Position and Rotation Estimation for Mobile Robots Straying from a Recorded Path Using Ego-motion

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ABSTRACT

In this study, we propose a method to estimate position and rotation of mobile robots straying from a recorded path as an improved view-based navigation. The view-based navigation can estimate a position of robots by matching an input image and recorded images that are related to the position on environmental maps. This method is able to accurately estimate a position of robots without accumulating positional errors in a long path. However, in conventional view-based navigations, it is difficult to generate other paths for avoiding humans and objects located in a recorded path. To solve this problem, we apply an ego-motion estimation method to the view-based navigation. The ego-motion can be calculated from 3D-position of corresponding SURF feature-points between input and recorded images obtained by a Kinect sensor. For evaluating feasibility of the proposed method, we performed experiments using data sets obtained from an actual indoor environment. As data sets for the experiments, color and depth images captured in parallel and diagonal paths strayed from a recorded path were used. The proposed method is able to estimate positional and rotational errors less than 20cm and 2 degrees, respectively. This results show that the proposed method is able to estimate position and rotation of robots straying from a recorded path. By using the proposed method, it expects to realize flexible path planning and to avoid humans and objects.

KEYWORDS: view based navigation, robot, ego-motion, robot vision, navigation, obstacle avoidance