Model-Based 3D Reconstruction of Buildings from Multiple Aerial Images

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Abstract

This paper proposes a model-based building reconstruction method. Modeled by Constructive Solid Geometry (CSG), buildings are reconstructed part by part by fitting each parameterized CSG primitive to the corresponding edge pixels of aerial images. The shape and pose parameters associated to a primitive provide a link between perception (images) and prior knowledge (primitive) of a building part, so that the fitting method proceeds to determine the shape and pose parameters so as to fit a primitive with the corresponding images. Having all of the building parts been uniquely represented by parametric primitives, a building can be reconstructed by using CSG Boolean set operators to combine the building parts. Consequently, a building is represented by a CSG-tree in which each node links two branches of combined parts. This paper demonstrates 10 examples of extracting various buildings. The process time for each primitive is about 20 sec and the successful rate of model-image fitting is about 90%.