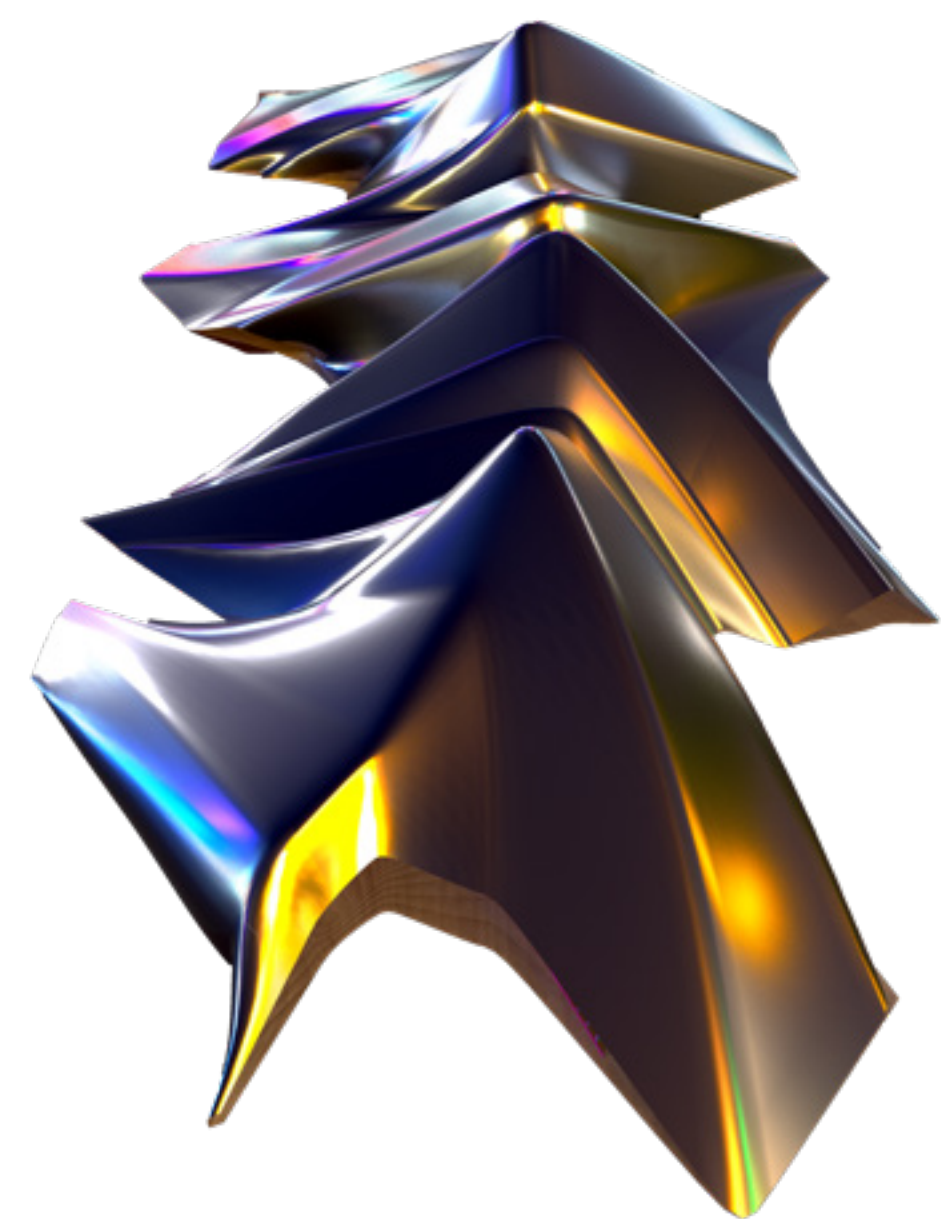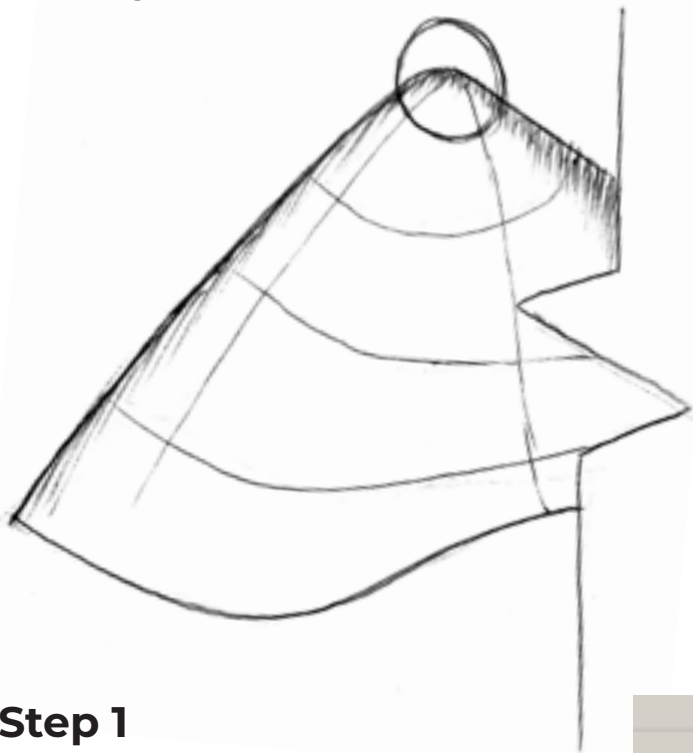# ASSIGNMENT 3
DIGITAL MODEL

