1. PROJECT

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Title: UK-China collaborative research project ‘Low carbon climate-responsive Heating and Cooling of Cities (LoHCool)’

Dates: 01 October 2015 to 31 March 2019

Funding organisation: The UK Engineering and Physical Sciences Research Council (UK EPSRC) and the National Natural Science Foundation of China (China NSFC)

Grant no.: [EPSRC Grant No. EP/N009797/1] [NSFC Grant No. 51561135002]

2. DATASET

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Title: Source codes of MATLAB program for the dynamic thermophysical process modelling of a typical 3-occupant residential apartment in the HSCW zone

Description: The dataset provides the source codes of MATLAB program for building dynamic thermophysical process modelling of a typical 3-occupant residential apartment identified in the HSCW (Hot Summer and Cold Winter) zone of China. The plain layout of the 3-occupant residential apartment is provided in a separate introduction document. Three versions of programs are available to calculate the cases of free room temperatures without energy supply, ideal building heating and cooling loads with fixed room target temperatures and building heating and cooling loads with room target temperature control bands, respectively. The model is developed based on the State-Space Method, with a view to investigating the impact of thermal mass of external walls on residential buildings in the part time part space heating and cooling in the HSCW zone. A small time interval can be set manually to get a high-resolution model in particular for the intermittent occupancy pattern. Different scenarios of heating/cooling modes, thermal mass and thermal insulation placements of external walls are considered and three representative cities Chongqing, Changsha and Shanghai in the HSCW zone are chosen as the input weather data. Options in the programs can be chosen and relevant default parameter settings can be changed to be fit for the building simulations of different scenarios.

Publication Year: 2018

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Rights-holder(s): University of Reading

Source(s): The typical meteorological year data of the three representative cities Chongqing, Changsha and Shanghai in the HSCW available in the reference below are used as the weather data inputs.

Reference of the weather data source: [China Meteorological Bureau](http://www.china-building.com.cn/), Climate Information Center, Climate Data Office and Tsinghua University, Department of Building Science and Technology. 2005. China Standard Weather Data for Analyzing Building Thermal Conditions, April 2005. Beijing: China Building Industry Publishing House, ISBN 7-112-07273-3 (13228).

3. TERMS OF USE

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Copyright University of Reading 2018. This dataset is licensed under a Creative Commons Attribution 4.0 International Licence: https://creativecommons.org/licenses/by/4.0/.

4. CONTENTS

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File listing

Free\_room\_temperature\_program.rar This file recorded the version of MATLAB programming code for calculating the case of free room temperatures of the typical 3-occupant residential apartment in different scenarios.

Heating\_and\_cooling\_loads\_heavyweight\_FixedTemp.rar This file recorded the version of MATLAB programming code for calculating the ideal building heating and cooling loads with fixed room target temperature for three functional rooms (2 bedrooms and 1 sitting room) of the studied apartment in different scenarios.

Heating\_and\_cooling\_loads\_heavyweight\_TempContBands.rar This file recorded the version of MATLAB programming code for calculating the building heating and cooling loads with room target temperature control bands for three functional rooms (2 bedrooms and 1 sitting room) of the studied apartment in different scenarios.

Each file has a main program entitled ‘Main\_program.m’ and a range of subroutines which are invoked in necessary places in the main program.

5. METHOD and PROCESSING

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The building dynamic thermophysical process modelling is developed based on the State-Space Method (SSM). For the SSM, please find detailed information in the following references [1-3]:

[1] Tsinghua University DeST Development Group, Simulation analysis methods of built environment systems: DeST, China Architecture & Building Press, 2006.

[2] D. Yan, J. Xia, W. Tang, F. Song, X. Zhang, Y. Jiang, DeST – an integrated building simulation toolkit. Part I: Fundamentals, Building Simulation 2 (2008) 95–110.

[3] X. Zhang, J. Xia, Z. Jiang, DeST – an integrated building simulation toolkit. Part II: Applications, Building Simulation 3 (2008) 193–209.

Related solar radiation models for calculating solar internal heat gains are referring to the reference [4]:

[4] J.A. Duﬃe, W.A. Beckman, Solar Engineering of Thermal Processes,4th edition, John Wiley & Sons, New York, 2013.

In addition, the models developed were used to prepare a journal paper for submission to the journal Energy and Buildings (see below). Some information can be found in the article once it is accepted and published.

Jie Deng, Runming Yao, Wei Yu, Qiulei Zhang, Baizhan Li, Effectiveness of thermal mass of external walls on residential buildings for part time part space heating and cooling based on state-space method, submitted to an international journal Energy and Buildings (in preparation).