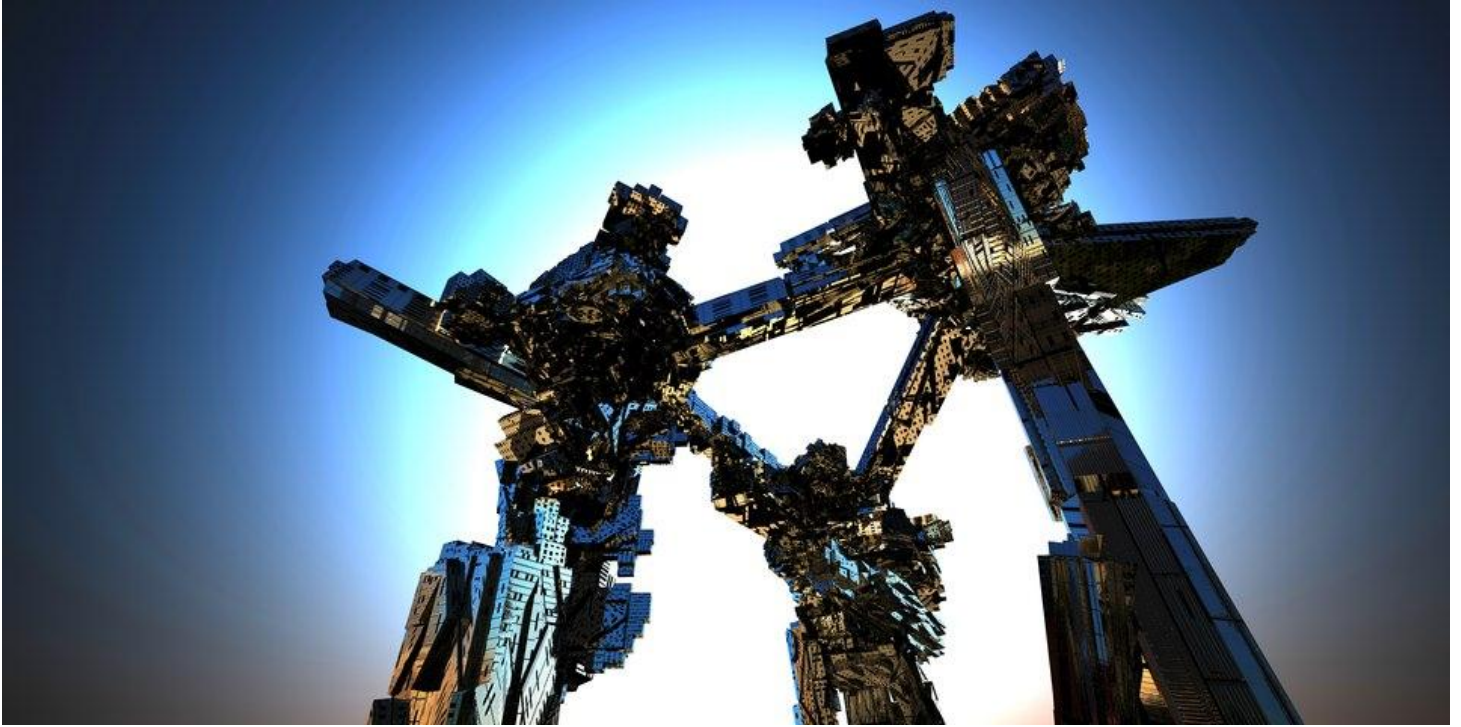


## Asynchronous Territories

2012 - 2013 MAA Term 2 RS1 Seminar | Mr. Luis E. Fraguada | Assignment 1

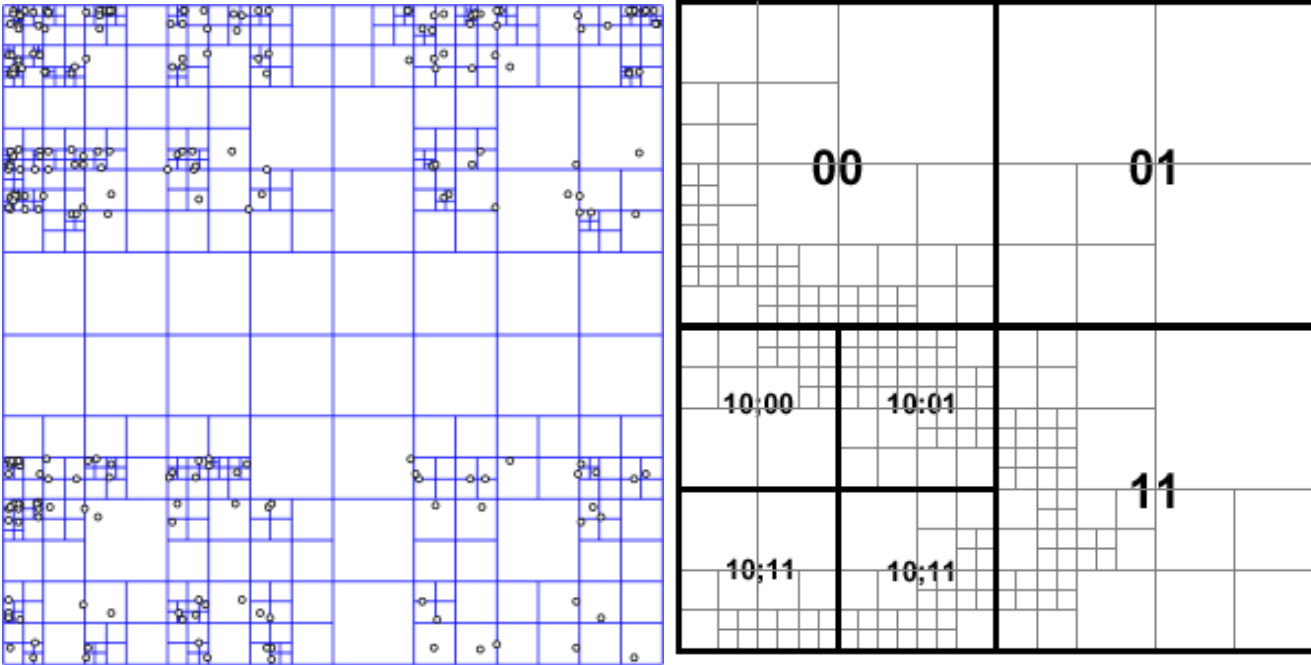
Rasheed Shallah

Quadtree Algorithm



Our Peter Trummer Workshop for Emergent Territories Studio was a quick start to explore the idea of Barcelona's urban morphologies' agglomeration. 1 million m<sup>2</sup> of building mass of various building typologies and urban morphologies was collected to perform a massive volumetric agglomeration acting as a city in itself. The aim for us is to extend the urban morphology up through massive towers which allow the city to grow on a parallel plane to that of the existing one. Moving forward we are looking for systems that help us define the way this city grow or be formed, especially in terms of massing organization and how the density of such growth or formation and massing can be somehow controlled. In contrary to the rest of the class, our design strategy directed us to think differently for our site selection; first, we get to choose multiple sites instead of one, and second, to start from the denser areas and grow out of them.

For that matter, I looked for some growth by d algorithms that can enhance our idea in one way or another. One of these algorithms I came across and grabbed my attention was a less famous one than Cellular Automata to me and a bit more intriguing; **Quadtree** algorithm.



The main usage of Quadtrees is” to partition a two dimensional space by recursively subdividing it into four quadrants or regions. The regions may be square or rectangular, or may have arbitrary shapes” (1).

The resulting forms of this operation can share some characteristics such as:”

- They decompose space into adaptable cells
- Each cell (or bucket) has a maximum capacity. When maximum capacity is reached, the bucket splits
- The tree directory follows the spatial decomposition of the Quadtree.” (1).

