Supplemental Material for Continuous Projection for Fast L_1 Reconstruction

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Abstract

In this document we provide a detailed description of the methods and parameters used for the generation of the models in the paper and the video.

Model	Camel	Daratech	Gargoyle	Garg. small
scans	18	16	16	16
resolution	245^2	300^2	300^2	150^2
noise	0.2	0.1	0.1	0.1
smoothing	0.5	0.1	0.1	0.1
laser FOV	8	4.5	4.5	4.5
peak mag.	0.05	0.1	0.1	0.1
registration	0	1.0	1.0	1.0

Table 1: *Virtual scan parameters used for our models. From top to bottom: Number of individual scans, scan resolution, (Gaussian) noise magnitude, laser smoothing, laser beam FOV, peak magnitude threshold, and initial registration error. For the remaining parameters in the framework, the default values were used for all models.*

1 Virtual Scanning Parameters

In order to generate realistic models which can also be used in a ground-truth comparison, we used a virtual scanning framework simulating an optical laser scanner [Berger et al. 2013]. In Table 1 we describe the parameters used for each model. The additive noise parameter simulates noise in the form of laser speckle, which stems from diffuse surface imperfections and can lead to outliers near depth continuities. According to the authors, typical noise magnitudes vary between 0 and 0.6, where the latter results in a highly corrupted signal. The peak magnitude threshold rejects points that have a low-radiance signal and hence a high likelihood to be an outlier. Setting it to a low value of 0.05 has the effect of keeping most points.

Three of our models also exhibit registration errors. In particular, 4 of the 16 scans have an initial random rotational alignment error of $1.0°$. They are subsequently registered using a locally weighted ICP algorithm [Brown and Rusinkiewicz 2007]. Such an initial misalignment is a common source of outliers, since ICP can converge to a local minimum and the final surfaces stay misaligned [Berger et al. 2013].

2 Facial Animation Sequences

The facial animation sequences (courtesy of Derek Bradley) shown in the accompanying video were produced with a passive capturing technique [Bradley et al. 2010]. It uses an array of 14 cameras arranged into 7 binocular stereo pairs. Using a multi-view stereo reconstruction algorithm [Bradley et al. 2008] results in 7 depth images. These are subsequently merged into a single model that initially contains many outliers [Bradley et al. 2010]. Our algorithm is applied to the raw point clouds resulting from this initial stage. Note that we subsample each point cloud from initially $5-6$M points to a moderate size of 80K points. Each sequence is captured with 30 FPS.

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