Project Selection

A project in my portfolio that has always bothered me was one from a third year studio. While I like the shape, the design itself lacks any thought about structural elements. For assignment 3, I wanted to change that. By utilizing what I know now about digital modeling and grasshopper, solutions made much more sense that before. Since the building was spanning long distances below this form, a space frame design was ideal to work with the unusual shape and large spans.

Initial Dilemma

The main problem with attaching a calculated structure to a shape that is so non-calculated is that the two don't work together. A space frame needs points to connect to, but this mesh seemingly had none. When bringing this question up, it was suggested to me that I triangulate the mesh.

Initial Solution

By triangulating the mesh, it would be turned into a series of triangles. These surfaces have geometry that rhino can work with and were the base of my solution.
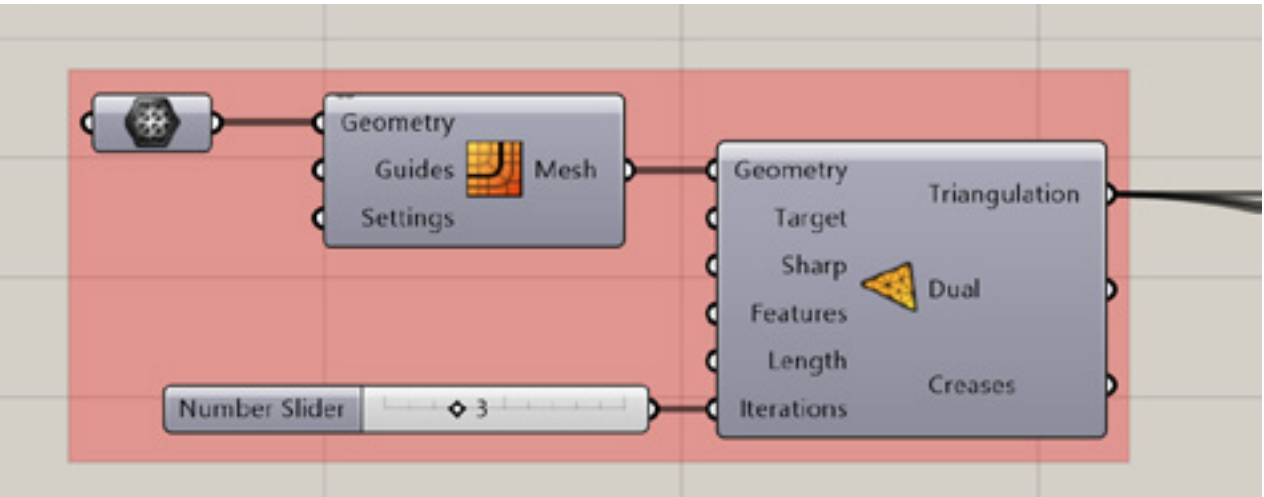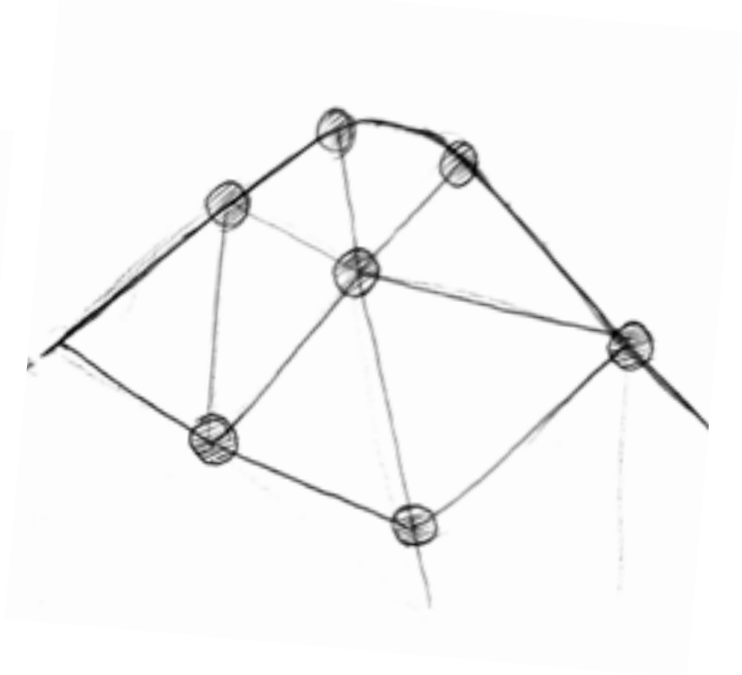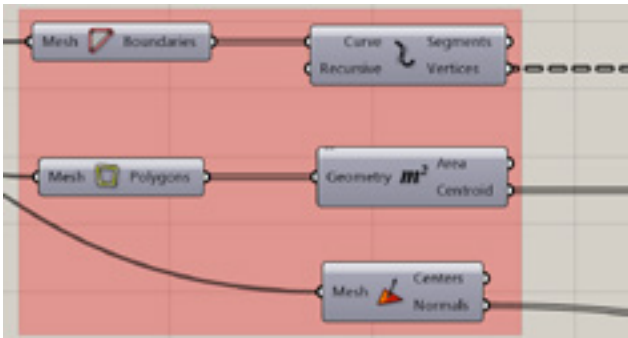

