Using a New Sub-building Classification Scheme for Analysis of Space and Usage Contribution to Building Energy Demand

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A wide variety of whole building energy simulation programs have been developed to predict energy consumption and analyze energy performance. Most of the energy simulation programs require building type as an input or classify each space based on assignability or primary function. However, buildings are often multi-functional, and assuming a single building type for energy simulation leads to widely varying accuracy in the simulation results, depending on how much of that building is actually used as the assumed building type and the variability of the energy demands made as a result of the different functions the building serves. To address this issue, a new classification scheme was developed to capture variations in multi-dimensional uses of any campus building. The characterization scheme, based on the building classification defined by the Commercial Building Energy Consumption Survey of the U.S. Energy Information Administration, takes into account the number of occupants, frequency of occupancy, and special electronic or major equipment in each room or space being classified. To demonstrate the use of the new classification scheme, and to determine how space usage affects the energy usage of a building, we built a multivariate regression model based on standard building energy factors (heating, cooling, humidity, dew point, occupancy) combined with the new sub-building classification scheme to analyze how building use (at the sub-building level) relates to building energy demand. Using the new classification, occupancy data, and weather data, our final model revealed that cooling degree hours (hours during which cooling is needed), and not heating degree hours, seems to have a significant influence on a building's energy consumption. The new sub-building classification can replace building type as an input for energy simulation programs and has an advantage in predicting energy consumption more accurately.

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