

ENHANCING SLUMS SPRAWL IN CAIRO

Author name: Hunia Tomoum

Abstract

This paper targets the growth of informal urbanism in Cairo. Informal settlements in Cairo tend to have a chaotic organization which in most cases lack safety and security. Slums have their own cultural protocols than the rest of Cairo; where urban pattern emerges from the collective formation of each individual, this process can be referred to as the machinic phylum. The objective is to understand the slums' chaotic growth pattern and employ it, to cross the line from criminal introverted urban areas to the warm safely protected areas.

The proposal is to generate a process for the slums' growth by breeding the slums' own cultural and urban protocols - in this proposal the focus will be on "*Participation and the compactness of the built forms*"¹ - with nature's equations of growth in a system that coordinates the constant changes according to inhabitants behavior and context which may vary from Agricultural, desert or mountainous land.

According to 'Manuel de Landa - War in the Age of Intelligent Machines' computation allows us to simulate self organizational growth in which order emerges from chaos, Cellular automata allows us to input a set of rules, which in this case following the urban protocols simulating urban growth within the protocols feeded . The system needs to automatically upgrade and develop itself according to changes of collective behavior which in the computational field can be simulated by employing heuristic knowledge (knowledge of good practice and judgment/ the art of good guessing).

This can be achieved as mentioned by Michael Weinstock² DEM (discrete element method) is a computational method to simulate the motion of particles which not necessarily spherical which can be very complex with unlimited number of particles. This would help in this proposal to achieve simulation of fibrous structures with the concept of Emergence (as described in informal by Cecil Balmond: The internal will of chaotic systems to reach coherence)

¹ Shehayeb. 2009 : Advantages of Living in Informal Areas

² Weinstock; Hensel; Menges.2010 : Emergent Technologies and design

Paper

1. THE EMERGENCE OF SLUMS

First, we need to understand how the phenomenon of slums began:

*"In Greater Cairo, these phenomena began just after the Second World War (and later in the following decade for the rest of the country), when migration from Upper Egypt and the Delta caused housing pressures to become critical (Sims & Sejourne, 2000). Migrants, attracted by economic development then occurring in Cairo, coincided with the massive industrialization policy launched by the president, Gamal Abdel Nasser. The earliest of these migrants, mostly young men, settled in central or historical districts, where they rented and shared flats or rooms. Later, after amassing some savings, some were able to buy and build upon land on the fringes of the villages located in the peripheral part of the city– such as Kit Kat in Imbaba or Mit Okba in Agouza, both of which are in Giza Governorate– where the land market was cheaper than in the central districts. This period also saw the beginning of the phenomenon of squatting on state-owned land, mostly in the eastern part of the capital, in places such as Manshiet Nasser and Kum Ghurab in Cairo Governorate."*¹

Why is it very crucial to study patterns of slums growth in Cairo? and why enhance it rather than restricting it? As studies proved that a great number of the population lives in informal settlements and that people in informal areas prefer living there above going to newly built settlements.

"Informal settlements around Cairo sheltered 65% of Cairo in 2006 (10.5 out of 16.5 million inhabitant) .

*The figures show that informal areas are the fastest growing alternative, while New Towns are suffering reverse migration. "*²

Top view of Mansheyet Nasser (known for Garbage recycling) is an example of an informal area on a mountainous land. see (figure 1 and 2)

¹ Sejourne.2009 : The History of Informal Settlements

² Sejourne.2009 : The History of Informal Settlements



Figure 1



Figure 2

Accordingly, the attempt to study informal areas' protocols and patterns is crucial. The compactness of buildings and the narrowness of the streets, enables residents to be in control and restrict strangers access and vehicular flow, on the other hand it encourages participation which results in strong community ties and closer relations between neighbors which consequently creates a self policing community. People's participation in urban life is part of their life pattern, in terms of garbage collection, street cleaning, public landscaping and street lighting etc... An interesting fact is that people's participation tends to stop at the borders of their territory, where their narrow streets

meet the main streets. Inhabitants in informal areas constitutes of wide socio-economic groups, from judges to street vendors.

On the other hand, it is very important to study the reason behind the transformation of an introvert warm communal area into unsafe areas. Informal areas suffer from poorly ventilated buildings and an uncontrolled, unguided growth, and deteriorated infrastructure etc.. In consequence, this community becomes marginalized and thus leading to a more introverted community which encourages illegal activities and thus becoming an unsafe area.

" As emphasized in a recent UN report, informal mechanisms, like formal ones, comply with rules. Social networks and cultural norms are the organizational bases that dictate those rules and the means through which they are enforced." ¹

The objective is to encourage the growth of productive communities in those areas, such that each area can be specialized in different kind of production. Those places will then become ready to receive visitors as customers and break this boarder between people living in the informal areas and the rest of the city.

2. COMPUTATION OF FIBROUS STRUCTURES GROWTH

How can the informal areas growth be guided using computation? It is vital to employ and encourage the positive protocols that helps those communities grow while taking into consideration, the light admittance and ventilation to those buildings, and structural stability, also the system has to abide by the proximity growth protocol.

