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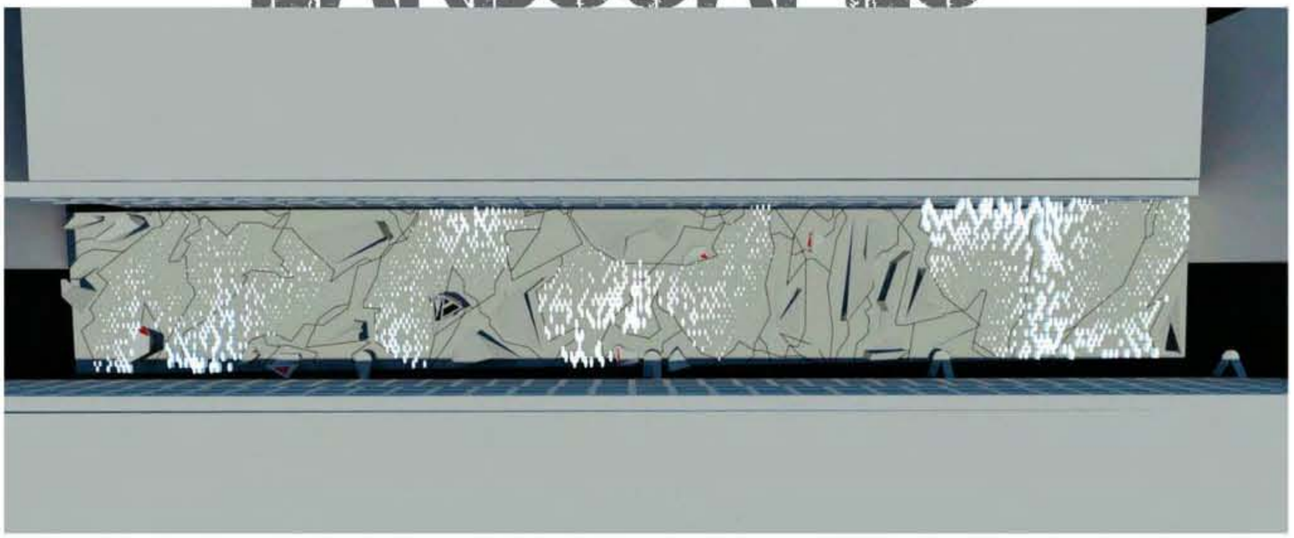
# COMPUTED LANDSCAPES



## Intertwined Urbanism

One of the most difficult decisions any designer faces is the point of inception. Where does one look for clues? The urban scenario today is a complex mix of uninterrupted, constant flow of information. We are not too far from Neo visualizing green digits marqueeing in a parallel 4D space. The challenge lies in tapping this ubiquitous flow of data. But before we tap any such information let us try and understand this lust to intercept.

No urban space ever designed can predict its exact use. *"No historical space is ever univocal but always multiple and intertwined. This multiplicity and embeddedness, combined with critical presence of 'thick' time, allows for open ended interactions of parts – the hybridizations, blending, conflicts – that effectively destroy a structure's determinism and that feed its wildness. (Wildness emerges in a system once we lose the ability to predict - from the outside – what it will do)."* [1]

*ABOVE |*
***Hexa Spray_Pedestals in least dense areas | Nehru Place, Design Plus***





In today's interpretation of an urban design exercise, it is a mistake to sway pens to draw deterministic and regimented plans that attempt to provide a strict unilateral purpose. Today's task is to induce polygenetic structures, or to program systems that enable such structures, in their turn, to assemble themselves. *"Design today must find ways to approximate ecological forces and structures, to tap approximate, borrow, and transform morphogenetic processes from all aspects of wild nature, to invent artificial means of creating living artificial environments."* [2]

In short, *we should design algorithms everywhere.* Let's be clear this is not a novel thought by any means. Rem Koolhaas, for example, shared his definition of spaces through chance discoveries and interaction for OMA's Parc de la Villette competition entry. The urbanism today demands us to re-visit those seminal stands on urbanism using the design and discussion means at hand now.

In November 2008, at a lecture at RIBA, one of my colleagues from AA_DRL, asked Peter Eisenmann, what *'Algorithmic Thinking'* meant to architects. *"My friend, if I knew I would be doing it and not talk about it"*, was the reply he received.

