

Economical image stitching algorithm for portable panoramic image assistance in automotive application

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(Received November 30, 2016, Revised January 15, 2018, Accepted February 9, 2018)

Abstract. In this study an economical image stitching algorithm for use in automotive industry is developed for retrofittable panoramic image assistance applications. The aim of this project is to develop a driving assistance system known as Panoramic Parking Assistance (PPA) which is cheap, retrofittable and compatible for every type of automobiles. PPA generates bird's eye view image using cameras installed on the automobiles. Image stitching requires to get bird's eye view position of the vehicle. Panoramic images are wide area images that cannot be available by taking one shot, attained by stitching the overlapping areas. To achieve correct stitching many algorithms are used. This study includes some type of these algorithms and presents a simple one that is economical and practical. Firstly, the mathematical model of a wide view of angle camera is provided. Then distorted image correction is performed. Stitching is implemented by using the SIFT and SURF algorithms. It has been seen that using such algorithms requires complex image processing knowledge and implementation of high quality digital processors, which would be impracticable and costly for automobile use. Thus a simpler algorithm has been developed to decrease the complexity. The proposed algorithm uses one matching point for every couple of images and has ease of use and does not need high power processors. To show the efficiency, images coming from four distinct cameras are stitched by using the algorithm developed for the study and usability for automotive application is analyzed.

Keywords: fisheye camera; image correction; matching points; overlapping area; image stitching

1. Introduction

Automobiles are essential transportation way in our modern life and the numbers in traffic are increasing day by day. This increase brings many traffic accidents. Because of that accidents which cause material and nonmaterial lost, drivers have started to place importance on the safety (Hughes *et al.* 2008). Many simple accidents occur because the position of the vehicle cannot be precisely estimated by the drivers. This lead to development of the imaging systems in the automotive industry.

Many of the accidents are caused by the inattentiveness of the drivers in the traffic. The drivers pay much more attention to the front of the vehicles they can easily see, but are careless to blind

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