In reference to the process of natural growth and self organisation, the objective is to create a system that allows the informal settlements to grow respecting its own urban protocols, which can be interpreted as the "genome" (genome contains all the biological information required to build and maintain a living organism, like the DNA in human beings), more over, this system should be able to evolve according to inputs and external factors and patterns that is recognized by this system which can be interpreted as the "phenome" (phenome is the additional qualities gained by the effect of external factors which can be described as 'evolution').

Computation is important in terms of inputting those protocols into a system as it has to be smart enough to reformulate itself. In this proposal, the system proposed is units formation using fibrous structures, which is exemplified by a seed that grows from the ground and creates another seed in order to create more units, imitating plants growth and pollination.

¹ Shehayeb. 2009 : Advantages of Living in Informal Areas

"Metabolisms are the systems by which forms are able to live, to construct themselves and grow to dynamically maintain themselves overtime, and to reproduce." ¹

For example, if the protocol's growth limit is four floors to maintain the distance of the inhabitants eye surveillance, then, when the first dwelling unit is created it is considered to be on the ground floor which means that there is three more floors to be created above it, which also means that structurally it has to contain higher density of fibers or a composite of fibers and other stress bearable material, to be able to carry loads for those other three.

"Fibres do not perform well in compression, as they tend to buckle, even when partially supported laterally by the matrix in composites.

In biological material systems there are four known solutions; 1- Pre-stress the fibres in tension so that they hardly ever experience compressive loads 2- Introduce high-modulus mineral phases intimately connected to the fibres to help carry compression 3- heavily cross-link the fibre network to increase lateral stability 4- change the fibre orientation so that compressive loads do not act along the fibres." ²

After the first dwelling unit is created, and another user wants to create a dwelling unit, it has to coordinate with the first unit in terms of light admittance, ventilation, proximity. Uses also will determine, regulate and control the structural strength and volume of a space. Each unit lately produced is an evolved version of previously created units, responding to external factors.

"These engineering principles can be abstracted from biological forms and applied to the design of engineered materials, artefacts and buildings." ³

3.1. EXAMPLE OF FIBROUS STRUCTURES FORMATION

To show the possibility of the formation of those structures, in reference to a paper done in the university of North Carolina State. "Simulation and analysis of unbonded nonwoven fibrous structures" ⁴

Microscopic images of typical nonwoven webs made by spunbonding, meltblowing, and electrospinning." see (figure 3)

¹ Weinstock.2010 : The Architecture of Emergence

² Weinstock; Hensel; Menges.2010 : Emergent Technologies and design

³ Weinstock; Hensel; Menges.2010 : Emergent Technologies and design

⁴ Pourdeyhimi, Maze, Tafreshi.2006 : Simulation and Analysis of Unbonded Nonwoven Fibrous Structures

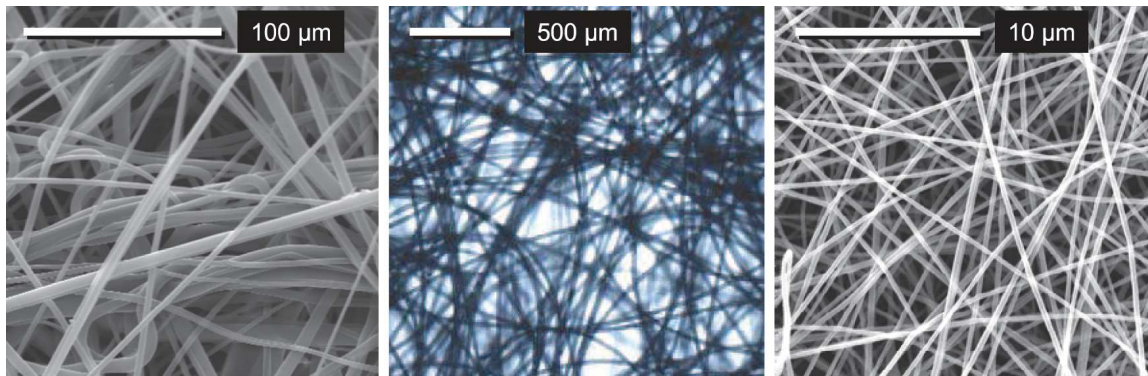


Figure 3

3.2. A STUDY OF NEST FORMATION USING TORNOGRAPHY SCANS

Natural systems analysis: nest of Swedish magpie. See (Figure 4)

"Owing to its complex structure, the Swedish magpie's nest required the use of computer tomography scans of rotational slices for digitizing the morphology; 450 slices were generated to describe the nest configuration through a high-resolution spatial database, with precise documentation of the varying material density levels using feature enhancement techniques (centre). the computer tomography scans are described as a voxel dataset, which was subsequently converted to vector based information employing a 'marching cube' algorithm that generated a polygonal surface model- MA Dissertation of Lina Martinsson, 2003" ¹

¹ Weinstock; Hensel; Menges.2010 : Emergent Technologies and design



Figure 4

CONCLUSION

Nowadays, technology help us to inspect elements around us in a microscopic scale, which enables us to generate systems that evolve from the real core rather than the general formation we see with our naked eyes. In this context the study of fibrous structures will be based mainly on exploration of natural systems which is a never ending field of study, allowing us to have unlimited explorations, experimentations and results.

Consequently, it is the inescapable facts of technological advancements and computation that is driving the future of our cities. The urge is to employ those systems to serve humanity and retain the social structure by keeping the identity of places rather than globalizing our cities.

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