STEAMVR™
Tracking Training

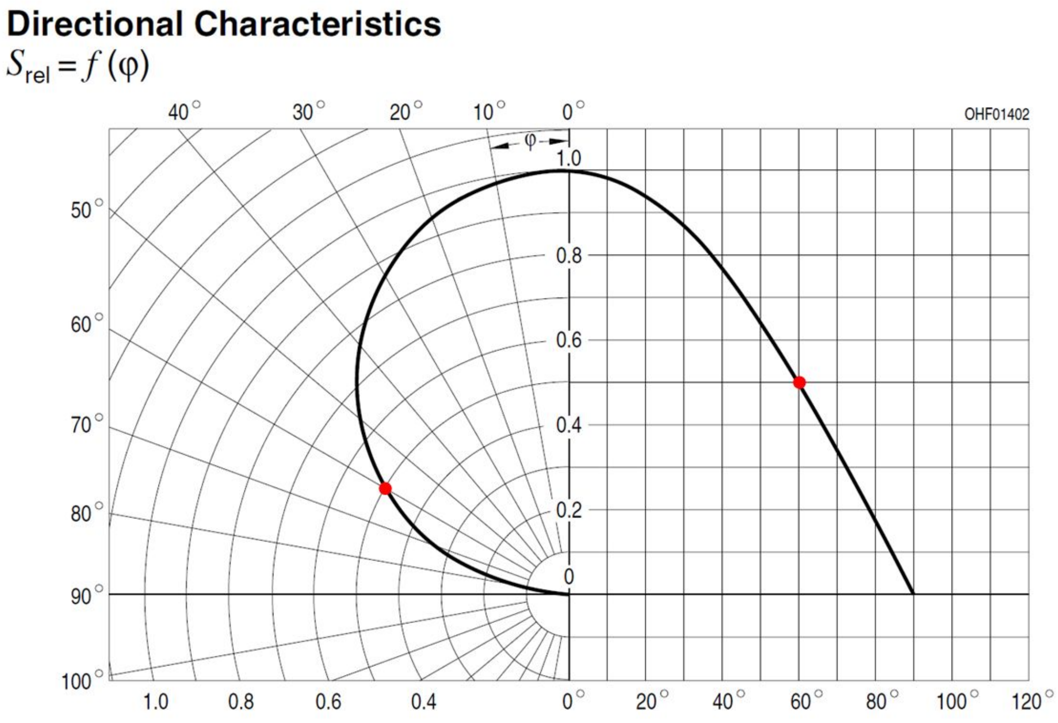
Interpreting Simulation Output

Simulation Inputs

- Sensor positions and normals
  - Position = X, Y, Z coordinates
  - Normal = facing direction
- Sensor field of view
  - ±60° from normal
- Self occlusion
  - Shadows cast by the sensor object
- Obstacle occlusion
  - Shadows cast by nearby objects
  - Model hands, heads, handles, accessories, etc

