Generation of Downtown Planning-Ordinances using Self Organizing Maps

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Outline

1. Background
2. Objectives
3. The proposed method
4. Illustration
5. Conclusions and future research
Ordinances?
What is an ordinance?
Ordinances = Urban Rules

Source: Lehnerer, A., 2009, Grand Urban Rules
1. Background.

- Ordinances usually are not capable of incorporating the complexities of the urban space.

- The Ordinance as opportunity.

- The Ordinance as link between urban projects and architecture.
2. Objectives.

• To be able to understand urban complexity:
  
  – 1st. Connect traditional and new concepts.
  
  – 2nd. This concepts as urban fabric.
  
  – 3rd. This urban fabric represent the urban reality as a living entity:
3. The Proposed Method (1)

- Reconstruct collected data into patterns:
  - Reconstruct data using a “recycling process”.
  - Using pattern (Alexander, 1968) (physical questions) + non physical questions (i.e. social or economic issues)

Ecotype Pattern

Typology idea
+ Factors from the concrete site (social, economic, etc.)
3. The Proposed Method (2)

• The Ecotype Patterns and their networks form a Network Ordinance:
  
  – This is achieved by using a heuristic procedure.
  – A heuristic procedure that excludes strange or useless variables.
  – Self-Organizing Maps –SOM- (Kohonen, 1989) as part of process:

By SOM each object is located near other similar objects. A profound topological relationship is revealed.

3. The Proposed Method (2)

Representation and Interpretation of SOM-WARD Cluster classification on GIS-CAD.

NETWORK ORDINANCE

- **Level 1.** Selection of concepts which are deemed valuable.

\[
\text{NETWORK-ORDINANCE}
\]

DISCOVERY OF THE URBAN STRUCTURES AS SEED FOR THE PROJECT AND INTERVENTION IN THE CITY.

- Level 2. Generation of the Self-Organizing Map.

**NETWORK-ORDINANCE**

**DISCOVERY OF THE URBAN STRUCTURES AS SEED FOR THE PROJECT AND INTERVENTION IN THE CITY.**

- Level 3. Interpretation of the result obtained through the reading of maps of SOM-WARD Cluster and thematic maps obtained.

• Level 4. Variables without coherencies are singled out and eliminated. In this case return to level 2.

- Level 5. When concepts which provide coherencies are defined, the procedure concludes and definitive Self-Organizing Map is obtained.

- Level 6. The SOM is represented on an usual GIS: showing clusters and their coherences between themselves in their spatial distribution.

• Level 7. Discovery of unknown urban structures as seed for the project and intervention in the city.

- The Network-Ordinance is achieved and new opportunities and projects are found on the way.
4. Illustration. The site.

• Selection of the site:
  – Site with clear historic fabrics.
  – Site with recent profound transformations.

• Santa Fe (Granada-Spain):
  – Very well preserved urban fabrics.
  – Founded as military encampment in 1483.
  – Since 1970 has received profound typological transformation.

4. Illustration. The collected data.

- **Building and site form.**
  - **Definition:** Id., Transformed After 1970, Empty Lot, Under Construction, Basement, etc.
  - **Plot Shape:** Plot Area, Façade Length, Number Of Patios, Patios Area, Patios Perimeter, Covered Area, Covered Area Ratio, Stories, Gross Floor Area, FAR, etc.
  - **Block Shape:** Block Width, Block Length, Block Area, Block Covered Area, Block Covered Area Ratio, Block Gross Floor Area, Block FAR, Block Length/Width Ratio, etc.
  - **Relationship to Public Space:** Plot Public Space Area, Block Public Space Area, Block Public Space Area Ratio, Public Space / Gross Floor Area, etc.
  - **Construction Status:** Conservation Status, etc.
  - **Salubrity:** Façade Length, Façade Ratio, Patio Ratio, Façade Surface Area Ratio, Public Space to Façade, Street Section, etc.
  - **Accessibility / Visibility:** To City Center, Distance City Center, To Main Street, XAxis Length, Yaxis Length, To Main Block Façade, Façade Position in Block, Façade Position with Space Public, etc.

- **Social and economic issues.**
  - **Ownership Structure:** Property Rental, Inhabited, For Sale, etc.
  - **Density:** Number Inhabitans / Block, Residential Density, Gross Floor Area / Inhabitants Ratio, Block Number Dwelling, Gross Floor Area / Dwelling Ratio, etc.
  - **Social Issues (Labour / Schooling / Origin / Age):** Block Active Population, Block Percentage Unemployed, Average Block Profession, Average Block Educational Level, Average Block Origin, Average Block Age, etc.
  - **Funtional:** Block Private Uses, Buffer Private Uses, Density Private Uses, Block Private Uses, Buffer Public Uses, Density Public Uses, etc.
4. Illustration. The selected data.

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4. Illustration. Results (1).

Heuristic Process

Discovering

Profound relation:
Block Width and Conservation Status

Opportunity to discover
new projects for the city
4. Illustration. Results (2).

Ecotypes and Network-Ordenance
5. Conclusion and Future Research.

• Conclusion:
  – Novel approximation to urban complexity.
  – Novel concepts: Network-Ordinance + Ecotype
  – Urban Ordinance as alive entity.
  – Urban Ordinance as sum of realities.
  – Discovering unknown situations.
  – Opportunity to understand urban complexity.
  – Opportunity to discover new projects for the city.

• Future research:
  – Characterize number and size of ecotypes.
  – Experiment with new reality generated by Network-Ordinance.
  – Experiment in other sites and other scales.
Thank you!