**Polygonal Mesh Demonstration Exhibit**

**Goal:**

Explain how three-dimensional objects are represented using simple polygons in the context of computer graphics. Allow interactivity with the level of detail the model uses.

**Components:**

* RaspberryPi – brains of the exhibit
* Arduino – receive input from guests
* Visualization – Processing or ThreeJS (WebGL)
* Internal Communication – Serial for Processing, Client/Server for web-based visualization

**Visualization:**

Depict different models (.stl, .obj,…) using polygonal meshes. Show various levels of resolution using a varying polygon count. Visually explain tessellation.

Traditionally meshes are depicted using lower and higher polygon counts using the following two schemes, differing in increasing and decreasing the triangle count:

* Increase triangles – Surface Subdivision, refine meshes, adding detail with more triangles.
* Decrease triangles – Triangle Decimation, used to reduce the amount of triangles maintaining structure of model.

Explanation: <https://www.cs.carleton.edu/cs_comps/0405/shape/decimation.html>

Example: <https://lowpoly3d.xyz/>

Either way it seems it would be simplest to save different copies of the same model with different triangle counts, instead of running the various algorithms, especially considering they are not symmetrical.

Interesting options:

* Possibly render mesh’s edges instead of faces to show a wireframe model.
* Mesh generation using Delaunay Triangulation given a set of points on a plane.

<https://en.wikipedia.org/wiki/Delaunay_triangulation>

Tasks:

* Figure out final visual and interaction
* Mesh displayer using Procesing/ThreeJS, plenty of source code on the internet

**RasberryPi:**

Tasks:

* Set up work environment
* Set up Arduino IDE
* Establish communication with Serial

<https://roboticsbackend.com/raspberry-pi-arduino-serial-communication/>

* Set up Processing IDE

<https://pi.processing.org/get-started/>

* Set up client/server

Swim emulator example: <https://github.com/jerusalem-science-museum/swim_simulator>

**Equipment:**

* RaspberryPi
* microSD – at least 8GB
* Arduino
* Slider

**Brainstorming:**

* Use four panel plexiglass method for holograms
* Generating a mesh for each guest based on camera/lidar sensor. <https://google.github.io/mediapipe/solutions/face_mesh.html>