A Computer Vision Based Robot-Positioning Algorithm for the Automatic Construction of Virtual Walkthrough Systems

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Abstract:

In order to obtain texture images of a real environment for building up the corresponding virtual walkthrough system, there is a need to photograph the interior of the environment with known camera positions. It is a tedious routine if the pictures are taken manually; therefore it is ideal to obtain these pictures automatically by robots. The main problem for this scheme is robot positioning. That is, we want to know the actual positions of the camera mounted on the robot from the information found in the pictures. We propose a computer vision method, which consists of the following two processing parts. First, we will design special planar color landmark objects placed in the environment to guide the robot. In particular the cross-ratios of the feature points on the planar objects are used for landmark identification and recognition. Second, we propose to use a color image based pose estimation algorithm to track the pattern changes of the landmarks so that the rotational and translational transformation of the robot can be recovered. The final system is an autonomous robot that can take pictures of an environment and be able to build up the corresponding virtual alkthrough system automatically.