STEAMVR™
Tracking Training

STEAM®VR
Tracking Training

Defining Sensor Placement

Review Exercise

Generate 32 sensors on the object in:
070_defining_sensor_placement
**generate_exercise**

The JSON File

- Each object contains a .json file that describes it

- One major component is the sensor positions and normals

- "modelPoints"
  - Array of coordinates to the center of each sensor
  - [X, Y, Z] for each sensor

- "modelNormals"
  - Array of unit vectors, normal to the face of each sensor
  - [X component, Y component, Z component]

- "channelMap"
  - Array of FPGA input channel IDs (0 - 31)

Array Index

0
1
2
3
4
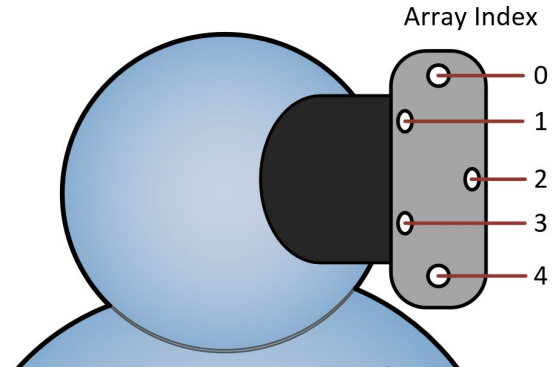
Model Points

- [X, Y, Z] coordinates for each sensor
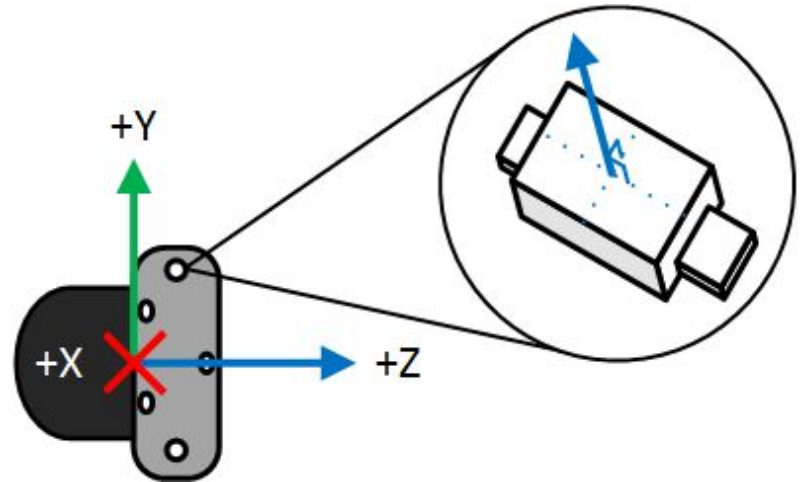- Units are in meters!

```
"modelPoints" : [
    [ -0.055,  0.030, 0.015 ],
    [ -0.050,  0.015, 0.005 ],
    [ -0.050,  0.0,   0.025 ],
    [ -0.050, -0.015, 0.005 ],
    [ -0.055, -0.030, 0.015 ]
]
```
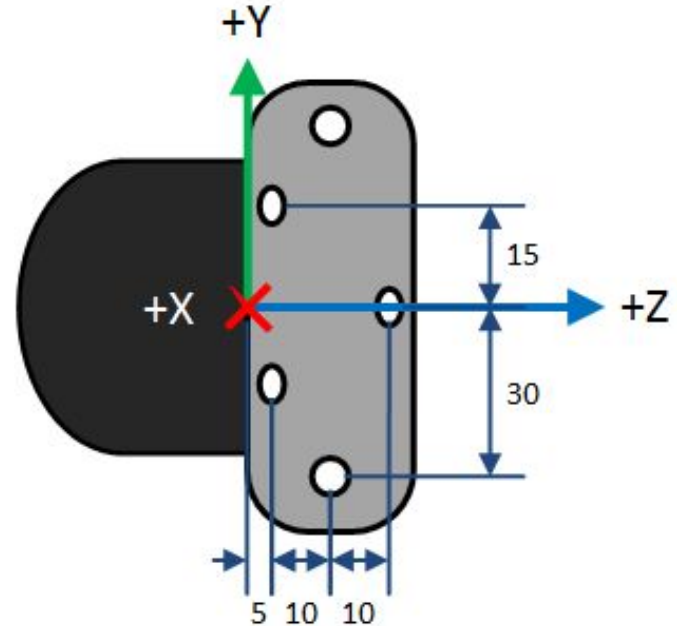
Model Normals