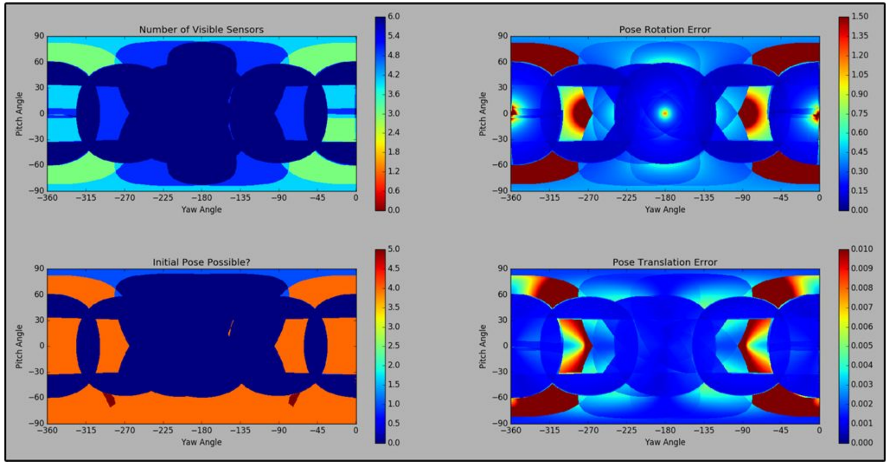
Sensor Field of View

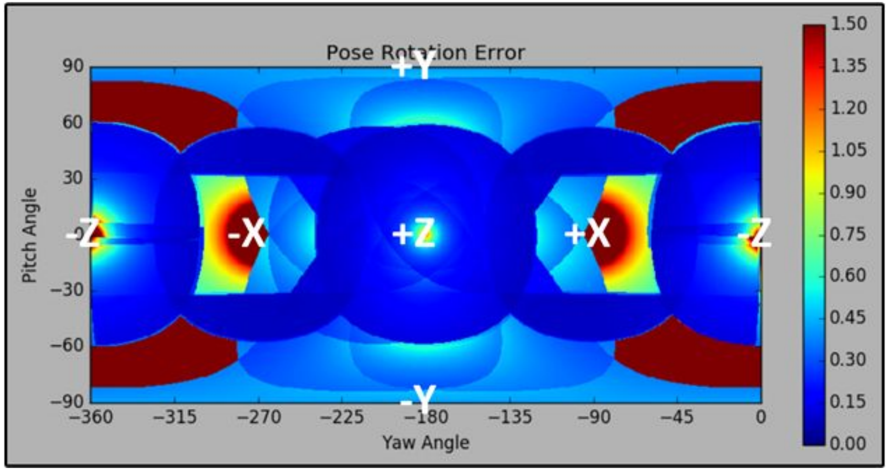
- BPW 34 S has a ±60° field of view from normal
- At 60°, the sensitivity is 50% of 0° sensitivity
- System is specified for 5 meters at 60° off axis
- Simulation output accounts for the 60° viewing angle limitation



2D Plots

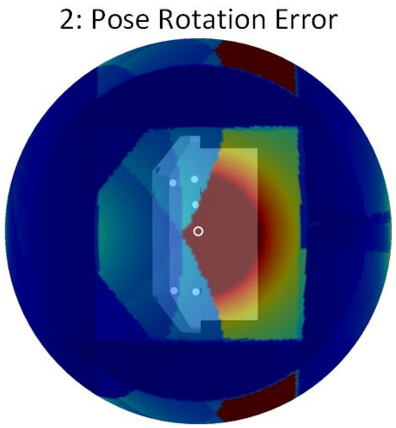
- Uses
  - Compare results at a glance
  - Share via email
  - Copy into documentation
- Navigation
  - +Z is in the center
  - +Y is up
  - -Y down
  - +X to the right
  - -X to the left
  - -Z wraps around the sides
- Blue is good
- Red is bad

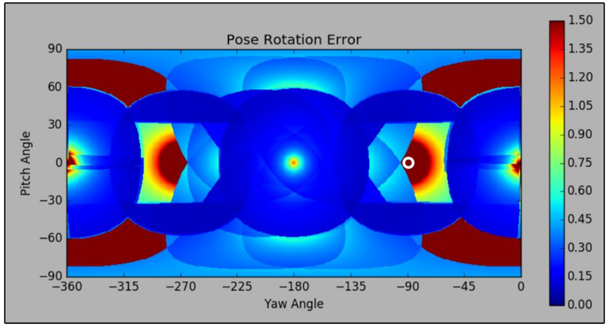




3D Plots

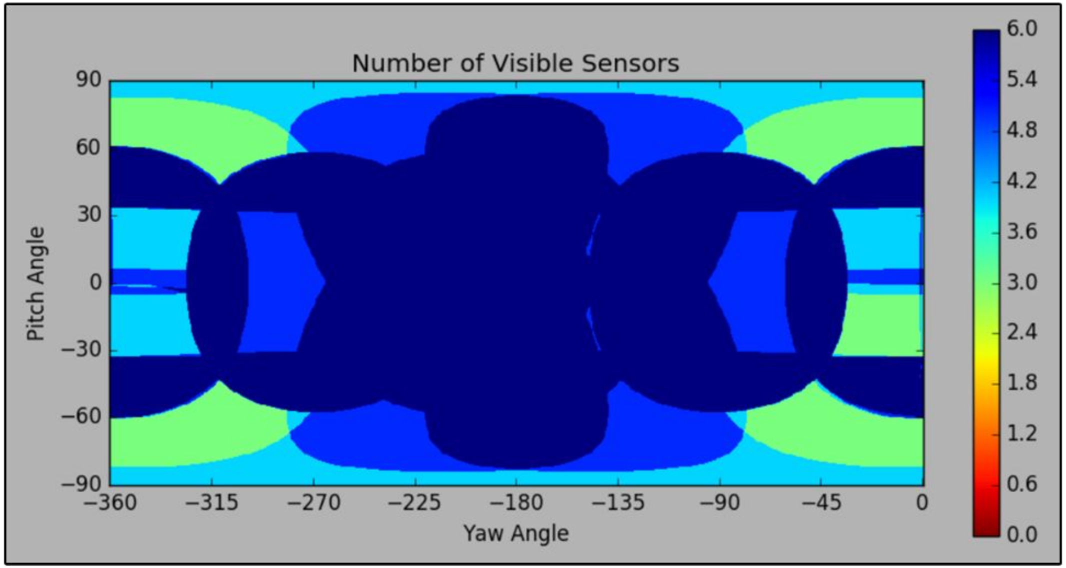
- Uses
  - Pinpoint poses that exhibit low performance
  - Show visible sensors in a pose
- Navigation
  - Use numbers 1-4 to select the plot
  - Click and drag the mouse to rotate
  - Scale the model using the slider





