An Integral Approach to Free-form Object Modeling

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Abstract

This paper presents a new approach to free-form object modeling from multiple range images. In most conventional approaches, successive views are registered sequentially. In contrast to the *sequential* approaches, we propose an *integral* approach which reconstructs statistically optimal object models by simultaneously aggregating all data from multiple views into a *weighted least-squares (WLS)* formulation. The integral approach has two components. First, a *global resampling* algorithm constructs partial representations of the object from individual views so that correspondence can be established among different views. The global resampling algorithm is based on the spherical attribute image (SAI) previously introduced in the context of object representation and recognition. Second, a *weighted least square* algorithm integrates resampled partial representations of multiple views, using the technique of *principal component analysis with missing data (PCAMD)*. Experiments using synthetic data and real range images show that our approach is robust against noise and mismatch. In addition, the results show that our integral approach is insensitive to the order in which views are incorporated in the model.