal, a room dynamic simulation model is created in the EnergyPlus software. A number of simulations are carried out based on the created mathematical model. The individual and aggregate selected factors influence on inside air temperature change is considered. The general structure of the multivariate nonlinear regression model for inside air temperature determination is analyzed and selected. Constant coefficients are obtained for each selected influencing factor, and verification of the received nonlinear regression model is performed based on simulation data using January climatic data from the IWEC file. The adequacy of the obtained regression model is estimated by the corrected determination coefficient (R^2=0.981) and Fisher's criterion (F=1324.3), which indicates the high accuracy of the obtained multivariate nonlinear regression. The proposed approaches for creating regression models can be used for other architectural and thermal and physical properties of buildings envelope.