- Unit vectors in three dimensions
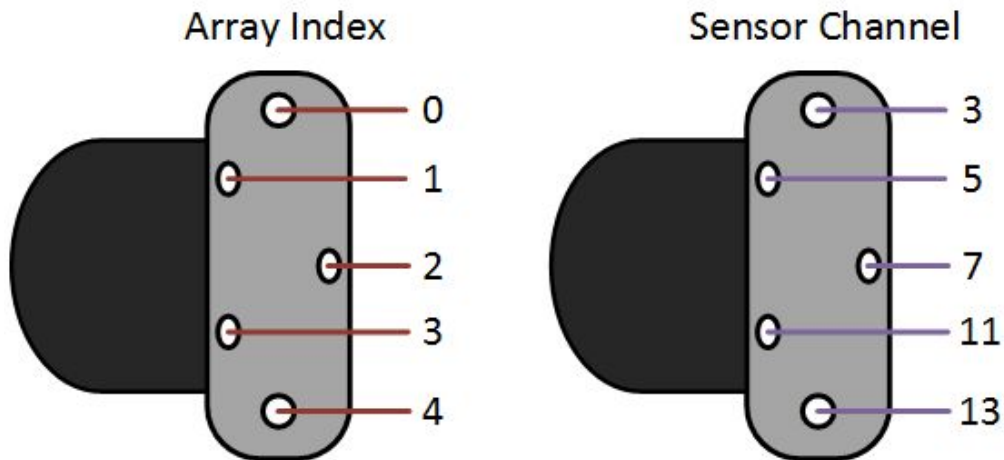
- Magnitude must = 1!

```
"modelNormals" : [
    [ -0.7071, 0.7071, 0.0 ],
    [ -0.7071, 0.0, -0.7071 ],
    [ -0.7071, 0.0, 0.7071 ],
    [ -0.7071, 0.0, -0.7071 ],
    [ -0.7071, -0.7071, 0.0 ]
]
```

Channel Map

- Input channel to the FPGA
  - Defined by the schematic and FPGA configuration

- Array index identifies an individual sensor in all three arrays
  - "modelNormals", "modelPoints", "channelMap"

```
"channelMap" : [
    3,
    5,
    7,
    11,
    13
]
```


Array Index


Sensor Channel

Writing a JSON File

- Everything enclosed in braces and separated by commas

```
{
    "channelMap" : [...],
    "modelNormals" : [...],
    "modelPoints" : [...]
}
```

- Take a look in the simulation directory for an example
- Time to write your own!

Visualizing the JSON File

- HMD Designer GUI includes a JSON visualizer

- Object is displayed transparent

- Sensors are placed according to the JSON file

- Green indicates the face of a sensor

- Red indicates the back of a sensor

- Channel number is written on the face
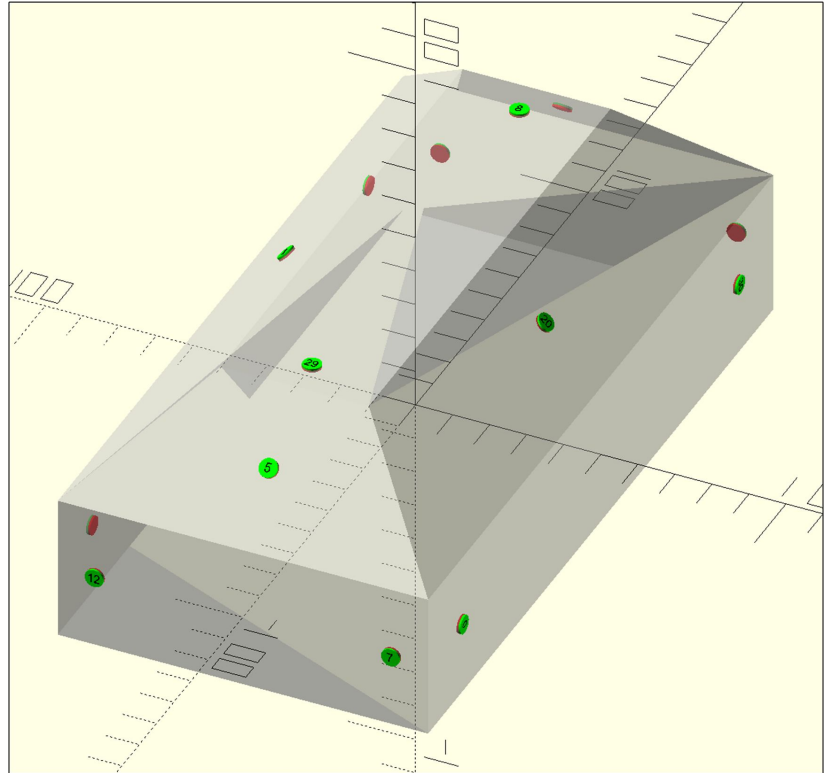
Configure HMD Designer GUI to Visualize

