Object Based Quantitative Assessment of Dense Stereo

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**Issue:** Existing dense stereo assessment techniques consider global scene performance rather than specific performance on foreground objects [1]. A method of comparing stereo algorithm foreground object performance in dynamic automotive environments is required.

**Approach:** Utilisation of a publicly available stereo imagery dataset [2] containing foreground object annotation and laser scanner ground-truth data to produce a novel 3D reproduction accuracy metric.

Point clouds are computed for the each stereo input image pair (Fig. 1) using a variety of dense stereo algorithms [3-10]. Each ground truth ‘car’ is extracted for comparison, Fig. 4.

**Results:** Evaluation over ~2400 samples over range 5-35m using [3-10] shows that [3-5] have noticeably lower displacement error than [6-10] on foreground objects at ranges greater than 10m. Maximum disparity parameters limit some algorithms to a minimum range ~7m. Displacement error as a function of stereo matching accuracy (disparity error, Δd) and foreground object range was also simulated, Fig. (5, 6).

**Summary:** An object based accuracy assessment via ICP provides a method for dense stereo algorithm performance analysis in dynamic real world automotive environments. Of the algorithms tested [3] performs the best with low displacement error (<0.1) over the tested range. Future work will consider other object types such as pedestrians and cyclists.