GENIUS, a methodology to integer building scale data into urban microclimate and energy consumption modelling

Nathalie Tornay, Marion Bonhomme, Serge Faraut


Illustration of Marion Bonhomme thesis
GENIUS, a methodology to integer building scale data into urban microclimate and energy consumption modelling

- Context
- Problematics
- 1. Urban scale
- 2. Building scale
- 3. Material scale
- Development
Performance of solar panel
Solar gains through the windows

=> To perform building energy balance simulations
GENIUS, a methodology to integer building scale data into urban microclimate and energy consumption modelling.
GENIUS, a methodology to integer building scale data into urban microclimate and energy consumption modelling.

**Context**

**Problematics**

How can we characterise **the building scale** in order to update, and to make full use of **urban simulation tools**?

1. Urban scale
2. Building scale
3. Material scale

*Illustration of Marion Bonhomme thesis*
GENIUS, a methodology to integer building scale data into urban microclimate and energy consumption modelling

Method

Method: Interview urban planners (FNAU) about the different urban typologies in France.

References: Marion Bonhomme thesis

Aim: to take in account the vision of designers operating processes, in order to identify a system of ranking of urban typology.
GENIUS, a methodology to integer building scale data into urban microclimate and energy consumption modelling

1. Urban scale

1. detached house

2. semi-detached house

3. row house on open island

4. row house on closed island

Problematics

Context

Methodology

Results

Discussion
GENIUS, a methodology to integer building scale data into urban microclimate and energy consumption modelling

Context

Methodology

Results

Discussion

1. Urban scale

5_ detached building

6_ linear building on open urban island

7_ linear building on closed urban island

Problematics

Building scale
GENIUS, a methodology to integer building scale data into urban microclimate and energy consumption modelling

1. Urban scale

8. High rise building

9. Industrial building

10. Informal urban island

High rise building

Industrial, building

Ephemeral constructions
GENIUS, a methodology to integer building scale data into urban microclimate and energy consumption modelling

**Context**

**Methodology**

**Results**

**Discussion**

1. **Urban scale**

   - **MApUCE project**

   - Urban typologies will be defined by **morphological indicators** at urban island scale coded on the OrbisGIS/H2GIS GIS by IRSTV.

   - This morphological indicators will be used as input to an automatic classification (unsupervised statistical analysis).

   - The method of the classification is a work in progress by LRA.
GENIUS, a methodology to integer building scale data into urban microclimate and energy consumption modelling

**Context**

**Method**

**Results**

**Discussion**

1. Urban scale
2. Building scale

Bibliographical studies
GENIUS, a methodology to integer building scale data into urban microclimate and energy consumption modelling

1. Urban scale

2. Building scale

Context

Problematics

Methodology

Use building

Databases such as IGN (Institut Géographique National).
Such as housing, office, religious building, castle, school, hospital…

date of construction

Thermal rules

<table>
<thead>
<tr>
<th></th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
<th>P5</th>
<th>P6</th>
<th>P7</th>
</tr>
</thead>
</table>

location building

Local materials

1_schiste
2_meuliere
3_pisé

ICUC9 _ Toulouse _ 20th-24th July 2015 _
GENIUS, a methodology to integer building scale data into urban microclimate and energy consumption modelling

**Methodology**

**Problematics**

1. Urban scale
   - urban typology
   - use building
   - periods of construction
   - and location

2. Building scale

From input data:
- urban typology
- use building
- periods of construction
- and location

It is possible to predict typical or representative buildings on the territory of the France
Bibliographical studies

- “reference buildings” in France (Rapport «RAGE 2012»)


- ...
GENIUS, a methodology to integer building scale data into urban microclimate and energy consumption modelling

1. Urban scale
2. Building scale
3. Material scale

Example: Residential house
GENIUS, a methodology to integer building scale data into urban microclimate and energy consumption modelling

**Methodology**

1. Urban scale
2. Building scale
3. Material scale

**Results**

- 1 urban typology +
- 1 use building +
- 1 date of construction +
- 1 location ≠ one constructive system wall and roof.

**Discussion**
GENIUS, a methodology to integrate building scale data into urban microclimate and energy consumption modelling

Context

Problematics

1. Urban scale
2. Building scale
3. Material scale

Development
GENIUS, a methodology to integer building scale data into urban microclimate and energy consumption modelling

Context

Problematics

1. Urban scale
2. Building scale
3. Material scale

Development

Thank you

nathalie.tornay@toulouse.archi.fr