Virtual Reality 3D Scanning

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**Introduction**

* Introduce 3d scanning, registration
* Motivation for interactive 3d scanner (holes / interactive registration)
* Motivation for HMD / virtual reality immersive interface (depth perception for interactivity, hand gestures?)

**Background, Related Work**

* Kintinuous: registration for large scale data
* AR-Rift: integration of real-time live video into the Oculus
* “Sparse Iterative Closest Point”: registration algorithm most suitable for this situation, discuss correspondences and pairwise registration for sequences of clouds
* Other registration algos and why ICP was chosen (initial guess, interactively watch convergence)

**Approach/Methodology**

* Three main parts: VR view, camera capture, continuous registration
* Discuss live VR view and conversion from camera to VR coordinates
* Use of VR positional tracking information to provide mostly accurate initial guess for ICP
* Discuss use of ‘third eye’ for color, mapping to texture and calculation of UV coordinates in texture
* Interactive selection of point clouds to register from a live ‘staging area’
* Interactive registration (can move/scale current point cloud relative to old)
* Watch ICP iterations in real-time

**Challenges**

* Performing ICP while providing interactive framerates (threading?)
* Accounting for depth camera <-> HMD position/rotation offset

**Evaluation**

* Capture test scenes
* Compare ICP with and without initial guess from HMD positional tracking
* Data: ICP convergence, (use UV/color in convergence data?), framerates with / without threading, framerates using buffers vs. individually rendering point clouds, coverage/FOV and min/max angles upward/downward during tracking

**Future Work**

* Extending range of HMD positional tracking
* Other registration methods