ROBOTIC SYSTEM FOR AUTOMATED AND RAPID VEHICLE INSPECTION

Matoušek, Václav

Prof. Ing. Václav Matoušek, CSc., email:matousek@kiv.zcu.cz, Department of Computer Science and Engineering ,University of West Bohemia ,Univerzitni 8, 306 14 Plzen

ABSTRACT

The paper will present the design and integration of a vision-guided robotic system for automated and rapid vehicle inspection. The main goal of this work is to scan and explore regions of interest over an automotive vehicle while a manipulator's end effector operates in close proximity of the vehicle and safely accommodates its curves and inherent surface obstacles, such as outside mirrors or door handles, in order to perform a series of close inspection tasks. The project is motivated by applications in automated vehicle inspection, cleaning, and security screening. In order to efficiently navigate the robotic manipulator along the vehicle's surface within regions of interest that are selectively identified, an efficient and accurate integration of information from multiple RGB-D sensors and robotic components is proposed. The main components of the proposed approach include: automated vehicle category recognition from visual information; RGB-D sensors calibration; extraction of specific areas to inspect over the vehicle body, and path planning from an efficiently reconstructed 3D surface mesh to move the robotic arm along and in close proximity of the vehicle. The proposed multi-stage system developed merges all components to achieve rapid 3D profiling over a complex surface in order to fully automate the process of surface following for vehicles of various types and shapes. To validate the feasibility and effectiveness of the proposed method experiments are carried out with a 7-DOF manipulator navigating over automotive body panels.

Index terms: Security robotics, sensor based navigation, RGB-D imaging, curvature estimation, path planning, surface following.