

Design and Development of Vision-Based Uneven Surface Detection Mechanism of Low Computational Complexity for Walk-Assisting System for Blind People

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Abstract

There are plenty of blind people who blind since birth or blinded by accident. Usually, they face a lot of problems while walking because most of the surfaces are uneven surfaces such as road bumps, and potholes. The goal of this study is to find a vision-based method for helping blind people to detect uneven surfaces. To identify uneven surfaces, colour differences, shadows of the uneven surfaces, and the techniques such as contour length, contour area, and nonzero pixel ratio of an image are being used. The image is initially captured and cropped to match the viewing angle of a human. Hue, Saturation, and Value (HSV) filter is applied to the cropped image along with thresholding techniques for classifying the image components such as road, grass, or concrete. Further the HSV thresholds aid in obtaining more detailed information from the image. Subsequently, the image is divided into eight parts, and the nonzero pixel ratio, contour area, and contour lengths are computed for each part. The resulting data is stored in separate arrays, and maximum values are determined. If the maximum values from two arrays share the same indexes, it suggests the presence of an uneven surface. To test the effectiveness of the method, the test images of various surfaces were captured and tested. From the test results, we found that the proposed algorithm can identify uneven surfaces. The findings of this study contribute to improving the mobility of visually impaired individuals by assisting them in navigating uneven surfaces more effectively.

Keywords: *Uneven surface, HSV filter, Contour detection, Low computational complexity*