

Scene Chronology - Supplemental Materials

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1 Visualization

A video of an interactive application for exploring our space-time cuboids is available at <http://www.cs.cornell.edu/projects/chronology/>. In this video, we explore each of our three datasets and move forward and backward in time to highlight the dynamic content found in each.

2 PMVS Modifications

Our system makes use of a modified version of PMVS2 in order to compute the initial dense 3D reconstruction that we segment. While two patches occupying the same 3D space can be considered redundant (and hence one can be filtered) for 3D reconstructions, this is not adequate for our application where we must obtain a 4D reconstruction, one where different patches with different associated appearances may co-exist in the same 3D space, but be separated by time. This section aims to describe our modifications to PMVS2. We refer the reader to [1] and the PMVS2 source code at <http://www.di.ens.fr/pmvs/> for more details. A software patch will be released with the rest of our system.

In particular, PMVS uses the notion of a “neighbor” to cull redundant patches during the filtering stage and to prevent the generation of redundant geometry during the expansion stage. According to the PMVS2 source code, a patch p_i is a neighbor of patch p_j if there exists an image I_k such that (1) p_i projects into I_k and passes a depth test, (2) p_i passes a photoconsistency threshold with respect to I_k , (3) p_j projects into I_k and passes a depth test, and (4) p_i and p_j are within some spatial distance from each other. According to our nomenclature, this implies that if p_i is photoconsistent-visible in I_k then p_j need only be projection-visible in I_k for p_i and p_j to be potential neighbors. For reconstructions with changing appearance, this means that one appearance could prevent the other from growing.

Our change is simply to redefine the neighbor criteria to require that both patches be photoconsistent-visible in at least one common image.

Additionally, we relax some of the depth test requirements. In particular, we increase the default soft depth test threshold by a factor of 5 while keeping the neighbor distance threshold fixed (in PMVS2’s implementation, these parameters are the same). This allows multiple appearance surfaces to be slightly offset from each other due to reconstruction error.

References

1. Furukawa, Y., Ponce, J.: Accurate, dense, and robust multi-view stereopsis. In: CVPR. (2007)