

Accepted Manuscript

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PII: S2210-6502(17)30081-0

DOI: [10.1016/j.swevo.2018.02.007](https://doi.org/10.1016/j.swevo.2018.02.007)

Reference: SWEVO 360

To appear in: *Swarm and Evolutionary Computation BASE DATA*

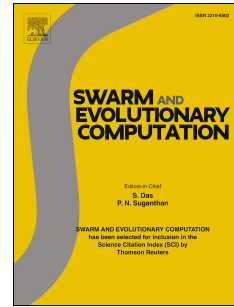
Received Date: 31 January 2017

Revised Date: 26 January 2018

Accepted Date: 11 February 2018

Please cite this article as: Y.Y. Moon, Z.W. Geem, G.-T. Han, Vanishing point detection for self-driving car using harmony search algorithm, *Swarm and Evolutionary Computation BASE DATA* (2018), doi: 10.1016/j.swevo.2018.02.007.

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Vanishing Point Detection for Self-Driving Car Using Harmony Search Algorithm

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Abstract

Self-driving or autonomous vehicles require an ability to detect road lanes. In order to do so, a vanishing point should be first detected because the vanishing point exists on the extended lines of road lanes. For detecting the vanishing point, a random sample consensus (RANSAC) algorithm has been generally utilized. However, the performance of RANSAC is sometimes not so good but fluctuated. Thus, this study proposes a new approach to estimate the vanishing point using a harmony search (HS) algorithm. Results show that HS stably estimates vanishing points with respect to statistics when compared with RANSAC. We hope this model to be utilized in self-driving car in the future.

Keywords: self-driving car; autonomous car; lane detection; vanishing point; RANSAC; harmony search

1. Introduction

A vanishing point is an intersection point at which all parallel lines in three-dimensional (3D) space meet together [1, 13]. The vanishing point plays an important role in detecting road lanes because road lanes are parallel in real-world 3D space but they meet at the vanishing point in two-dimensional camera image [2]. Thus, the detection technology of vanishing point is necessary for self-driving automobiles.

In order to detect road lanes, all the edge components are first extracted from a camera image. Then, the vanishing point, which is the intersection point of the projected edge components, is estimated. Finally, based on the vanishing point, road lanes are determined [3].

So far various researchers have tackled the topic of vanishing point detection. Mainly, the research has focused on how accurately vanishing points could be detected when various noises exist [4-8, 12, 14]. Among them, the random sample consensus (RANSAC) algorithm, which utilizes straight lines obtained using Hough transform is one of the most popular ones [9,10]. The RANSAC algorithm

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