Intelligent Architectures

Space, Time, Mobility, and Self-regulation

Dr. Dimitris Papanikolaou / dpapanik@uncc.edu / Office: Storrs 146/ **URBAN SYNERGETICS LAB**

"In the most general sense, computation is the process of storing, transmitting, and transforming information from one form to another" (Santa Fe Institute).

PREMISE

Buildings and cities become more intelligent, posing new challenges to architects and planners. If intelligence is the ability of adapting to changing conditions, *designing intelligence* is the process of determining the components, structure, and behavior of systems capable of interacting with their environments towards a purpose. During the past decades, the design of "smart" buildings and cities followed a technocratic hierarchical approach in which the building or city was seen as a "computer brain" for best serving the needs of its users. Today, widespread expansion of computing, and simultaneous sharing of resources between people, makes this hierarchical design approach increasingly infeasible for the simple reason that the needs and wants of one individual may often conflict those of another. At the same time, as we move from the internet of bits to the internet of things, the distinction between what is a computer and what is a building, increasingly vanishes. Today, territorial-scale systems like peer-to-peer postal services, shared co-working spaces, autonomous drone networks, and mobility on demand systems, are examples of cyber-human systems that self-organize with no clear hierarchy.

The premise of the studio is that, as we move towards the future, building and urban environments become more distributed, more interconnected, and more shared. In such context, building, urban, or territorial intelligence can no longer be the decision outcome of a singular brain but rather the collective outcome of a continuous cooperation between individuals. Towards that end, architecture can no longer be a passive shelter but rather it must become an intelligent medium for enabling human interactions. The ontological distinction of what is a building and what is a computer becomes a major architectural statement: just as Modernism gave form to machine functionality, so today, a Second Modernism must give form to computational logic and social synergy.

The graduate thesis studio will explore the design, modeling, and analysis, of intelligent architectural or urban ecosystems as well as their cyclic transitions in time, asking the question: how do we design intelligent architectures across technologies and scales? Inspired by Santa Fe Institute's quote that in the most general sense, computation is the "process of storing, transmitting, and transforming information from one form to another," the studio will seek novel ways in which memory, form, and materiality can become expressive media to compute, communicate, and coordinate, in addition to (or instead of) digital technology.

METHOD

To achieve this, the studio will focus on key concepts of (1) systems-thinking and ecology such as *structure*, *information feedback*, and *dynamics*; (2) computation and computer architecture such as *logic* and *logic gates*; and (3) social behavior such as *commons sharing* and *cooperation*, and explore their application in architecture, by combining geometric or typological methods with physical or computer simulation methods (like mechanical models, hydraulic models, system dynamics, multi-agent systems, etc.) in design. The studio will explore this topic in three levels: components, organizations, and behaviors. In the first level students will develop a typology of components, logic rules, and basic interactions. In the second level, students will study how their components can arrange into larger organization patterns. In the third part, they will map their behavior in time, assessing their potential to adapt and/or self-organize. Studio outcomes may be collectively presented in a form of a website/ publication.

TOPICS

Students are responsible of choosing their site, program, and type of building based on their theses investigation from previous semester and position it through the lens of the studio's premise. Topic areas include but not limit to: shared mobility systems; sharing systems capable of serving more demand with less capacity; transformable structures exploiting energy to adapting to programmatic needs.

LEARNING OBJECTIVES

- Implement systems thinking in design and integrate physical or digital simulation methods into design
- Develop a strong thesis statement and be able to position it critically within the architecture/technology discourse
- Work independently by cultivating a learning-through-making approach to design and become comfortable working within unknown fields of knowledge
- Think out of the box and challenge pre-established notions about design and technology

READINGS

Relevant readings will be being posted regularly on the course website. See also reading list provided in previous term.

APPLICATION PROCESS

To enroll in this studio, send a short statement to dpapanik@uncc.edu summarizing your (1) interests and (2) strengths as they align to the studio objectives, and (3) what you wish to accomplish by the end.