Software Engineering

3D Scanner C++ Project

Weekly Report (01/01/2017 - 07/01/2018)

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Assessment of the week

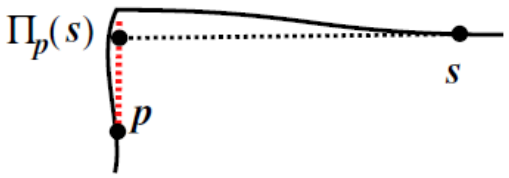
For this week we made several findings on the way in which we could smoothing our meh. We will implement this in our project and hope it becomes a success. we will in this report explain specific ways in which it could be done based on our previous findings and current ones.

Previous Objectives

1. Research Filters to use for the mesh (Continue)
2. Progress on the GUI
3. Try to include Open-CV on the previous year program (In progress)

Feature Preservation

The fact that bilateral filtering is feature preserving in the image domain does not, per se, make it feature preserving when extended to 3D. We explore the 3D filter's behavior near corners using the predictors above, with an eye to understanding its treatment of features. We examine a single corner, separating two mostly flat regions. For now, we assume the surface is noise free. If we consider two samples on the surface, s and p,



both on the same side of the feature, then the prediction Î p(s) is likely to be very close to s, as shown in figure 4-2 (regardless of which predictor we use). The term for the influence weight in the filter for this prediction, will therefore be near its maximum. The weight of this prediction will therefore depend for the most part on the spatial weight function.

Normal Estimation and Improvement

The predictors we have discussed require normals (actually, tangent planes) to form predictions. Normals might be provided, or need to be estimated from the data. In either case, they are likely to be noisy, and need some sort of smoothing, or mollification [Huber 1981; Murio 1993], before use in predictors. The need for mollification of noisy normals will be demonstrated and discussed in our final report.

Smoothing Triangle Models

In the context of smoothing triangle models without connectivity, we proposed using a predictor based on facets, but applied to vertex positions [Jones et al. 2003], by taking p as the centroid of the facet. In the limit, this is the same as the approach discussed above for points. As the facet normals are first-order entities of the vertices's, noise in the vertices's is magnified in the normals and predictions. In order to address this, we applied a mollification pass, using a standard blurring filter on the vertex positions to create a smoothed model (without feature preserving). The original vertex positions were not modified in this pass; instead, the normals of the facets from the smoothed model were copied to the corresponding facets of the original, and these smoothed normals were used for prediction. This method was found to be sufficient for almost all models.

Figure 1: Original noisy face scan, and smoothed with the method described

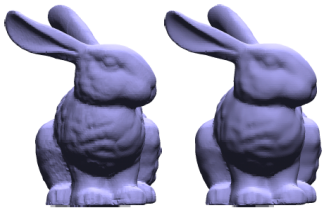


Figure 2: Original model, and model smoothed with narrow spatial and influence weight functions

This Week Objectives

1. Work on the Final Report and submit and time
2. Finalize on the source code
3. Prepare the Presentation slides.

Reference

- **Trello Account** `https://trello.com/b/MaBdGQ7p/software-engineering`
- **GitHub Account** `https://github.com/MSCV1-2017/3D-ScannerProject`
- **Previous Project** `https://github.com/umaatgithub/3D-KORN`