Anatomically Correct Surface Recovery: A Statistical Approach

We present a method for 3D surface recovery in partial surface scans. The method is based on an Active Shape Model, which is used to predict missing data. The model is constructed using a bootstrap framework, where an initially small collection of hand-annotated samples is used to fit to and register unknown samples, resulting in an extensive statistical model. The statistical recovery uses a multivariate point prediction, where the distribution of the points is given by the Active Shape Model. We show how missing data in a partial scan, once point correspondence is achieved, can be predicted using the learned statistics. A quantitative evaluation is performed on a data set of 10 laser scans of ear canal impressions with minimal noise and artificial holes. We also present a qualitative evaluation on authentic partial scans from an actual direct in ear scanner prototype. Compared to a state-of-the-art surface reconstruction algorithm, the presented method gives matching prediction results for the synthetic evaluation samples and superior results for the direct scanner data.

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