- Add the JSON file

- Add the sensor object file

- Select the JSON file
  - Instead of "Generate"

- Select the sensor object file

- Click: Visualize Model

10
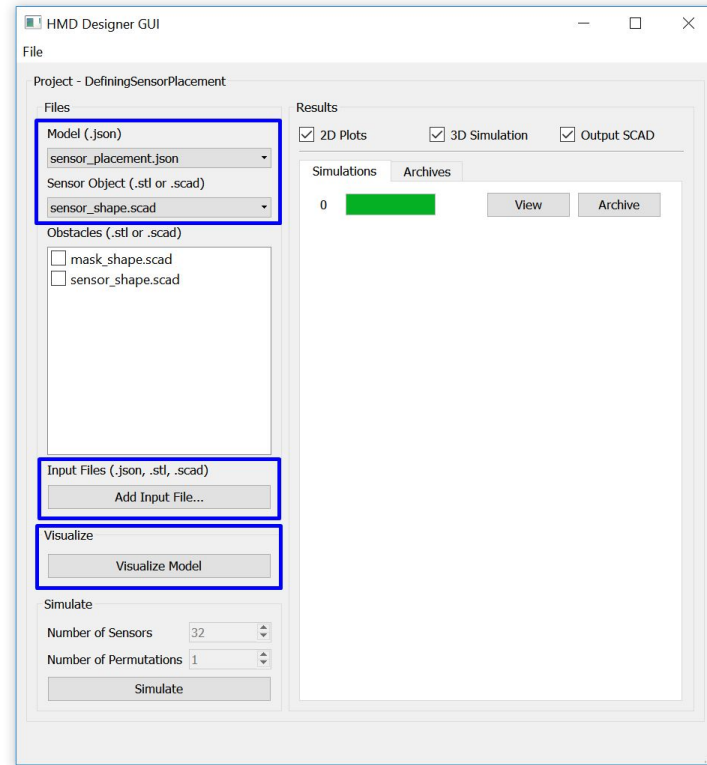
JSON Sensor Placement Exercise

- Open example.scad in 070_defining_sensor_placement\ json_exercise

- Write a JSON file to describe the sensor placement displayed
    - sensor_placement.json
    - sensor_shape.scad

- Channel numbers are written on the sensor

- Visualize to verify placement
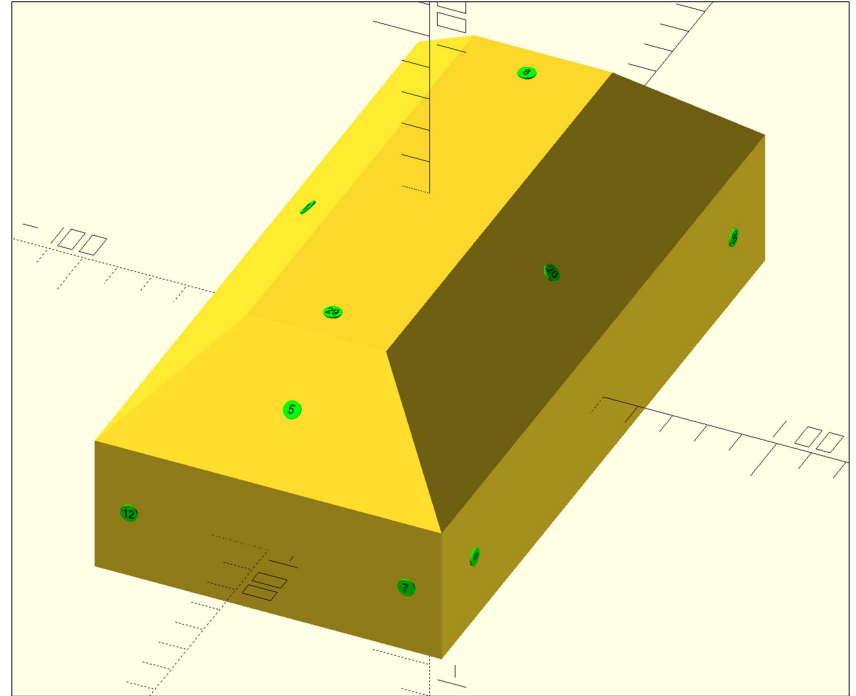
Simulating the JSON File

