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# Uncertainty analysis of occupant behavior and building envelope materials in office building performance simulation

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## Abstract

In this paper, a numerical model is developed to analyze the uncertainty of occupant behavior and building envelope materials on energy performance. The study is carried out for hot, moderate and cold weather conditions. Random variations of parameters related to occupant behavior and building envelope are studied in order to quantify the uncertainties on the final energy loads. Regarding occupant behavior, the studied parameters are the occupant arrival and departure times, the number of occupant and internal gains due to occupant activities. Regarding the building envelope, the studied parameters are external walls, floor and roof U-values. The results show a large variation of energy needs due to uncertainties related to occupant behavior and building physical properties. The uncertainties in input data show that parameters related to occupant behavior have a considerable influence in hot climates compared to parameters related to building envelope materials. On the other hand, for cold climate, the influence is more pronounced for parameters related to building envelope than parameters related to occupant behavior.

*Keywords: energy performance, uncertainties, occupant behavior, building envelope, Matlab.*

## 1. Introduction

The building sector is nowadays the largest energy consumer, even before the sectors of energy and transport [1]. In Europe, more than 40 % of the total energy demand is dedicated only to the consumptions of houses, with more than 25 % of greenhouse gas emissions [2, 3], among which 60 % of the total energy consumptions are dedicated to heating and cooling in most of the countries of the IEA (International Energy Agency) [4].

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