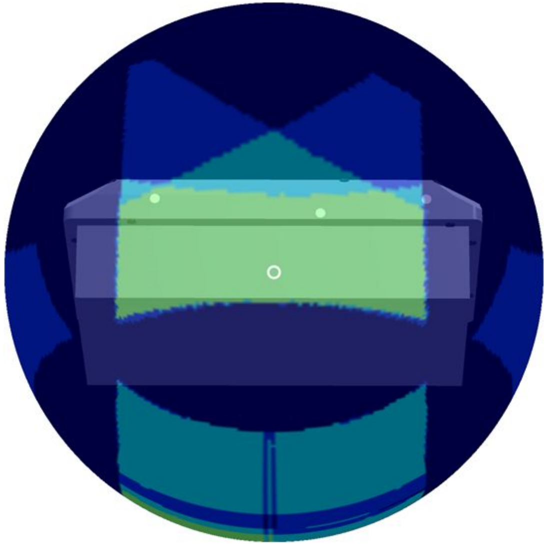
Number of Visible Sensors - 2D

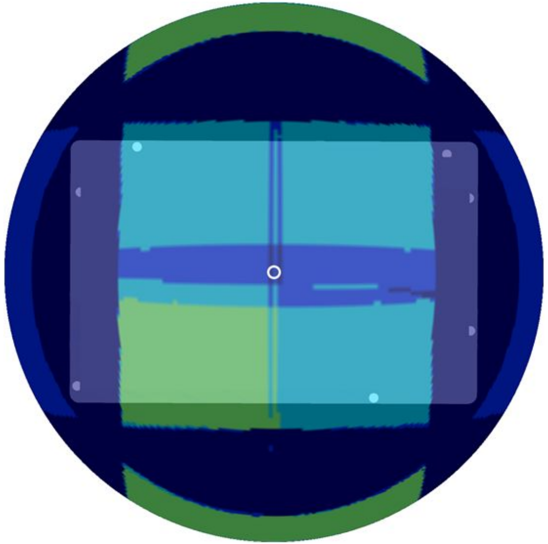
- Initial indicator of placement quality
- 4 required to boot
- 5 preferred
- **Where to expect problems?**



Number of Visible Sensors - 3D

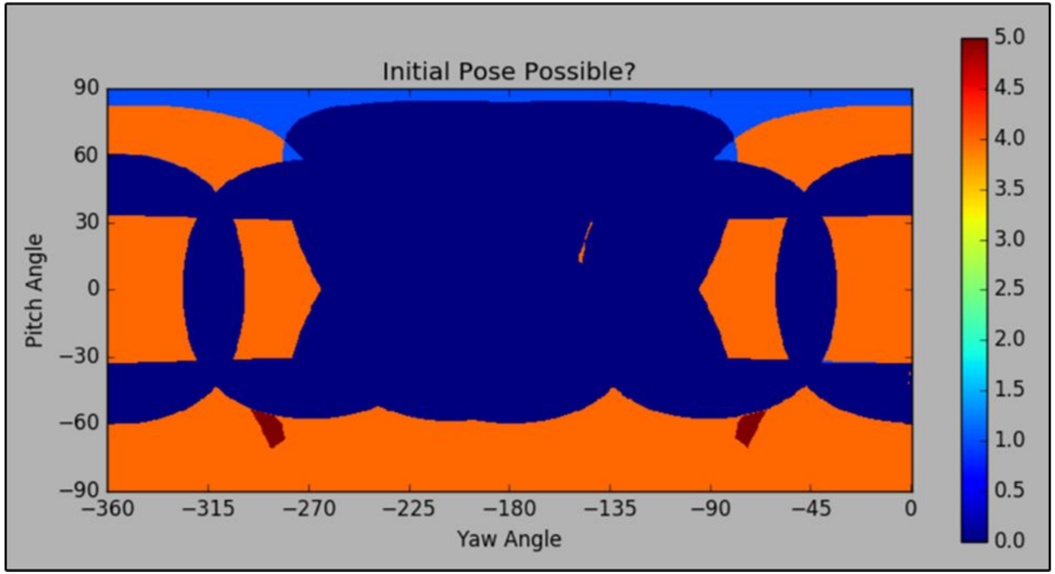
- Line up the POV marker with the problem area
- **What about sensors on the back face?**
- **How could we fix this pose?**
- **What about the -Z pose?**





