IJM articel style class for latex

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Table of Contents

Description 1

Files 1

Used packages 2

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.

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

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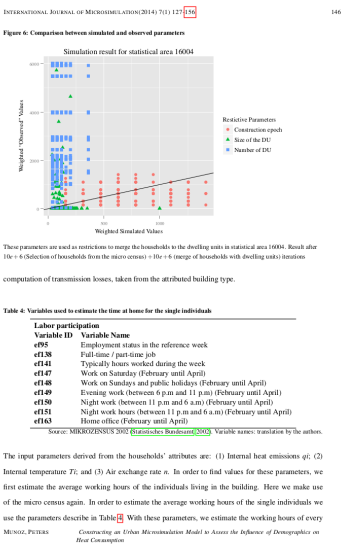
ABSTRACT: We present ongoing work on the construction of a spatial microsimulation model to assess the influence of demographics on residential heat consumption for Hamburg, Germany. Demographics are important for urban energy planning as: (1) Buildings are becoming more energy-efficient and building 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



International Journal of Microsimulation(2014) 7(1) 127-156 146

Figure 6: Comparison between simulated and observed parameters

Simulation result for statistical area 16004

Weighted Simulated Values

Weighted "Observed" Values

Restrictive Parameters
Construction epoch
Size of the DU
Number of DU

These parameters are used as restrictions to merge the households to the dwelling units in statistical area 16004. Result after 10e+6 (Selection of households from the micro census) +10e+6 (merge of households with dwelling units) iterations

computation of transmission losses, taken from the attributed building type.

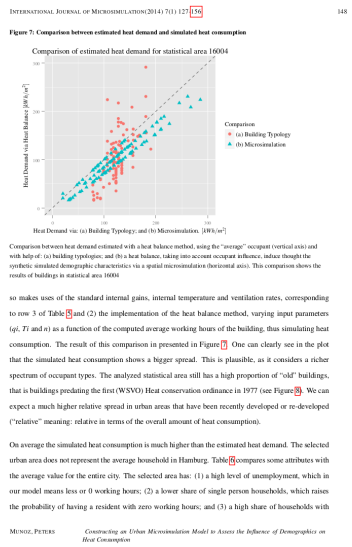
Table 4: Variables used to estimate the time at home for the single individuals

Variable ID	Variable Name
Labor participation	
eP95	Employment status in the reference week
eT138	Full-time / part-time job
eT141	Typically hours worked during the week
eT147	Work on Saturday (February until April)
eT148	Work on Sundays and public holidays (February until April)
eT149	Evening work (between 6 p.m and 11 p.m) (February until April)
eT150	Night work (between 11 p.m and 6 a.m) (February until April)
eT151	Night work hours (between 11 p.m and 6 a.m) (February until April)
eT163	Home office (February until April)

Source: MIKROZENSUS 2002 (Statistisches Bundesamt(2002). Variable names: translation by the authors.

The input parameters derived from the households' attributes are: (1) Internal heat emissions qi; (2) Internal temperature Ti; 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

Munoz, Peters — *Constructing an Urban Microsimulation Model to Assess the Influence of Demographics on Heat Consumption*



International Journal of Microsimulation(2014) 7(1) 127-156 148

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

Comparison of estimated heat demand for statistical area 16004

Heat Demand via Heat Balance [kW/m²]

Heat Demand via: (a) Building Typology; and (b) Microsimulation. [kW/m²]

Comparison
(a) Building Typology
(b) Microsimulation

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, induce thought 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 5 and (2) the implementation of the heat balance method, varying input parameters (qi, Ti and n) as a function of the computed average working hours of the building, thus simulating heat consumption. The result of this comparison in 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 8). 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 6 compares some attributes with the average value 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

Munoz, Peters — *Constructing an Urban Microsimulation Model to Assess the Influence of Demographics on Heat Consumption*

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 `\includegraphics` command. Used to display the IJM logo
lastpage	Reference last page of the document
setspace	Define space between lines
parskip	Define `\parindent` (paragraph indent) and `\parskip` (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)