Artificial-Neural-Network-Based Model for Predicting Heating and Cooling Loads on Residential Buildings

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ABSTRACT

A population growth of around 1,000 people per day is the main factor contributing to the increase in housing demands in Florida. Optimization of the energy performance of residential buildings is crucial for the reduction of greenhouse gas emissions and fossil fuel consumption. This optimization entails the designers to accurately predict the energy consumption of buildings right from the design stage. Traditional energy modeling techniques require a lot of expertise and tend to be time-consuming and lacking in terms of energy predictions. Artificial intelligence (AI) techniques have been recently used to predict the energy usage of buildings and to be an alternative solution to such engineering methods. This study developed an Artificial Neural Network (ANN) model based on a large dataset of more than 18,000 newly constructed single-family houses in Florida between the years 2009 and 2019 to predict the heating and cooling loads on single-family houses. An ANN model based on this data set is developed to predict the energy usage of detached residences. The ANN will help designers to make the right decisions during the conceptual design stage of residential projects, and to explore the different design options using generative design for energy optimization purposes.