The Title of Your Paper Goes Here

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1   Introduction

As a key technique to image-based navigation, augmented reality (AR) and 3D reconstruction, geo-localization has drawn massive attentions in the literature. When presenting a geo-localization problem, an image or a frame of video is often used as the query data, a 3D model is needed to provide a global coordinate, a sensor prior is optionally employed and the camera pose with respect to the global coordinate system is to be estimated.

In this work, we estimate the camera pose using an overhead image captured by a low-altitude aerial device as query and a corresponding building point cloud as 3D model. Comparing to existing methods using images captured on the ground or in high-altitude, we are not able to take advantages of vanishing points and suffer from more critical perspective effect. There are two key observations that vertical facades of a point cloud correspond to edges of building roofs in the overhead image and that roofs at different altitudes are of different scales in the image, which inspires us to treat this geo-localization problem as a combination of a multi-layer shape matching problem and a global optimization procedure.

2   Our Approach

Given a building point cloud, we first extract contours of building roofs in different altitudes according to the altitude histogram of points, where each contour is fit into a set of line segments (Figure 1b,c). And then the contours are matched with the edge map of the overhead image respectively and achieve a local project matrix for each contour (Figure 1d). To achieve the global project matrix between the whole point cloud and the overhead image, we need a series of pairs of 3D feature points and corresponding 2D feature points. To this end, we use the intersections of neighboring line segments of building roof contours as 3D feature points. For each 3D feature points, we search the k*k neighborhood of its corresponding point in the overhead image after shape matching, and find a corner as its paired 2D feature point (Figure 2). With this set of paired 3D and 2D feature points, we can calculate a global project matrix by minimize an energy function based on distance transformation, with which we can finally estimate the 6 DoF camera pose in point cloud coordinate system.

Figure 1(e) shows the result of the proposed method by projecting roof contours onto the overhead image.
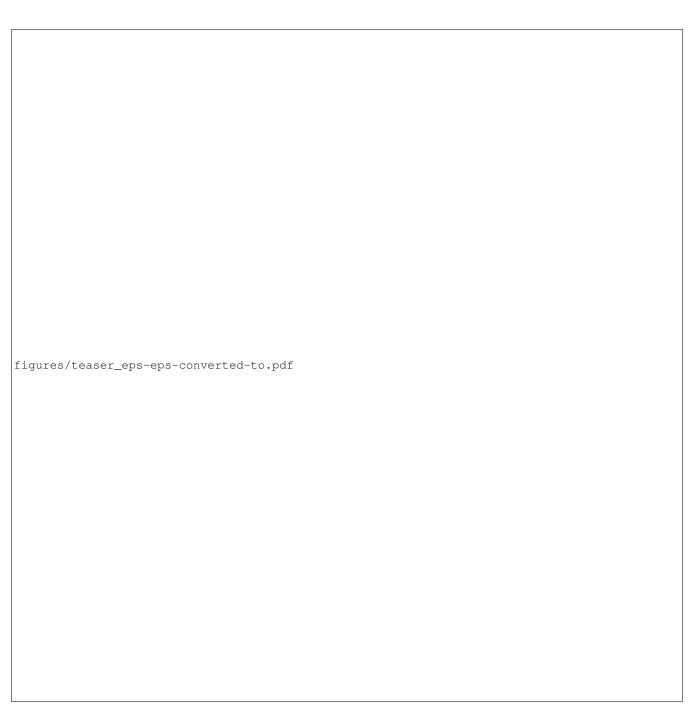
References

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Figure 1: *abcd*