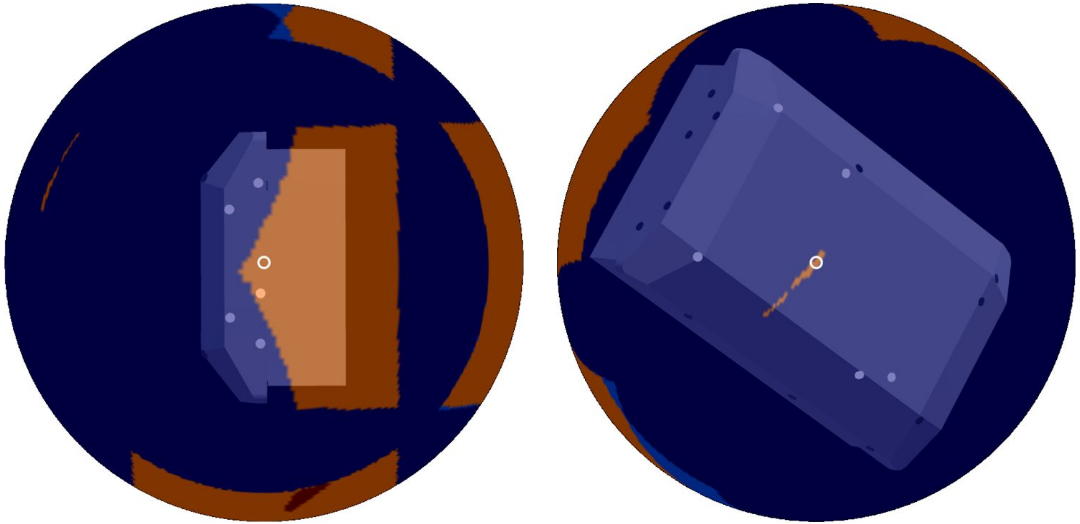
Initial Pose Possible - 2D

- **What are the criteria for booting?**
- Resembles the Number of Visible Sensors plot
- Object boots or not from a given pose
- Discrete colors come from hard limits on criteria



