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Urban Autopoiesis: Towards Adaptive Future Cities

A city can be understood as a living self-maintaining organism with its own metabolism which is not entirely stable, always in a state of flux, growing and decaying. It shows **emergent properties** as complex entities in nature do. As we know from other scientific disciplines, living organisms are able to adapt and evolve according to internal and external conditions in never-ending formation process and organize themselves in a self-sufficient and self-producing manner.

By revealing and simulating these wider **complex processes** in an interactive simulation model of a city, architects and planners will be able to identify its relational and behavioural characteristics and establish new guidelines and conditions for proper **environmental and cultural sustainability of the habitable, livable and cultural space.**

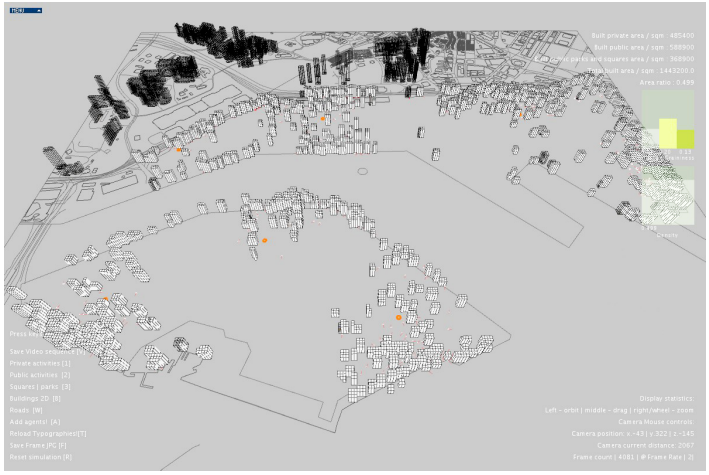
By means of integration of multidisciplinary approach of **complexity science framework** consisting of computer science, urban design, Citizen Design Science and game development into an advanced urban simulation, one can investigate the dependencies between ***bottom up citizens' demands***, urban pattern **formation processes** and proposed urban typologies. In that way it will be possible to find an appropriate model of an **adaptive city** which is sustainable as similar as natural systems are.

The aim of the research is therefore a development of an interactive **digital simulation as a generative urban model platform**, accessible in the Value Lab Zurich and Asia, visually understandable for architects, planners and stakeholders. Such a generative model can contribute to a better understanding of a complex city entirety and yield convenient spatial morphological solutions for better livability in cities.

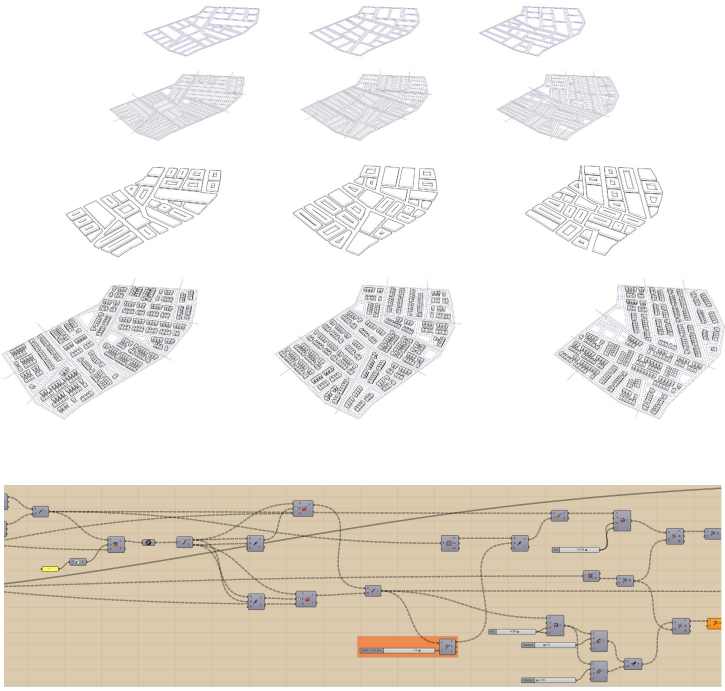
Following this paradigm of **urban autopoiesis,** the research will try to find appropriate morphological characteristics of an urban space which reflects processes of self-sufficiency, distribution and spatial requirements. It will convey an identification of correlations between city units referring to soft (social, ecological, economic) and hard (engineered) urban systems.

The research will yield a visual representation of qualitative and selected quantitative characteristics and measures of the built environment, in particular, level of densification, intensity of attraction, way of navigation, density, accessibility, spatial concentration, speed of social interactions, emotional feedback in regard to aesthetics of urban space and prospective design outcomes and improvements in the model.

Furthermore, such a model will allow user to identify the most significant processes within a city which influences the urban changes and might contribute to the phenomenon of self-maintenance as a characteristic of the process of urban autopoiesis.



Agent-based urban model of Tanjong Pagar in Singapore, case study of urban autopoiesis.



Computational generative urban model, case study Cape Town.