Large-Scale Data for Multiple-View Stereopsis - DTU Orbit (07/11/2019)

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The seminal multiple-view stereo benchmark evaluations from Middlebury and by Strecha et al. have played a major role in propelling the development of multi-view stereopsis (MVS) methodology. The somewhat small size and variability of these data sets, however, limit their scope and the conclusions that can be derived from them. To facilitate further development within MVS, we here present a new and varied data set consisting of 80 scenes, seen from 49 or 64 accurate camera positions. This is accompanied by accurate structured light scans for reference and evaluation. In addition all images are taken under seven different lighting conditions. As a benchmark and to validate the use of our data set for obtaining reasonable and statistically significant findings about MVS, we have applied the three state-of-the-art MVS algorithms by Campbell et al., Furukawa et al., and Tola et al. to the data set. To do this we have extended the evaluation protocol from the Middlebury evaluation, necessitated by the more complex geometry of some of our scenes. The data set and accompanying evaluation framework are made freely available online. Based on this evaluation, we are able to observe several characteristics of state-of-the-art MVS, e.g. that there is a tradeoff between the quality of the reconstructed 3D points (accuracy) and how much of an object’s surface is captured (completeness). Also, several issues that we hypothesized would challenge MVS, such as specularities and changing lighting conditions did not pose serious problems. Our study finds that the two most pressing issues for MVS are lack of texture and meshing (forming 3D points into closed triangulated surfaces).

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