Efficient Meshes from Point Clouds for Tactile Internet

Research Project CSE3000
Supervisors: Kees Kroep, R. Venkatesha Prasad

Willem Stuijt
w.l.stuijtgiacama@student.tudelft.nl

TU Delft

Background

Tactile Internet aims to enable the transmission of tactile feedback between far away places

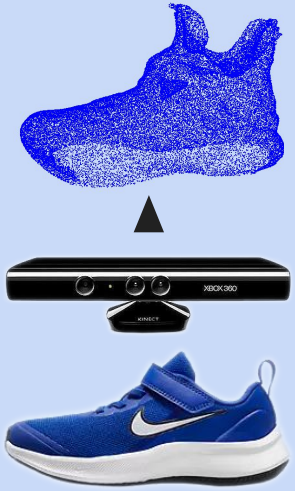
The quality of sensory feedback quickly erodes as network latency goes above 5ms

Since information can't travel faster than the speed of light, can we instead predict tactile feedback through a simulation?

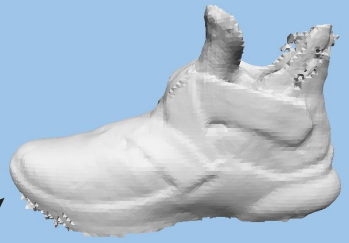
The physical environment must be scanned and represented digitally for an accurate simulation using the point clouds of commodity hardware such as the Kinect

Problem

The point clouds belonging to each object must be transformed into a polygon mesh that feels like the original object and has the least amount of polygons possible to save on computations

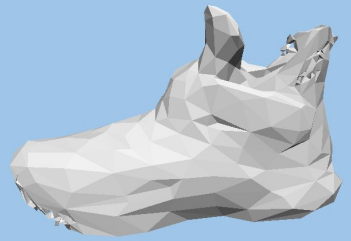


Solution



Reconstruction

A point cloud can be reconstructed into a mesh through a voxelization method called Marching Cubes. Up to 20 mm of gaussian noise is tolerated



Simplification

Mesh reconstruction creates dense, redundant meshes. Up to 97% of the triangles in the reconstructed mesh can be removed without major increases in error. The result is an accurate and efficient mesh

Conclusion

A noisy point cloud can be transformed into an efficient, low-polygon mesh that can be transmitted and used in tactile simulations

Future Works

- Research on error metrics that reflect mesh tactile fidelity.
- Sharp features, such as the edges of a cube, could be better preserved.
- Flat planes are not completely simplified.