Topic: 3D Scanning based Modeling in VR

Start: 03/01/2021

End: 03/07/2021

Task description:

3D scanning is meaningful for remote exploration and co-working with industrial robots. Despite the plethora of 3d reconstruction systems, we have yet to see a single solution that makes scanning intuitively and interactively. In this thesis, an interactive model generating framework in VR will be developed. Through immersive scanning, users find themselves in a familiar coordinate space, where working with 3D models looks more intuitive. At the same time, Semantic information can easily be obtained with controllers and involved in the modeling process.

Tasks:

* Literature review on point cloud registration and stereo fusion algorithms.
* Implementation of a basic user interface in VR.
* Capturing point clouds by 3D scanners and VR devices.
* Align the point clouds by existing algorithms.
* Recording, saving and loading of point clouds.
* Obtain feature points of 3D objects by interactive operations in VR.
* Fitting the feature points into primitive shapes.
* Labeling the 3D objects by human-centered method in VR.
* Segmentation and Interactive operations of the scanned primitive objects.
* Evaluation of the implemented interactive immersive modeling scheme.

Optional:

* Judge which points belong to the generated 3D surfaces or objects.
* Fitting the feature points into 3D objects of complex shape. Possibly, create mesh based 3D models by volume growing algorithms.
* Surface extraction through region growing methods.
* Animate segmented meshes with the help of an immersive Rigging and Skinning system.