RESEARCH IN DIGITAL FABRICATION

06.16.2016

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The inspiration for this research came from several previous works not necessarily related to architecture. After researching about how to use 3D printers and laser cutters in a way I can make physical printed models be part of the concept of the project and not just the printed version of a digital model, I realized that a good way to start would be relate digital fabrication to nature. Therefore, I found a interesting project from Institute for advanced architecture of Catalonia called "MAA PROJECTS: AREAÑA" in which a machine create some sand piles and then let some glue fall over them originating interesting structures.

After that I also found some amazing works of art by Matt Keliner, which are unbelievable sand castles defying gravity, until you realize there is a wood structure under the sand, so why not use nature patterns to hide structures?

One interesting nature pattern I have found is Clay Cracks, which are always asymmetrical and unique. The question was "How can I transform some clay crack pattern in something dynamic that could be used in an efficient way on a building façade?" That is when I did a little research and came up with three most traditional perforated facade covering technics (Panels, *Mashrabiya*, and *Cobogós*) so I decided to get inspired by them to create a dynamic version of it.

I also found some references: l'Institut du Monde Arabe by Jean Nouvel is a good example of repeatedly using a kind of mechanical iris to create a facade that could open and close according to the weather based on traditional Arabic mashrabiya. However, there are too many elements on each module; it is a complex and expensive system, which is symmetrical (opposite to clay cracks pattern). Al Bahr Towers, by Aedas Architects, 2012, Abu Dhabi is one of the best examples of dynamic facades, but it still symmetric.

That is when I found Tessellate the latest system from Zahner and the Adaptive Building Initiative (ABI) in joint venture. which is "a modular framed and glazed screen system whose perforated pattern shifts and evolves kinetically; as the four metal perforated panels glide past one another, they create a dynamic architectural element capable of regulating light and solar gain, airflow, and privacy". (http://www.azahner.com/tessellate.cfm)

This is an interesting way of covering a facade, and a good example of Kinect architecture by using animated metal surfaces as an aesthetic element of the building to control light, however I could not find anything about using this idea and technology with asymmetrical patterns.

Through this research, I will generate several asymmetrical patterns based on clay cracks and use them to explore kinect systems by laser cutting some small-scale perforated surfaces and testing what the different types of movement of them behind each other can result in terms of shadows, textures and openings. The fact of using asymmetrical patterns instead of symmetrical ones, can originate some interesting, functional uses of the "tessellate" screens on architecture.

Imagine the "tessellate" idea applied to a whole building floor, the movement on a symmetrical pattern will make all this floor have the same quantity of light getting inside, using an asymmetrical pattern instead, part of the floor could have a lot of light getting in while the other part have very few.

An asymmetrical kinetic surface, which could respond to environmental changes, besides looking visually interesting, can make a floor of a building have more than one function. With different needs of light during the day and different spaces while having the same pattern on the facade, the same would happen to a building that receives natural light in different sides during the day.

Bibliography:

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BILL OF MATERIALS

-Little motors $20
-Something to control it (on/off control)?
-Engines $10
-MDF boards $20

SCHEDULE

-5th week
Create several patterns based on clay cracks and trees branches.
Laser cut some of these patterns and build prototypes.

-6th week
Experiment with light, test shadows effects, movement to determine how it could be functional and visually interesting in in a real building.
Start to design and build the mechanism of it (how it works)

-7th week
Finish the mechanism and choose a pattern to use on the final model.
Start making the final board

-8th week
Finish the final board and model.