

Definition and Simulation of Occupant Behavior in Buildings

EBC ANNEX 66

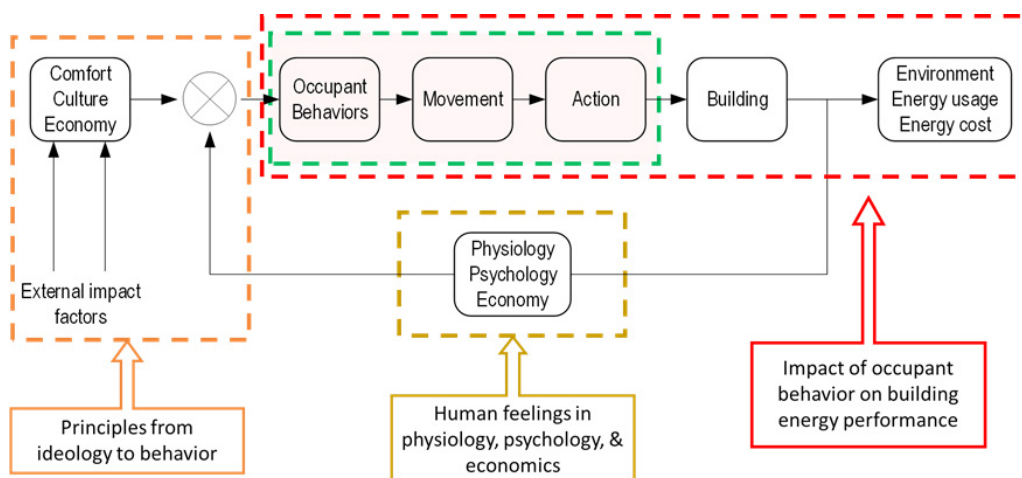
Occupant behaviour is a key issue for building design optimization, energy diagnosis, performance evaluation, and building energy simulation. It contributes significantly to building energy use. Before this project, general understanding of occupant behaviour was quite limited both in terms of building systems design and energy retrofit, leading to inappropriate over-simplifications. Existing studies on occupant behaviour, mainly from the perspective of sociology, lacked in-depth quantitative analysis. Although there are many groups worldwide studying occupant behaviour, often in isolation, the behaviour models created so far have often been inconsistent, with a lack of consensus about common terminology, good experimental design and modelling methodologies.

Due to the complexity and the great diversity in behaviour often encountered, it is prerequisite for researchers to work together to define and simulate occupant behaviour in a consistent and common way. International cooperation

PROJECT OBJECTIVES

- 1 identify quantitative descriptions and classifications of occupant behaviour,
- 2 develop effective calculation methodologies of occupant behaviour,
- 3 implement occupant behaviour models with building energy simulation tools, and
- 4 demonstrate the occupant behaviour models in design, evaluation and operation and optimization by case studies.

is particularly important for both knowledge discovery and data sharing.



Occupant behaviour influences building systems by movement or actions and further determines the building indoor environment and energy use. Both the indoor environment and energy use in turn affect occupant behaviour through psychological, physiological and economic factors together with several external factors like comfort and culture.

INTERNATIONAL ENERGY AGENCY

The International Energy Agency (IEA) was established as an autonomous body within the Organisation for Economic Co-operation and Development (OECD) in 1974, with the purpose of strengthening co-operation in the vital area of energy policy. As one element of this programme, member countries take part in various energy research, development and demonstration activities. The Energy in Buildings and Communities Programme has co-ordinated various research projects associated with energy prediction, monitoring and energy efficiency measures in both new and existing buildings. The results have provided much valuable information about the state of the art of building analysis and have led to further IEA co-ordinated research.

EBC VISION

By 2030, near-zero primary energy use and carbon dioxide emissions solutions have been adopted in new buildings and communities, and a wide range of reliable technical solutions have been made available for the existing building stock.

EBC MISSION

To accelerate the transformation of the built environment towards more energy efficient and sustainable buildings and communities, by the development and dissemination of knowledge and technologies through international collaborative research and innovation.

The target of the project was to set up a standard occupant behaviour definition platform, establish a quantitative simulation methodology to model behaviour in buildings, and understand the influence of behaviour on building energy use and the indoor environment.

How to quantitatively describe the influence of occupant behaviour on building performance and how to analyze and evaluate the impact of occupant behaviour in buildings are fundamental scientific questions. Answering these questions was the main focus of this project.

ACHIEVEMENTS

The outcomes from this project are:

- a standard definition and simulation methodology for occupant presence and movement models,
- a standard description of occupant action behaviour simulation, a systematic measurement approach, and a modelling and validation methodology in residential and commercial buildings,
- an occupant behaviour XML schema, a software module that can be integrated within building energy modelling programs, a software developers guide, and sample computer codes to demonstrate the use of the schema and module,
- case studies and a behavioural guide that are useful to architects, engineers, building operators, and designers of controls systems.

Project duration

Completed (2013 - 2018)

Operating Agents

Dr Da Yan,
Department of Building Science,
School of Architecture,
Tsinghua University,
Beijing, 100084
P.R. CHINA
yanda@tsinghua.edu.cn

Dr Tianzhen Hong
Building Technologies
Lawrence Berkeley National Laboratory
1 Cyclotron Road, MS 90R2000
Berkeley CA 94720
USA
thong@lbl.gov

Participating countries

Australia, Austria, Canada, P.R. China, Denmark, Germany, Italy,
R. Korea, the Netherlands, New Zealand, Norway, Singapore,
Spain, UK, USA
Observer: Hungary, Poland

Further information

www.iea-ebc.org