2nd International Conference of Multidisciplinary Approaches (iCMA), 2015
Faculty of Graduate Studies,
University of Sri Jayewardenepura,
Sri Lanka
ISSN: 2386 – 1509

LOW-COST REAL TIME STEREO VISION BASED AUTONOMOUS ROBOT NAVIGATION SYSTEM

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The main part of an intelligent mobile robot system is the capability to operate in uncharted indoor environments and avoid the obstacles accurately. Most of the existing auto navigation robot systems are based on infrared sensors (IR sensors), sonar sensors and laser range finders which are unreliable compared to a vision based system. This research work describes a low implementation cost and real time stereo vision based intelligent mobile robot navigation system. Real time vision based mobile systems are rapidly developing areas in the field of autonomous robot navigation. The proposed algorithm works in an indoor surrounding with various size and types of obstacles. A dense disparity map is computed from the stereo images captured by two cameras carried by the robot. By using the real time 2D disparity map obstacles can be avoided in indoor environments and reproduce a three dimensional model of the same environment to get the depth information. The only sensor used is a stereo camera. The proposed system expressed by three blocks. The first block is produce an accurate depth map using the captured stereo images. The second block is a decision synthesizing process that analyze the created depth map and conclude the most convenient path for the robot to avoid the obstacles.Furthermore, the third block reconstruct the 3D environment. The developed system has been tested in six different indoor environments and the proposed algorithm is able to avoid static and dynamic obstacles with 95% of accuracy and reproduce the 3D scene to extract the depth information. The robot is designed to reach and explore positions unreachable by human beings.

Keywords: Stereo Vision, Mobile Navigation, Obstacles Avoidance, Point-Cloud, Disparity Map, Raspberry-Pi, Low Cost.