## Algorithmic Thinking

The above term in general would have clarity of understanding and stating the problem. If a problem can be broken down into objective parameters with set variables then we have taken a broad step towards in setting up a design tool / system. Here, every alteration to the variable of the system would define a specific design output that is, needless to say loyal to / resultant of the variable. However, this is not an easy step. The multilayered *subjectivities* of an urban environment make it extremely difficult to be *reductivist*. In the words of Gary William Flake, *"...traditional scientists study two types of phenomena: Agents (molecules, cells, ducks, species) and the interaction of agents (chemical reactions, immune system responses, duck mating, and evolution)."* [3]

To elaborate further, Algorithmic Thinking is about creating rules. Synonymous to any life cycle, a rule would have its subsets for birth, life and death. These can be *multilayered binary decisions,* laid down in either series or parallel, combining together to form complex agents or their behaviour. Since it relies on definite instructions, the onus lies on accurate knowledge / prediction of the parts.

Hence, Algorithmic Thinking is a pool of abilities:

1. The ability to analyze given problems .

2. The ability to specify a problem precisely (objectively).

3. The ability to find the basic actions that are adequate to the given problem.

4. The ability to think about all possible special and normal cases of a problem.

5. The ability to improve the efficiency of an algorithm.

## Categorizations | Methods | Whodunnit?

Let us clarify one important aspect. Algorithmic or even computational thinking is not reliant on computers or anything digital. As mentioned before, it's a way of thinking. But what should it mean for designers? Architects always claim to know the environment, the program, and the users they are designing for. The binary objectivities of their design process not only helps in preparing for all fathomable outputs but would compel them to notice circumstances (inputs or outputs) that were not conceived.

*BELOW |*
***Density Reading_Catalogue of Boid Strolling | Nehru Place, Design Plus***


A number of isolated computational steps were followed to recreate a virtual environment:

STEP 1 – Simulated the pedestrian traffic using the maximum footfall for weekdays as an objective test-bed (addressing a population of 2000 at 1330 hrs). Agents/ boids/ drones were deployed into the plaza with a simple rule of avoiding each other and spending time in the plaza. Originating from either end and based on fuzzy principles of directionality, location, conferences, final target etc. they strolled at their respective paces.

Each agent, simulating a set of visitors, divided the plaza. Since, all design outputs were dependent on the same algorithm, all divisional results were considered equals. Theoretically, the number of runs is directly proportional to the stability of the output.

STEP 2 – Average output was then used to identify the density patterns. This programmatic parameter was based on existing identified functions. The locations were determined based on boid congregation. Broadly, 4 categories were formed (from maximum dense to least):

1. *Touch me nots*
2. *Display Portal*
3. *Pavilions/ Follies*
4. *Use me as you please*

Maximum Congregation

Minimum Congregation

STEP 3 – This step was about crafting the 3rd dimension using the guidelines setup by the first two Steps. As far as the project is concerned, this step relied more on the intuitive decisions and hence questioned the role sharing between the designer and the computational system. But this discussion is beyond the scope of this article.

At this point it is important to point out that the design outputs changes if the design tool used changes, while keeping the environmental parameters constant. That is, if the method to read and interpret population density varies the landscape would change.

For example, in the project *Parametric Landscapes,* a thesis by Swati Gautam at Sushant School of Art and Architecture; plaza density was understood as the optimum volume required for specific densities to thrive. However, unlike the proposal by Design Plus that created its own density patterns, this proposal mapped existing pockets of congregation. Simultaneously, it addressed the issues of connectivity by introducing a walkable mesh that would link parallel buildings at various levels.





*BELOW: LEFT & RIGHT |*
***24x7 Destination | Nehru Place, Design Plus***

*FAR BELOW |*
***Interpreting Density | Parametric Landscapes, Swati Gautam***

## Variables Adapting to Environment

Frei Otto's thoughts and experiments on occupation and connections demonstrate that natural territorial rights and spheres of influence with respect to human settlements can be explained via simple algorithms. Distancing occupations was explained by a system of magnetic needles and soap bubbles that find optimum resistance to one another, to create a grid of equilateral triangles. *"The territories associated with equilateral triangle grid are equilateral hexagons or equal circles."*[6] This hexagonal patterning occurs over large surfaces, such cracks on dried earth or crystallization of zinc or patterns of settlement.

Algorithmic models can be developed either to operate within an isolated domain or they can be altered to blend with the environment or graft into an environment.