- HMD Designer can simulate a given JSON file

- Select

  ○ JSON file

  ○ Sensor Object

  ○ Obstacles

- Click: Simulate

- Generating takes time, simulating is fast!
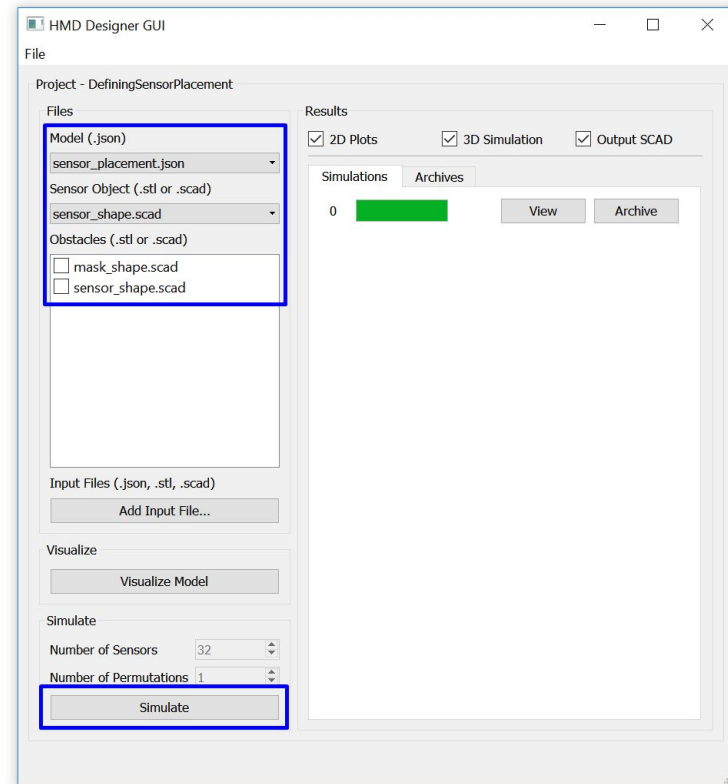
Improve Sensor Placement

- How can this placement be improved?
  - Move sensors?
  - Reorient sensors?
  - Add sensors?
- Archive the current results
- Create a copy of the JSON file
- Update the new JSON file and simulate
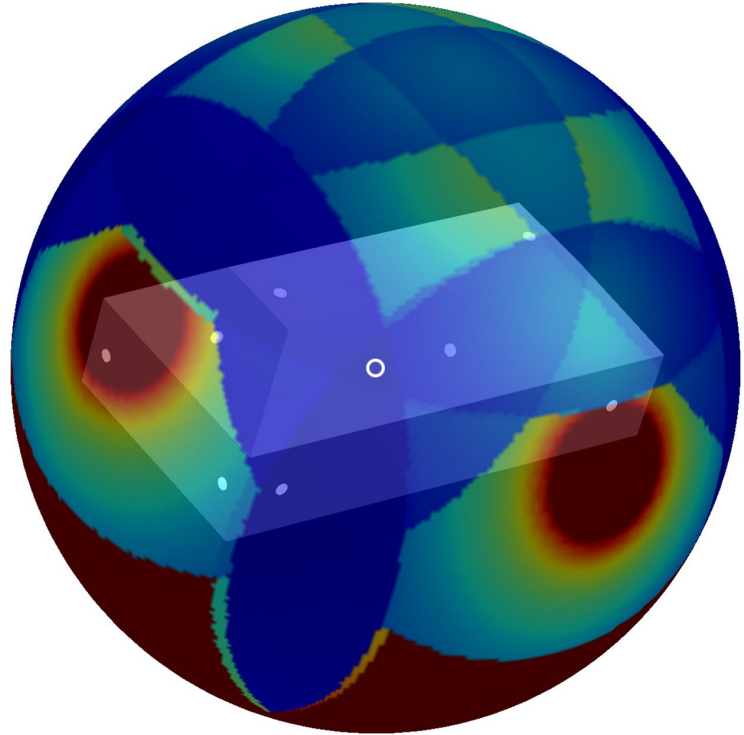
Remember the Real World!

- In VR arms and hands don't exist

- In the real world they do!

- Less than 32 sensors may yield a good simulation

- What happens when a user holds the object?

- Extra sensors may mitigate the problem

- Simulate obstacles to know for sure!