Step 1

The first portion of the grasshopper file takes an input mesh and reformats it into a triangulated mesh. This creates the base geometry for the rest of the program
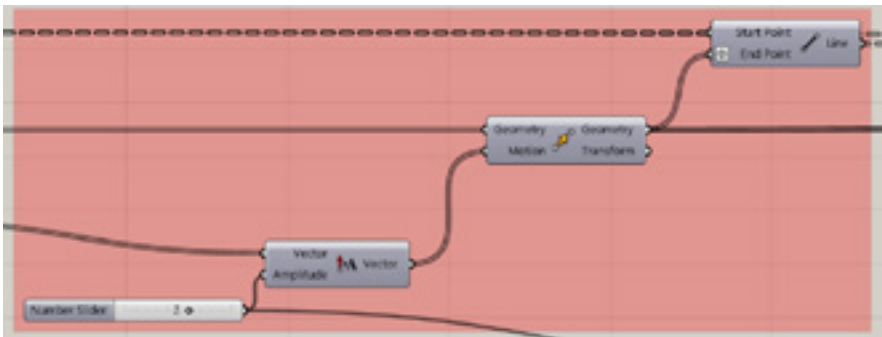
ASSIGNMENT 3

SCRIPT BREAKDOWN

Step 2

The mesh produces boundaries and polygons, which are turned into the spanning structure and centroids respectively. These centroids are then offset in a normal vector
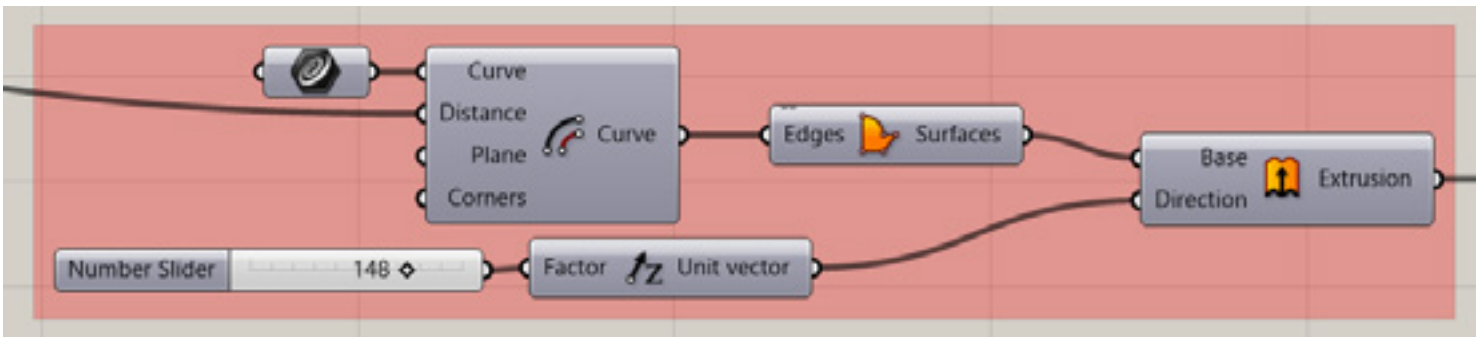
Step 3

