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Lecture:

Generation of Downtown Planning-Ordinances using Self Organizing Maps.

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[0. Introduction]

[Slide 3]

I want to start my explanation with a question, it is...

Are the cities and their urban rules or ordinances prepared for changes and actual complexity?

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[1. Background]

I think common ordinances usually are not capable of incorporating the complexities of the urban space for which they were designed.

The Ordinance is an opportunity and the link between urban projects and architecture, and sometimes this is forgotten.

I want to highlight the importance of urban complexities.

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[2. Objectives]

To do this I want to state our principal objective as:

- To be able to understand urban complexity. To do this we must:
 - o 1st. Be able to connect traditional and new concepts.
 - o 2nd. Understand these concepts as part of an urban fabric.
 - o 3rd. These urban fabric forms try to represent and explain the urban reality as a living entity.

And finally the Ordinance is formed by different parts of the city, when these parts change, the Ordinance evolves.

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[3. The Proposed Method]

To achieve these objectives we will use the following methodology:

- Firstly we use a “recycling process” such a feedback system that integrates all the collected information.
- With this process we will reconstruct the collected data into patterns.
- The Christopher Alexander pattern is created for us with physical questions, while we also include non physical questions.
- In this way we form a kind of pattern that we call as Ecotype pattern.
- Ecotype patterning is similar to the typology idea, but however it is also an inclusive process that includes factors from the place and other social and economic issues.

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- The Ecotype Pattern and their networks altogether form a Network Ordinance.
- This is achieved by using a heuristic procedure.
- A heuristic procedure is understood as the process of searching for information when you don't know what you are searching for.
- We use a heuristic procedure that excludes strange or useless variables, and these variables don't depend on artificial calibrations.
- The iterant model, commonly known as Self-Organizing Maps, from Teuvo Kohonen, is fed into the Network Ordinance procedure.
- By a Self Organizing Map each object is located near other similar objects. So we can get a profound topological relationship.

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- Finally, additional information is provided through the representation of SOM-WARD-Cluster classification on a traditional GIS-CAD cartographic base.

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I will now explain how we generate our Ordinance. This is the process:

- Level 1. Selection of concepts which are deemed valuable, and which are numerically quantifiable.

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- Level 2. Generation of the Self-Organizing Map through the heuristic and iterative process proposed by Teuvo Kohonen.

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- Level 3. Interpretation of the results obtained through the reading of maps of SOM-WARD-Cluster pattern regions and the thematic or mono-variant maps obtained. One can observe the variables contemplated which are not interrelated.

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- Level 4. The variables observed which do not provide coherencies in formalization of the SOM pattern will be singled out and eliminated, and the process will be repeated from level 2.

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- Level 5. Once the concepts which provide coherencies are refined. The procedure concludes and the definitive Self-Organizing Map is obtained with the new urban objects represented.

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- Level 6. The SOM is represented on a usual GIS cartographical base, until showing the groups or clusters coherent between themselves, in their spatial distribution. In this representation, it will be simple to establish the degree of adaptation of the proposed building or urban object in relation to its environment.

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- Level 7. At all times we can discover unknown urban structures. They can be considered as seed for the project and intervention in the city.

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- Finally the Network-Ordinance is achieved, and new opportunities and potential projects are found on the way.
- The Network-Ordinance is formed in this way, with the sum of every reality.

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[4. Illustration]

To illustrate the proposed method, first I'm going to explain the reasons for the selection of the site:

- We were looking for a town with clear historic fabrics and with recent profound transformations.

We selected Santa Fe, a village near Granada, It was founded by the Catholic Monarchy as a military encampment in 1483. It has a very well preserved urban fabric and since 1970 it also has received profound typological transformation.

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We want to try bringing out the constants, historical trends, recent trends and the related patterning between building concepts and socio-economic concepts.

For us, process is very important the data processing:

- We used different kind of data: For example we used for define building and their site form several issues, for example Plot Shape, Block Shape , Relationship between buildings and their Public Space, Salubrity and Accessibility or Visibility.
- On the other hand we also used Social and Economic issues, for example Ownership Structure, Several ideas of Density, Labour Issues, Schooling, Origin, Age or Urban Functions.

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Thanks to Self Organizing Maps we discovered some useless data. Finally we eliminate these concepts. Now these concepts or data are represented in grey in this slide. We can see they are an important part of the total.

There were others concepts that we understood they won't modify or condition the future reality, and they were removed, too. This is the case of Conservation Status, in red. It wasn't used for Ordinance; it was eliminated but it gave us an interesting idea of the actual reality.

We will see that in next slide.

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For example; we discovered a profound relation between the conservation status properties and the buildings' form and block width. This idea is represented in an isolated manner with these graphics. Here there are 3 concepts, but only 2 are properly working, and we can watch a profound relation among themselves.

On this way, we can receive help on discovering new opportunities for urban planner project. This is achieved by the heuristic process.

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In this slice we can see the generated result of general Ordinance. Is different to previous, here 27 concepts are working altogether.

We can see on the left the Mono-thematic maps generated using Kohonen's Self Organizing Maps. The patterning is represented as numbered and rounded regions.

On the right we can see the translation into a GIS map of the Network-Ordinance.

We can see here, the relation between traditional buildings and their plot form. I am referring to the Ecotype in pastel yellow. This is an untransformed residential fabric.

In grey-blue Ecotype emerged most of the new constructions, and we can observe that they have destroyed many typological values. In this way, this is important, we can evaluate when a building doesn't fit property to its environment.

In grey are revealed high level building, historic building. They are usually situated in main or important positions in the village.

Again in red emerged peculiar constructions, they are narrow blocks, and they form a clear typology and Ecotype pattern.

Strange areas are drawn in dark. They are usually buildings under construction and empty lots.

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Is important to know, this classification is made automatically and we feel it as a very consistent one.

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[5. Conclusion and Future Research]

And to finish,

- I think our research is interesting because is a novel approximation to the urban complexities, and because we introduce two novel concepts. They are Network-Ordinance and Ecotype urban planning idea.
- I think it is interesting because it treats the Urban Ordinance as if it's alive, and the Ordinance is created by the sum of own urban realities.
- This tool can help those who use it to discover unknown situations.
- This gives us the opportunity to understand urban complexities. This way of understanding ordinances gives us the ability to see ordinances as flexible entities.

Our Ordinance tool is capable of reflecting the complexities and simplicities of the urban needs.

And this Ordinance process provides us an opportunity to discover new projects for the city.

We think this research will improve if we characterize of the number and size of Ecotypes.

Also it can be experimented with new realities generated by Network-Ordinance and it can be probed in other sites and even in other scales of urban planning.

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Thank you very much.