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### COMPETITIONS

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This Project challenges us to design a performance space in which the performance would happen at three different spaces for 15 minutes once per year.

For this Project, I wanted to create something complex for a simple performance. To deal with complexity, I decided to use Fields Condition after reading more on Stan Allen’s Field Conditions.

The project is divided into three fields:

1. LANDSCAPE
2. THEATRE/SOUND
3. OBJECTS

Each field interacts with one another in various ways and conditions. Grasshopper was used to replace every colored block with its corresponding object.

A Script was written to show how the fields would interact with each other.

The LANDSCAPE Field consists of the landscape. The landscape was divided into bits and bytes through a grid system.

Within every byte which consisted of 30 bits, 14 bits were dedicated to the OBJECT Field. The LANDSCAPE Field would allow certain types of OBJECTS to emerge in one byte. For example, closer to the centre of park, there was less tree Objects and more shorter objects.

Within the OBJECT Field, different Objects had different scattering properties. Some Objects were set to scatter more than others. Thus, the OBJECTS field would interact differently with Time.

The THEATRE Field was an absence of physical interaction with the two other fields. Rather, it would interact with the field with sound and visual permanence that signified amplification.
The Colored Cubes on the left are just placeholders for the actual objects. A grasshopper algorithm would then replace every single cube with its corresponding object.

In the drawing on the right, the rotation represents the various spreading and eroding coefficient of the object. The more it rotates, the more it is likely to spread or erode.
1. A visualization of Theatres and Observation Towers orbiting around the Sound Funnel revealing their composition.

2. Showing the Landscape field, divided into three categories, plants, earth soil, and concrete.

3. Placing the Object field on Top as bits.

4. Revealing the Bytes in which the Object Bits are organized into. Certain Objects cannot occur more than a specified number of times in one Byte.

5. Showing all the fields layered on each other and counting the number of Object Bits on the Map.

6. Allowing the program to run and for the Object and Landscape fields to interact with one another leaving the Theatre Field Untouched. Each but had a Spreading and Erosion co-efficients.

Concrete for example erodes slowly but does not spread. Grass Spreads quickly but also erodes. Trees Spread slowly but erodes slow so the take over the field in the end.
This Project was based on studying Peter Zumthor’s Therme Vals. The challenge was to re-imagine his Architecture and method of design in the context of the YMCA in Brooklyn New York.

As a group, we decided to go with the theme of fragmentation since Zumthor works with it in his Vals project, and we wanted to work with fragmenting our site and its context to build our project.

The project uses the idea of fragmentation to expand on the Pool and Recreation Program of the YMCA. This creates a multiplicity of scattered blocks, organized with a particular logic following Zumthor’s Sketches. These allow for individual private moments, and more social recreations, all connected with an underground track that stretches and curves to connect the different pools together.
Many Years Later, as she faced the 100-Year Flood, Sophia was to remember that distant evening when her father took her to discover the glass ball.

At that time, New York was a Metropolis of many people, built on the bank of a river of clear water that ran along a bed of sand. The world was so recent that many buildings lacked names, and in order to recognize them it was necessary to draw their outlines.

A few people from the Metropolis gathered together and decided that the buildings’ outlines were made from pure geometries.

These people were then named the architects. Later, they did many operations on these forms. Cutting, stacking, rotating, flipping and a combination of the infinite within the finite. They are even said to have made a few of the buildings in New York itself.

The people did not know the purpose of the buildings of the Metropolis. But after many experiments, Sophia came to understand the effects of their curvature.
Many Years Ago, every Minute, the people of the Metropolis would get lost in the sinusoidal effect of the river, as if they swam away to another city.

Memory loss was a big issue in the structures of The glass bEach.

Every Day, the children ran with joy to discover the new look of the glass bEach; one morning drowning and another morning appearing again. It was known that the Gypsies themselves cast a spell to make the Metropolis as alive as the rise and fall of the river.
Every year, the people of the river came to celebrate the rise of the water, yet again, and with great uproar for the city they found and what it will become.
Every Month, Sophia thought that the lowest tide was higher when she went to swim at the glass beach. Some Winters, when the river touched the large surface of the glass beach, Sophia was able to skate on the crystalized river.

Every year, the people of the river came to celebrate the rise of the water, yet again, and with great uproar for the city they found and what it will become.
But every 100 years or so, Sophia feared the river a couple of times.

Many years later, she feared the river more frequently every 100 years.
The partitions that we live within are static. They do not sense our presence, nor do they adapt to our varying behavior. As a result, we don’t tend to respond to the walls we pass by. When they are empty, we tend to fill them up with paintings, pictures, or even windows. But what happens when a partition-wall becomes responsive to human behavior?

Building off the Raffaello’s Robotic Chair sudden collapse (Raffaello, 2006), this project attempts to build a character for a partition-wall. It starts off as a standalone partition-wall. Many people will pass by, but every once in a while, when it catches a person passing by within its radius, it will fall down and collapse with a unique character to grab their attention. But unlike the Robotic Chair which heals itself, it would depend on people to bring it back up.

In building this wall-partition, a large portion was dedicated to the character of the object and the way it collapses. This was made and tested using digital simulation techniques in order to mimic its physical essence. The simulation would then respond to the digital values read from the real physical world using sensors and electronics.

While the Skeleton gives the wall its animated character of how it falls and moves, the sensors allows such movements to be more responsive to their surrounding and the users.

Since the narrative is about an object that crashes when it detects a moving person in the room, the project tried to combine the Ultrasonic Sensor with the Simulation in order to make the Wall more Responsive. The code was written in Arduino.