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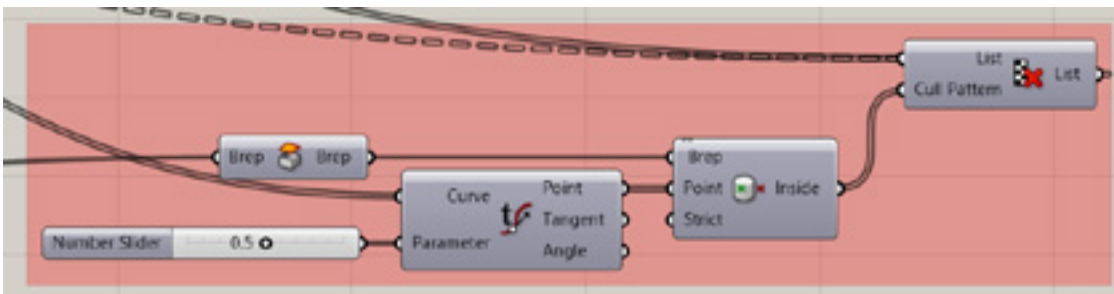
Step 4

To cull any unwanted lines, a curve is created from a flattened version of the mesh. This is offset by the same distance as the centroids are. It is extruded to surround the shape
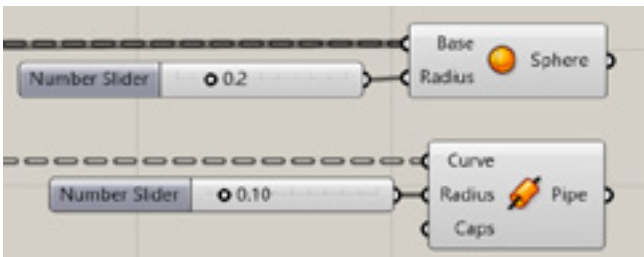
Step 5

By sorting the list of lines and culling the ones that are outside of the extrusion, all unwanted lines are left out of the final structure
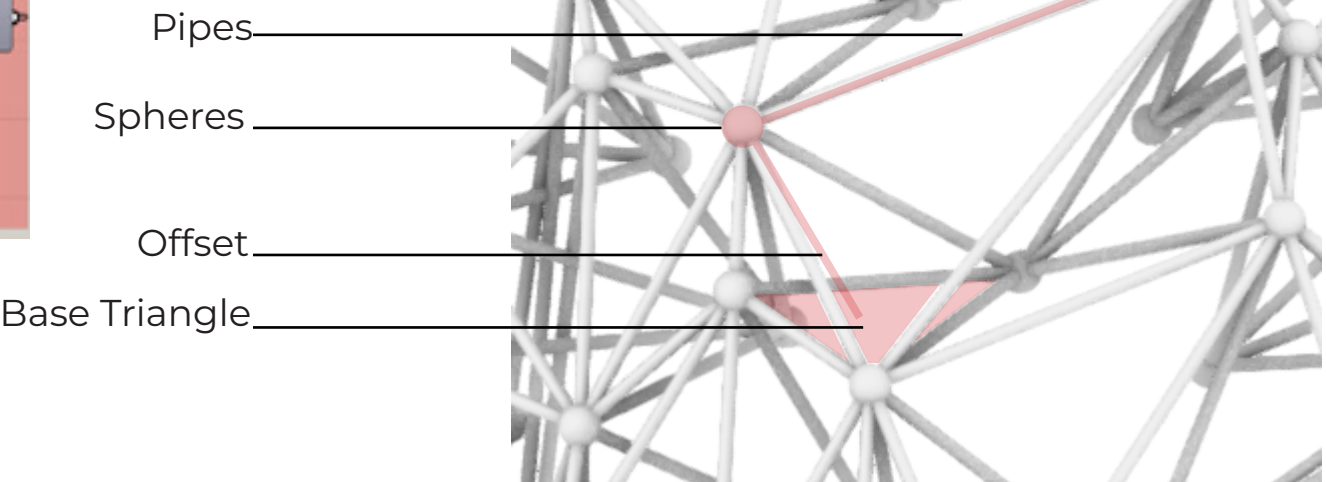
Step 6

The final output are spheres, placed at the intersections of the pipes for connections, and the pipes themselves

