

Vision-Based SLAM with Standard Off-Shelf Cameras

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Abstract

Pose estimation is an essential task in indoor and outdoor navigation. Especially in domestic applications, low-priced and eye-safe sensor systems are desirable. Video cameras with their passive mode of operation and wide availability in a growing number of devices are a suitable choice for such a navigation sensor.

In this paper, we present a modular system consisting of an ego-motion estimator from monocular camera images and a feature classifier allowing a 3D reconstruction and their geometrical classification. The system has been successfully used for registration of endoscopic images in medical applications, driver assistance classifying traffic sign candidates and as a guidance system in indoor environments (Fig. 1).

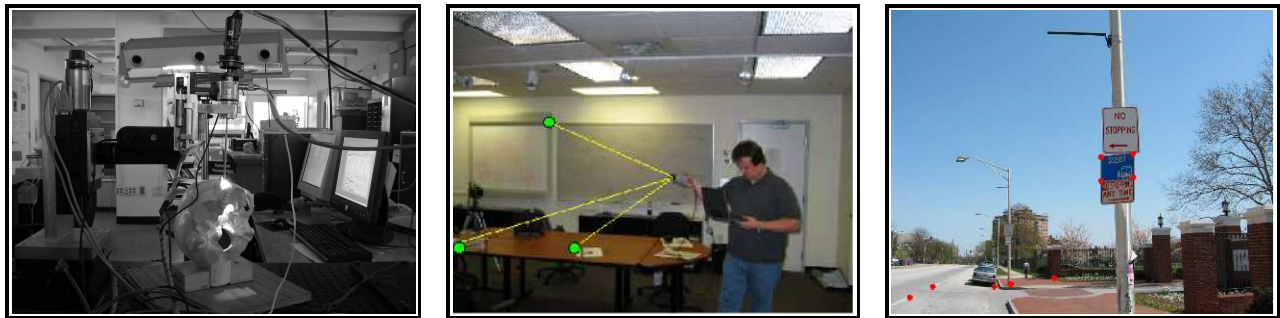


Fig. 1

THREE APPLICATIONS OF THE NAVIGATION SYSTEM: (LEFT) REGISTRATION OF A MONOCULAR ENDSCOPE CAMERA, (MIDDLE) VISION-BASED GUIDANCE SYSTEM (V-GPS), (RIGHT) TRAFFIC SIGN DETECTION.

We discuss the new possibilities and limitations opening up with the introduction of this novel vision-based SLAM system and discuss the quality of the reconstruction and localization in dependence on the feature distribution around the sensor and the detection/tracking accuracy of the image processing.

A way to compensate possible drifts in the ego-motion estimation and refinement of the 3D reconstructions based on the results from longer image sequences will be presented as well.