DIGITAL DESIGN WORKSHOP //

S02  DATA-DRIVEN FACADE

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Session 02 : Data-Driven Facade
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Step01_Design Surface
- Flat input surface on xz plane < input surface
- Divide surface, get point grid on the surface
- Evaluate uv coordinates of the points on the surface
- Map grey scale bitmap to the surface < external data set
- Sample grey scale values based on uv coordinates of the surface
- Remap the sampling values to exaggerate
- Move vertices of the point grid using the sampling values
- Reconstruct design surface out of the revised point grid < design surface

Step02_Initial Paneling
- Project the point grid onto the design surface (using finding intersections)
- Get polylines (degree = 2) out of the projected points
- Shatter the polylines into segments to build individual panels
- Flip the data tree of the segments for lofting panels
- Shift the lists to set up pairs of segment lists
- Loft individual panels
- Check data structure
- Flip the data tree of the panels to match it to the original < paneling patches

Step03_Paneling
- Divide the input surface into surface patches per the given u & v
- Offset the outlines of the surface patches (for reveal between panels)
- Get vertices of the offset outlines
- Check the orders of the vertices and match the orders
- Project the vertices onto paneling patches from step02
- Reconstruct patches out of the projected vertices < base panels

Step04_Triangulation
- The base panels are not flat
- Get two diagonals from the base panels
- Get distances from the centroid of each base panels to the two diagonals
- Compare the two to choose folding direction (triangulation)
- Generate folding direction pattern based on the comparison < folding pattern
- Prepare two sets of triangulated base panels for both folding directions
- Selectively pick panels based on the folding pattern < folded panels

Step05_Perforation Preparation
- Set point grids on the folded panels (two triangles per panel)
- Generate outline of the each triangles < triangular patches
- Remove any points on or outside of the triangle boundary < perforation base grid

Step06_Solar Angle
- Set up a sun ray vector
- Get surface normal vectors of the each triangular patches
- Get angles between the two vectors
- Set a threshold (critical angle)
- Create pattern based on the threshold and the value of angles < perforation pattern
- Selectively pick triangular patches using the pattern < perforation groups
- Selectively pick perforation base grid using the pattern < perforation groups

Step07_Perforation
- For the group above the threshold, constant perforation radius applies < group A
- For the other group, perforation radii respond to a set of point attractors < group B
- Set up point attractors and get distances from the point attractors to the centroids of all triangular patches in group B
- Remap the values to min. & max. perforation radius
- Remove some perforation circles randomly using flocking pattern logic

Step08_Flaps
- Get outlines of the triangular patches and remove the longest segments (diagonals)
- Extrude them toward the input surface from step01

Step09_Unfold Panels
- Set up a grid on xy plane
- Match x,y counts and data structure to the 3d panels
- Use unfold from TT Toolbox