Base Result

Frame Anatomy

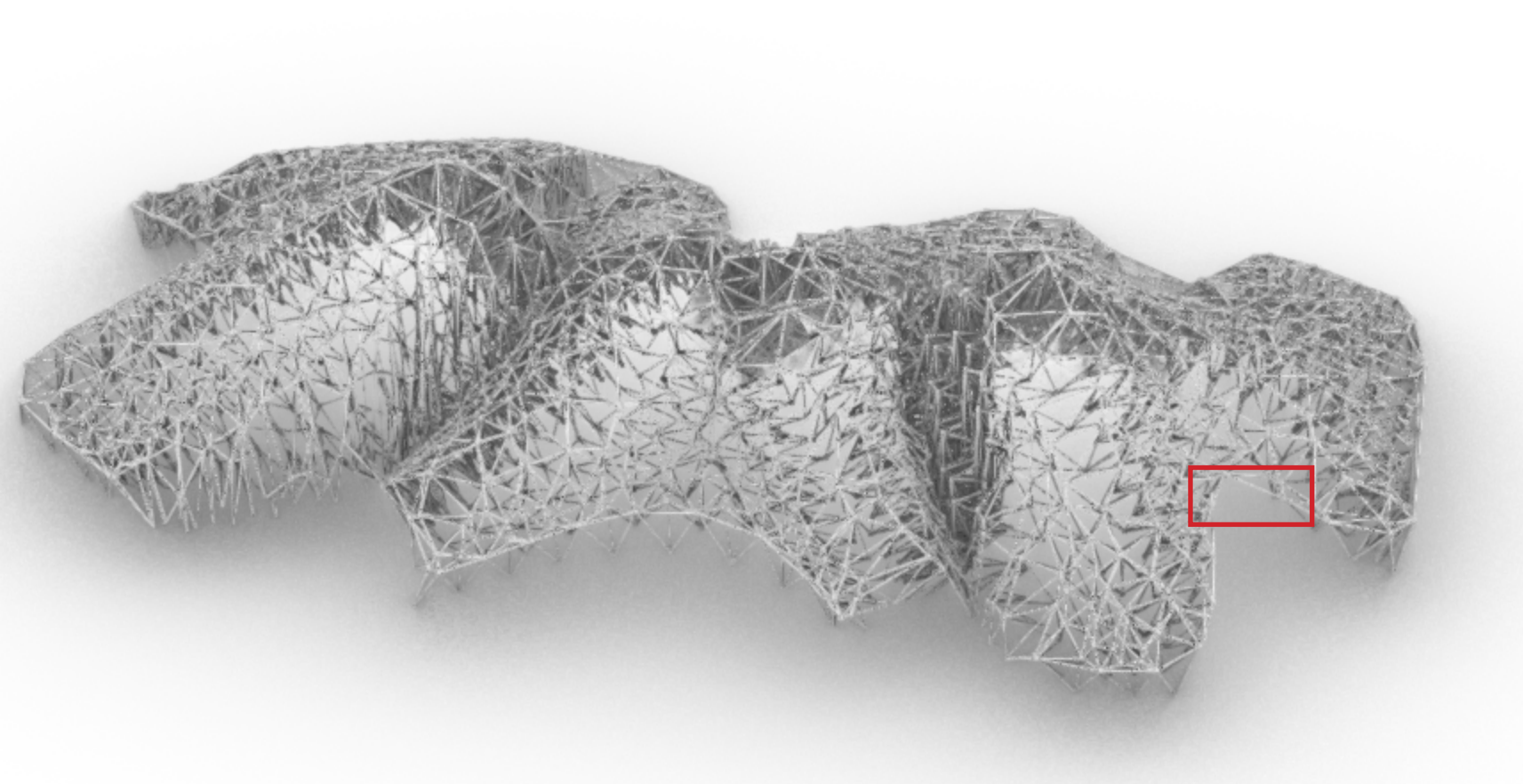Pipes

Spheres

Offset

Base Triangle

ASSIGNMENT 3

TAKEAWAYS + ADDITIONAL EXPERIMENTS

This project showed me the importance of establishing variables in old projects in order to create parametric designs. Making a parametric system for a design which was meant to have parametric features added to it works well. When retrofitting an old project with new parametric features, it is important to understand what variables you have to work with. I thought this mesh was incompatible at first, but after having conversations, I realized that there were in fact variables (vertices, faces, and edges) hiding in the mesh that I had to look for more closely. One can create something so long as they have basic components to work with.

Increasing the Offset Distance (Too Much)

Substituting Other Meshes in Script