The classification of Quadtree differs according to the type of data they represent which can be as follows:

-The region quadtree

-Point quadtree

-Node structure for a point quadtree

-Edge quadtree

-Polygonal Map Quadtree (1)

(1). Wikipedia.com

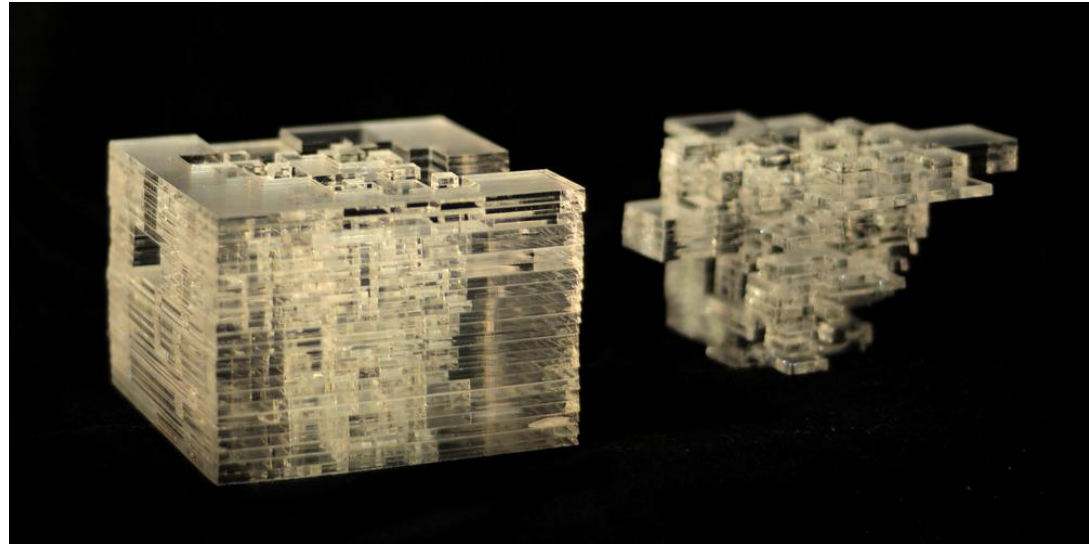
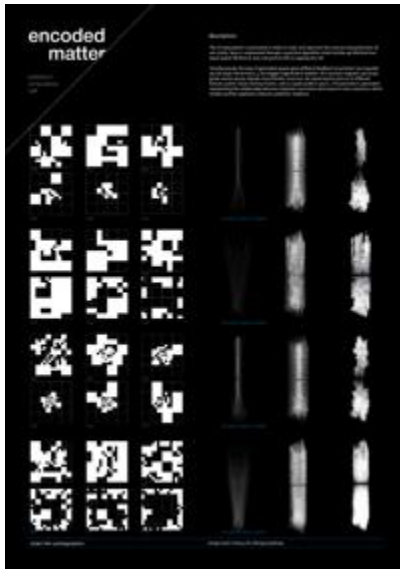
### Examples:

Two scripted examples were found that translate the quadtree into a 3d subdivision pattern:

-The first one is taken from Ezio Blasetti’s Encoded Matter course done at Columbia University in 2012, and from which a description of the project is provided:

“The 2D grid pattern is generated in order to study and represent the natural zoning behavior of ant colony. Space is segmented through a quad tree algorithm which divides up eld into four equal spaces till there is only one particle left occupying one cell. Simultaneously, the area of generated spaces gives di-erent feedback to particles’ moving path: eg. the larger the territory is, the bigger magnitude it radiates. This territory magnetic processes guide species group migrate toward better resources. By capturing this process in di-erent formats: points

cloud, territory frames, and occupied positive space, a 3D geometry is generated representing the relationship between migration movement and resource crisis awareness, which model could be applied to enhance urbanistic initiatives.”



Full project, code and video can be found on at: <http://code.algorithmicdesign.net/Quadaggregation>

I downloaded the Python file, solved some problems in the coding, yet I got another type of error that was remained unsolved.

-The second one is a grasshopper definition made by [matei23](http://buaiblog.wordpress.com/2012/04/08/quad-tree-patterns/) (<http://buaiblog.wordpress.com/2012/04/08/quad-tree-patterns/>) that explores the patterns emerging from Quadtrees in 2 and 3 dimension ways

