ABSTRACT

A method for detection and description of rectangular buildings with flat and with gable roofs from two or more registered aerial intensity images is proposed. The output is a 3D description of the buildings, with an associated confidence measure for each building. Hierarchical perceptual grouping and matching across views aids building hypothesis formation and increases the robustness of the system.

The system is exclusively feature-based. Perceptual grouping in each view and matching across views is performed in a hierarchical manner, utilizing primitives of increasing complexity, starting with line segments and junctions, and proceeding to higher level features, namely parallels, U-contours and parallelograms (as 3D rectangles appear as parallelograms when projected under the conditions employed in aerial imagery). Binocular and trinocular epipolar constraints are used to reduce the search space for matching features. A selection mechanism retains hypotheses with sufficient roof evidence to warrant further examination. A verification procedure employs roof, wall and shadow evidence to decide whether a hypothesis should be considered a building or not. Overlapping verified hypotheses are disambiguated depending on the type of overlap (partial overlap or containment) and the 3D heights of the hypotheses.

A user-assisted mode enables building model construction utilizing user inputs. By using the (computed) feature hierarchy in the model construction process this mode reduces the number of user inputs required to construct building models, when compared with generic 3D modeling tools.