

IJM articlel style class for latex

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Version: 1.0
Date: 21 Jul 2015

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Description

This is the repository dedicated to the maintenance and further develop of the latex article template for the [International Journal of Microsimulation](#).

This template has been developed to fit the current template of the journal.

The template has been develop under the assumption that it will be compiled using [pdflatex](#). Depending on the contents of the paper the template may also be compiled using a different method.

This template requires some additional packages in order to compile, please refer to section [Used Packages](#) for further information and links to the individual packages.

INTERNATIONAL JOURNAL OF MICROSIMULATION(2014) 7(1) 127-136
INTERNATIONAL MICROSIMULATION ASSOCIATION



Constructing an Urban Microsimulation Model to Assess the Influence of Demographics on Heat Consumption

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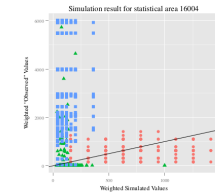
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ABSTRACT: We present ongoing work on the construction of a spatial microsimulation model to assess the influence of demographics on residential heat consumption for Hamburg, Germany. Demographics are important for urban energy planning as: (1) Buildings are becoming more energy-efficient and building occupant behaviour accounts for a growing share in the variation of consumption; (2) building occupant needs are changing along with demographic change; and (3) the share of small decentralized district heating grids, in which fewer customers mean less averaging out of heterogeneous occupant profiles, is set to play a bigger role in the country's heat supply. We construct a spatial microdata set for the city of Hamburg (of roughly 1.8 million inhabitants and 370 000 buildings), with households populating geo-referenced buildings, in three steps: (a) Synthesizing the population of small scale "statistical areas", comprising up to around 2 000 people (we do this by selecting households recorded in the German microcensus and fitting them into the statistical areas); (b) assigning energy relevant properties to the geo-referenced buildings from the Hamburg digital cadaster (we do this by making use of a well-established building typology developed for energy assessment) and constructing dwelling units in these buildings; and (c) matching households to the dwelling units in these buildings (which we do again by using household data from the microcensus). This last step – allocating households to buildings

Figure 6: Comparison between simulated and observed parameters
Simulation results for statistical area 16004



These parameters are used as restrictions to merge the households to the dwelling units in statistical area 16004. Result after 10×6 (deduction of households from the micro census) $\times 10 \times 6$ (merge of households with dwelling units) iterations computation of transmission losses, taken from the attributed building type.

Table 4: Variables used to estimate the time at home for the single individuals

Variable ID	Variable Name
e095	Employment status in the reference work
e128	Full-time / part-time job
e142	Typically hours worked during the week
e147	Work on Saturday (February until April)
e148	Work on Sundays and public holidays (February until April)
e149	Evening work (between 6 p.m. and 11 p.m.) (February until April)
e150	Night work (between 11 p.m. and 6 a.m.) (February until April)
e151	Night work hours (between 11 p.m. and 6 a.m.) (February until April)
e163	Home office (February until April)

Source: MICROCENSUS 2002 ([Eurostat/Statistics Brandenburg 2005](#)). Variable names: translation by the authors.

The input parameters derived from the households' attributes are: (1) Internal heat emissions q_i ; (2) Internal temperature T_i ; and (3) Air exchange rate n . In order to find values for these parameters, we first estimate the average working hours of the individuals living in the building. Here we make use of the micro census again. In order to estimate the average working hours of the single individuals we use the parameters describe in Table 4. With these parameters, we estimate the working hours of every

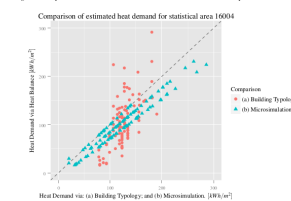
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Figure 7: Comparison between estimated heat demand and simulated heat consumption



Comparison between heat demand estimated with a heat balance method, using the "average" occupant (vertical axis) and with help of: (a) building typologies; and (b) a heat balance, taking into account occupant influence, reduce through the synthetic simulated demographic characteristics via a spatial microsimulation (horizontal axis). This comparison shows the results of buildings in statistical area 16004

so makes uses of the standard internal gains, internal temperature and ventilation rates, corresponding to row 3 of Table 2 and (2) the implementation of the heat balance method, varying input parameters (q_i , T_i and n) as a function of the computed average working hours of the building, thus simulating heat consumption. The result of this comparison is presented in Figure 7. One can clearly see in the plot that the simulated heat consumption shows a bigger spread. This is plausible, as it considers a richer spectrum of occupant types. The analyzed statistical area still has a high proportion of "old" buildings, that is buildings predating the first (WSVO) Heat conservation ordinance in 1977 (see Figure 9). We can expect a much higher relative spread in urban areas that have been recently developed or re-developed ("relative" meaning: relative in terms of the overall amount of heat consumption).

On average the simulated heat consumption is much higher than the estimated heat demand. The selected urban area does not represent the average household in Hamburg. Table 5 compares some attributes with the average values for the entire city. The selected area has: (1) a high level of unemployment, which in our model means less or 0 working hours; (2) a lower share of single person households, which raises the probability of having a resident with zero working hours; and (3) a high share of households with

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Files

File	Description
IJM-article.cls	Style class
readme.pdf	This File
IJM-article.tex	Article example, you can edit this file
logo.png	IJM logo

FIGURES	Folder with sample figures
IJM-article.pdf	Sample article

Used packages

Package	Description
hyperref	Handle cross-referencing commands
graphicx	Needed to use the <code>\includegraphics</code> command. Used to display the IJM logo
lastpage	Reference last page of the document
setspace	Define space between lines
parskip	Define <code>\parindent</code> (paragraph indent) and <code>\parskip</code> (space between paragraphs)
url	Handle web address and email address inputs
textpos	Allows for absolute positioning of text and images
apacite	Format bibliography in APA style
endnotes	Convert footnotes to endnotes
ccaption	Format captions
faccyhdr	Format header and footer
geometry	Manipulate the geometry of the layout
mathdesign	Provides Garamond fonts. This package collides with other math fonts (e.g. mathptmx)