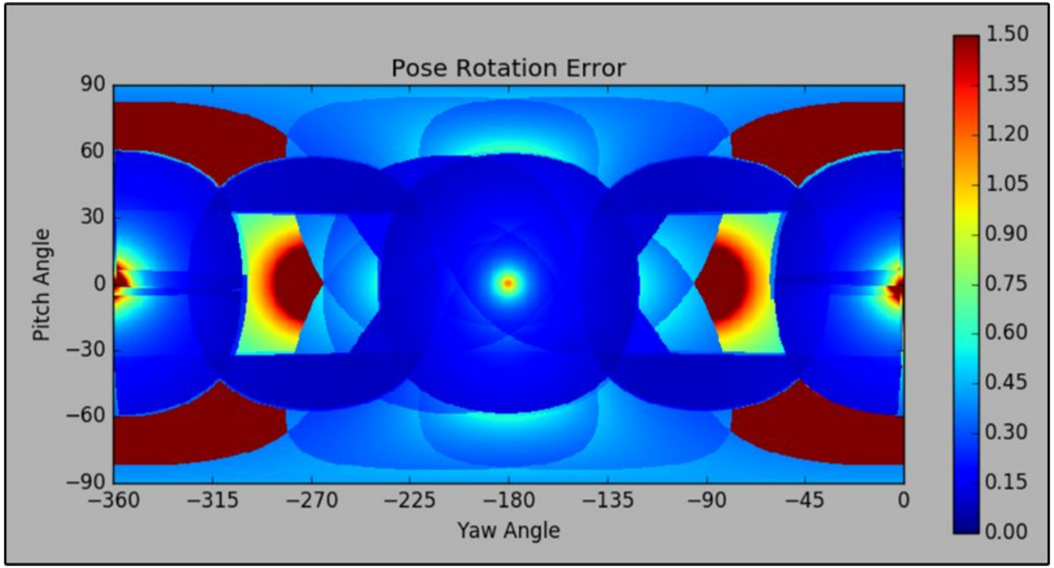
Initial Pose Possible - 3D

- 3D plots advantages
  - Highlights visible sensors
  - Helps find poses with coplanar sensors
- **How could we fix these poses?**



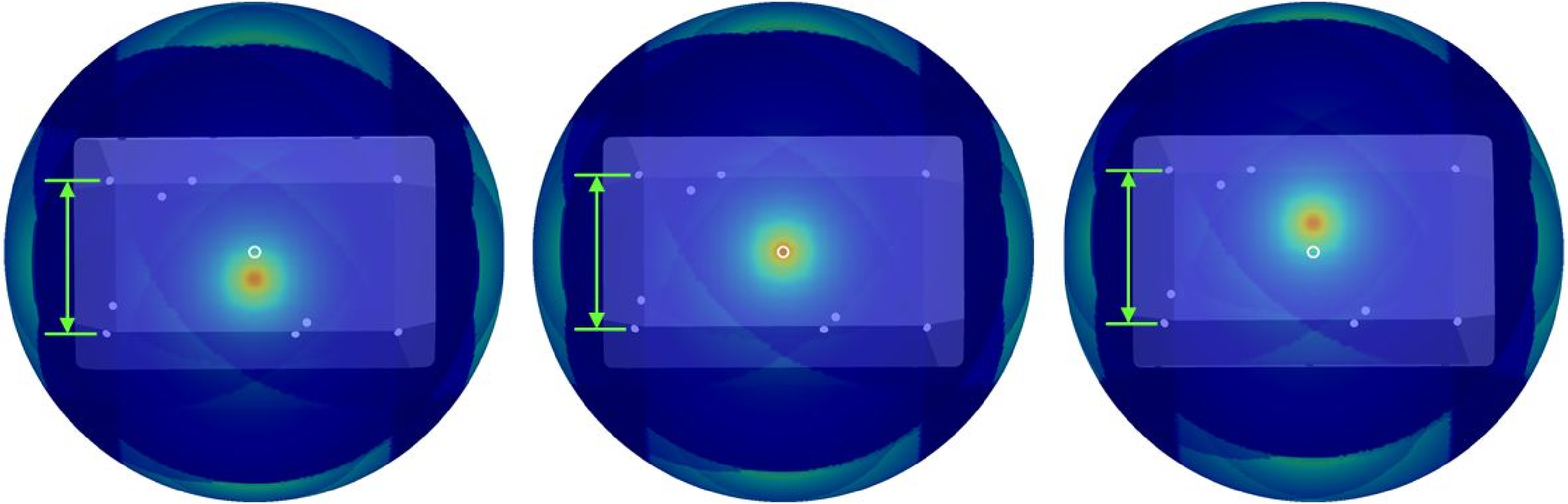
Pose Rotation Error - 2D

- What drives rotation error?
- What can we infer about the areas of poor performance?
- Which sides of the object have problems?



