Real-time Surface Reconstruction and Interaction for Mixed Reality

Eduardo Muñoz Martinez
University of Dublin, Trinity College, 2017
M.Sc. in Computer Science (Interactive Entertainment Technology)
Supervisor: Carol O'Sullivan

We proposed a method to reconstruct dynamic surfaces from the real world using a fixed Kinect depth camera. By acquiring a color image video and depth data from the device, the application reconstructs a dynamic point cloud and computes vertex normals to describe the real world scene. Matching the real-time color image with the reconstructed dynamic surfaces enables interaction between real and virtual objects. Considering the virtual objects as rigid bodies, collisions against the dynamic surface are computed by a physics module. Occlusions are generated by manipulating the opacity of virtual object's pixels and comparing depth information between its position and the depth data of the scene. We described techniques to boost real-time performance: pre-processing the background by computing depth segmentation to retrieve bounding boxes for each region and separate collision detection into low-cost phases.

The method and techniques proposed enable the user to interact in a real-time environment with virtual objects, allowing collisions and occlusions.

https://github.com/Eduardo28th/SurfaceReconstruction2017.git