Since the ultrasonic sensor can only detect objects in a single line, a sonar was developed that remembers past data points and compares to present ones.
The skeleton provided the characteristic of the collapse of the wall-partition. To create a wall with a stable unified character, a network was designed to connect the ball-joints using State Automata. The state automata allowed me to explore a variety of iterations of wall collapsing character, where each had its unique character based on the network of joints.
This project is an intensive computational summer project where we were given the opportunity to explore different ways to re-fit fragments within a target shape.

For that purpose, I was studying a particular mathematical formula known as the Minkowski Difference, which is very simple vector subtraction in 2D. This method is often used in physics simulations to perform collision detection. I used it to write a Python code that places fragments piece by piece iteratively with rule of thumbs that makes stacking efficient.

The method was studied in relation to Hungarian Algorithm which is a matching algorithm introduced to us in class. A metric of fitting most of the target shape was given to determine which method is best at fitting fragments that are unrelated to a target shape.

A combination of using the hungarian algorithm initially followed up by stacking of items with Minkowski Difference has proven to be most efficient.
The studio was to design a Student Housing near the University of Toronto.

Drawing my bedroom gave me an understanding of the basic dimensions needed for working, sleeping, as well as how I layout my furniture.

Learning from my room, I wanted to separate the workspace from the bedroom. I designed a 4-Room Unit where each room has its own Bedroom, WorkRoom, and BathRoom. Each Room is connected to a shared Kitchen and LivingRoom via a StairCase.

Each StairCase/Connector has two usable sides, the interior connect Shared Room with Private Room and exterior to create new social spaces in the atrium.

This Algorithm/Logic allowed me to design a series of 2-Room Units that could potentially stack together to form a greater variety.

Based on the different stairs the Private Rooms can connect to the Shared Rooms, I created 13 different units. Each of the 13 different units had 6 different “Orientations” as shown in the Unit Matrix. Then I used a grasshopper algorithm to stack the different units together to create a Matrix of 800+ Units. I then organized them into a table to observe the common properties of groups in columns and rows inside the matrix.

In the end, I chose 3 simple units, added more detail to them, and stacked them such that they can produce a social atrium where all workspaces look into the atrium, and all bedrooms face outwards.
Three Units from the Matrix were chosen based on stacking properties to produce a social atrium while maintaining quality of individual units.

The stacking produces a skip stop system illustrated in diagram.
Generating towers using Grasshopper algorithms. Different structural systems were explored.

An exquisite corpse approach was taken for the facade allowing us to explore different geometries and how they can be constructed and how they fit beside each other.

All geometries were generated on Grasshopper with the idea of fluidity in mind. Supporting walls take the shape of the wall and the facade acquires a viscous appearance.

Materiality and way of joining and construction through lasercutting and 3D printing was explored.
This Project looked into the mathematics and research of Origami and the techniques of folding Curves.

The project was pushed further by settling on a simple geometry, a "Cone", and manipulating it using mirroring techniques in order to accurately model a curved fold.

The project also explored a variety of joining techniques including stitching and riveting in order to give a thin sheet a volumetric & stiff shape.

The project then evolved from the use of Bristol Paper to the incorporation of Spring Steel for its unique properties and rivets.
This research is part of my workstudy position with professor Brady Peters. In this study, we researched different ways a straight hot wire could cut a foam block in planar cuts while theoretically maintaining some of its acoustic properties. The iteration we focused on was a foam cut made from stitching sin waves together. The resulting block is a wavy structure whose crests touch a singular plane and have varying random troughs for sound scattering and hopefully sound diffusion.

**COSINE OUTLINE VISUAL ALGORITHM**

1. Generate Random Cosine Waves
2. Extract 1 Full Wavelength of each Cosine Wave Consecutively from Tops
3. Stitch Cosine Waves together by moving them to the Wanted Height
4. Draw outline of Acoustic Panel to the bottom line.

**OPERATIONS**

1.1 Foam Cut of a Normal Acoustic Panel Using Kuka
Building on the previous research of Acoustic Panels, this ongoing project focuses on creating a grided system for these individual acoustic panels to slip into and create a continuous sound scattering wall.

The challenge was to create an algorithm that automatically inputs randomized acoustic panels on a wavy surface of the wall. The wavy geometry had to remain random while the maximum depth of the walls controlled to be higher at the centre and diminishing towards the ends.
In this competition, we were asked to design a parklet that would be used for performance and street art for Cafe Mosaic.

The design of Aperture addressed visibility relative to the viewer’s position through the angled positioning of each wooden bar to create slits. The view of the cars coming against the viewer from the closer side of the street is blocked to provide a safe experience to a parklet located adjacent to the street. Diverse seating options to accommodate different heights, size, shading, and activities was integrated into the essence of the design.
Building on the theme of the TEDxUofT Conference, "Deconstruct", designers were asked to design a sculpture.

The design consists of two sculptural pieces made from solid and semi-transparent cubes. Each cube is arranged in a specific orientation that conveys a whole. This whole is formed of two intersecting ideas, an artistic visualization of form and the deconstruction of light.

Pieces were made to be modular and snap together without the use of glue to strengthen unity from individuality.

The idea of intersection comes from the letter X, a sign of two lines meeting one another at a singular point. At the intersection is where the two lines deconstruct and reconstruct to form a new meaning. It is where different disciplines meet to form new relationships.

COMPETITION BY OUS ABOU RAS, ADRIANA SADUN, DIMAH GHAZAL

- The light goes through the boxes that form the X shape
- Spatial Interaction looking through the boxes
- The photographs depict details of the mirror film effect that deconstructs light.

STRUCTURE & DIAGRAM PROTOTYPES