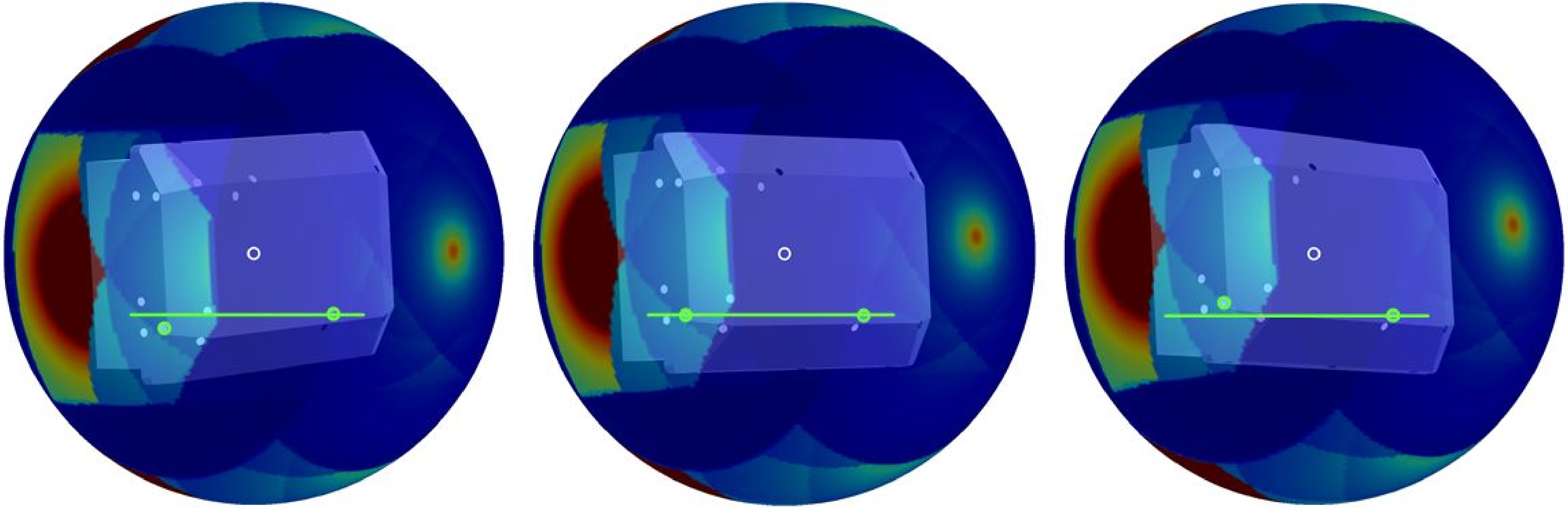
Pose Rotation Error - 3D

- 3D plots demonstrate how coplanar sensors lead to rotation error
- **How is the distance changing when rotated up and down?**
- **How could we fix this pose?**



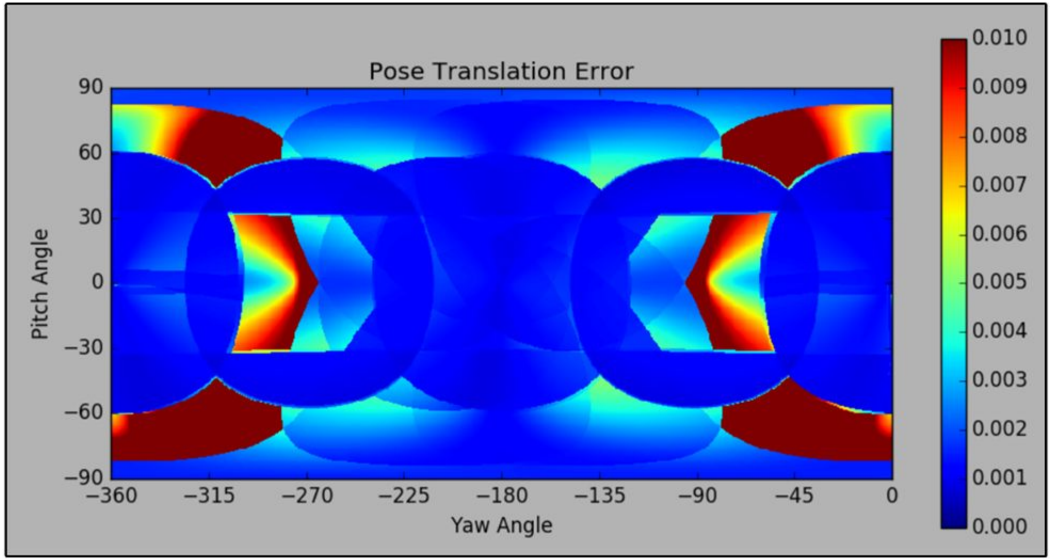
Pose Rotation Error - 3D

- This pose demonstrates the benefits of baseline in three axes
- **How is the relationship between the two highlighted sensors changing?**



