Architectural Morphology
Investigative modeling and spatial analysis

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Abstract

The development of new theorical and technical means, particularly in the field of computer science and its direct applications, leads more and more to a renewal of the approach on design and architecture. The increasing place of modeling and calculations in the architectural process confirms that Architecture lays on the interface, in this case ambiguous, between art and science.

Speakers

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Introduction

John Peponis, GeorgiaTech School of Architecture

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The Venice variations : Interactions between generation and explanation

1 Role of spatial analysis considerations in Design and Architectural Knowledge

Architecture and its narrative approach are direct consequences of the geometric spatial configuration and an embodied experience, which can be approximated through a topological description of space. That's why geometry and topology play both key roles in architectural analysis ; they have in fact a strong relationship which form determine most aspects of the architectural experience.

As a consequence, a useful tool of investigative modeling can be the try of different geometric shapes associated with the same topology. In that case, whereas the spatial integration stays the same (since we define it in the classic way, with N places and d_{ij} the topological distance from place i to j, the mean accessibility to other places : $I_S = \frac{2}{N\cdot(N-1)} \cdot \sum_{i<j} d_{ij}$) because it depends only of the topological configuration, the visual integration differs and is interesting to consider as a design criteria. The visual integration can be defined as follows : the architectural structure can be considered as a subset $A \subset P \subset \mathbb{R}^2$, where P is the part of the space we work in. Then the visual integration of a point is the measure of the visually accessible subset taking into account the architectural obstacles (walls). For $M \in P$, it is defined as

$$I_v(M) = \int_{M' \in P \setminus S} \mathbb{1}_{\{M + tM\vec{M'} | t \in [0,1]\} \cap S = \emptyset} dS$$

2 Evolution and Urban form : case Venice

3 Comparison to the project of hospital by Le Corbusier

4 Consequences on design

Daniel Koch, KTH

Architectural Interfaces & Resilience

Pablo Miranda Carranza, KTH

Tools used nowadays in advanced spatial analysis

Meta Berghauser Pont, TU Delft
Density, Architecture and the City

Why study density?

Through history, density of cities has always have a great importance. As a concrete example, there is evidence of the link between a high density of population and health problems in Ansterdam, Jordean at the end of the 19th century. At the same time, regulations to constraint the height of buildings according to the street width were taken all over the world (see Paris of Haussman for example). The promoters of the Garden City took the aspect of a healthier city as a main argument. In the late 50s, Jacobs proposed ([1]) in opposition to these idealisms a return to a more natural and by consequence a more dense city.

Today, density can still be an issue. Back to the example of Amsterdam, the global density is too low, as a consequence of an explosion of the urban footprint, and of different relative growths of land uses (the proportion of dwellings went bigger).

We could try to give an answer to the question of arguments for or against densification, but there are very much pertinent arguments on both side, so the really important aspect that appears is the study of density in itself, the fact that it has good or bad consequences on some aspects of the urban system is in fact an other problem, depending most of the time on the particular concrete situation we are in.

Measuring density

Performance of density

Ermal Shpuza, Southern Polytechnic State University

Interaction between boundary shape and circulation structure in the built environment

Recent research work has been oriented towards the study of the mutual effect of rules and constraints, in the sense of the relations between the building shape and the social organization occupying it. These two elements have totally different time longevity, so we can ask if it could lead to contradictions between the functionnal aim of an architecture and its effective use.

That lead to the study of two aspects and the links they have : the boudary shape of the building and the contained circulation. Circulation system is directly linked to a level of movement, and can be taken as a local description of floorplates, whereas the boundaries are more a global description. Such a study can also be done at the urban scale, by searching the impacts of an imposed shape on internal circulations.

We will see here first the pure shape aspect, then the influence of circulation on shape, and finally the inverse relation.

1 Unique shape approach

2 From circulation to shape : the inside-out approach

3 Influence of shape on circulation

Ulrika Karlsson, KTH
Biotic interferences

This presentation is more on research in pure design than in spatial analysis, but is closely linked to it because of the underlying systemic approach in the design process. It presents a work of integrated design lead by a multi-disciplinary team at KTH.

Christian Derix, AEDAS Architects R&D Computationnal Design and Advanced Spatial Modeling

Åsmund Izaki, AEDAS Architects R&D

Algorithmic aspects of spatial analysis

Conclusion

References

[1] Jane Jacobs. *The Death and Life of Great American Cities*. Vintage, 1956.