

Image Based Localization with Sparse Database Using Panning Query Images

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ABSTRACT

Image based localization has recently drawn broad attention as an alternative to conventional positioning technologies. Previous methods search a database for an image that best matches the query image captured by a user, and report the location and direction associated to the retrieved image. In order to achieve high accuracy in localization, it is crucial to construct a database with densely-captured images. This comes to a great cost when there is a change in the environment, since images have to be densely recaptured. We present a novel image based localization method which only requires a database with sparsely-captured images. In the proposed method, a query is a set of consecutive images captured while the user pans the camera. In contrast to a one-shot query in the previous methods, this makes it easier to find a corresponding image in the sparsely-captured images in the database. This, however, does not guarantee that an exact match is found. i.e., there exists a certain residual between the actual location and direction of the query and those of the matched image. In order to compensate for this residual, offsets in location and direction that best describe the transformation between the two images are estimated, and are used to correct them. The proposed method has been evaluated in a real shopping mall. An image database consists of images captured at 30 different points, each of which is at least 10 meters apart from others. At each point, 9 images were captured in random directions. Using this database, the method succeeded in estimating user's location and direction with the average error of 2.6 meters and 3.6 degrees, respectively, for approximately 90% of the area. This result shows the method is capable of estimating accurate localization and direction, even with a sparse database.

KEYWORDS: image based localization, sparse database, panning images