

Automatic Building Extraction from Urban ALS Data using Graph Cut Method

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In our research, an automatic building extraction method for LiDAR data is proposed. In this method, two point-based features: distribution of normal vector and flatness, as well as one nDSM-based texture feature: GLCM homogeneity are used as indicators to extract building point cloud. The detection process is formulated as two classes labeling problem and solved by using Graph cuts algorithm.

The main steps of the proposed method are as follows:

1. Ground points filtering: LiDAR points cloud are firstly classified into ground points and non-ground points. Then, DSM and DTM are interpolated with same resolution and nDSM is obtained by subtracting DTM from DSM.
2. Feature calculation: Distribution of normal vector and flatness of each non-ground points are calculated using the surrounding points. After that, these features of each DSM grid are attained based on the points which occupy this grid. GLCM homogeneity is calculated for each DSM grid using nDSM image.
3. Building extraction: Distribution of normal vector, flatness and GLCM homogeneity are used to construct the data term and height difference is used to construct smooth term of energy function respectively, and then, graph cut is employed to minimize the energy function to determine building point cloud.
4. Post-processing: Morphology filtering is carried out to refine the building detection results especially the building boundary.