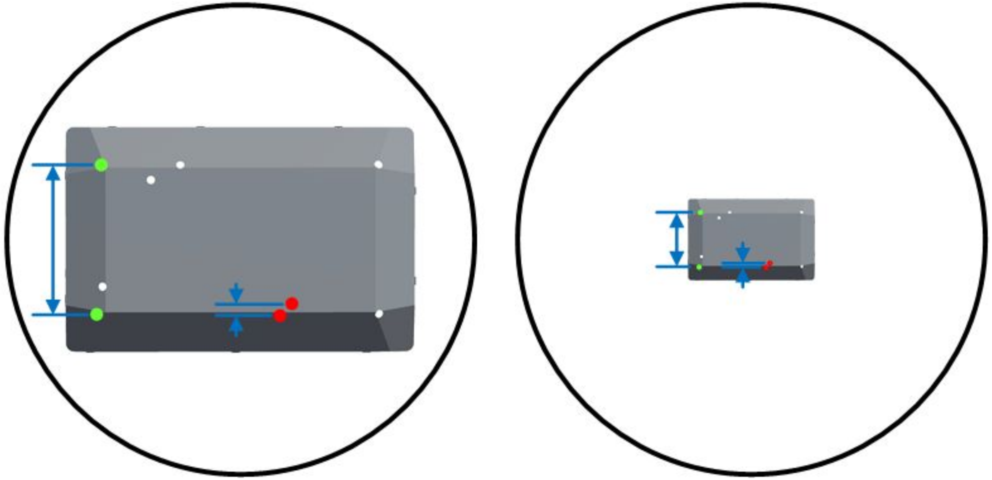
Pose Translation Error - 2D

- What drives translation error?
- What can we infer about the areas of poor performance?
- Which sides of the device have problems?



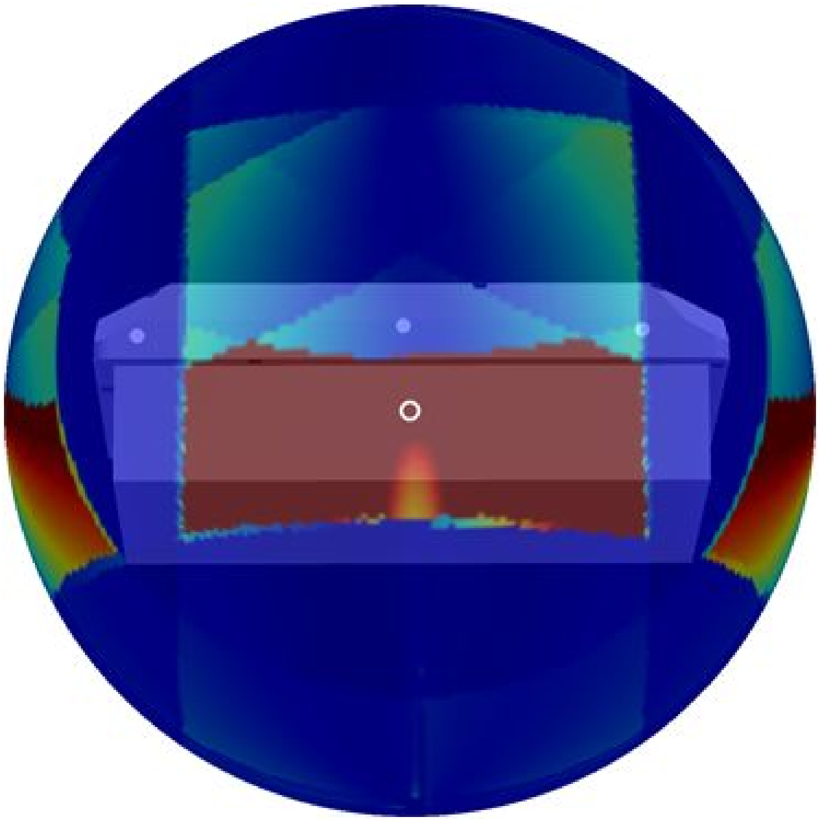
Pose Translation Error - 3D

- The model scale on the 3D plot demonstrates the foreshortening of sensor distance with translation away from a base station.
- Green sensor distance shrinks, but remains significant
- Red sensor distance is already marginal, and only gets worse with translation



Pose Translation Error - 3D

- 3D plot identifies poses with insufficient baseline
- **Looks like lots of baseline in X, why poor performance?**
- **How could we fix this pose?**



Summary

- Blue is good, brown is bad
- 2D plots are great for snapshots, emails, and documentation
- 3D plots are great for visible sensors and inspecting specific problem areas
- How good is good enough?
    - Plots are a good way to gauge relative performance
    - Compare against the simulation results of known good objects
    - There is no substitute for building a prototype and trying it in VR
    - Recommend getting an HTC Vive and using it often to develop a golden eye