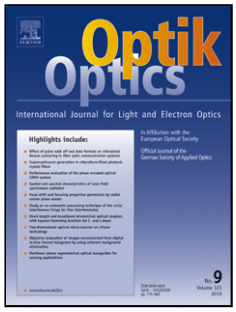

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Authors: Seyed Abbas Daneshyar, Manoochehr Nahvi

PII: S0030-4026(17)30366-2
DOI: http://dx.doi.org/doi:10.1016/j.ijleo.2017.03.100
Reference: IJLEO 59023

To appear in:

Received date: 4-8-2016
Revised date: 19-3-2017
Accepted date: 20-3-2017

Please cite this article as: Seyed Abbas Daneshyar, Manoochehr Nahvi, Moving objects tracking based on improved particle filter algorithm by elimination of unimportant particles, Optik - International Journal for Light and Electron Opticshttp://dx.doi.org/10.1016/j.ijleo.2017.03.100

Moving objects tracking based on improved particle filter algorithm by elimination of unimportant particles

Seyed Abbas Daneshyar [a], Manoochehr Nahvi [b,*]

[a,b]Department of Electrical Engineering, University of Giulan, Rasht, Iran
[a]abbas.daneshyar@gmail.com
[b]nahvi@giulan.ac.ir
Tel: +98 (-0) 13 33690274-8 Ext: 3037, Fax: +98 (-0) 13 33690271

Abstract

Object tracking is an important subject in machine vision. Various methods have been devised for object tracking, and among these methods particle filter (PF) has been found to be of particular significance. This method is based on random sampling of a probability density function, and estimating the desired variable based on samples weight. One advantage of this method is its ability to track the targets even in presence of occlusion; an ability which is due to the inclusion of unlikely areas in distribution of particles. The main difficulty with PF is however its slow performance, which makes it unfit for real-time applications. This paper presents an approach to improve the performance and increase the speed of PF for real-time object tracking. For this purpose, the classical PF method based on color histogram is exploited to develop an algorithm with reduced computational cost and increased tracking speed. In the proposed method, in each stage unimportant particles were removed using a binary mask. This mask is generated through consecutive frames difference or using Gaussian mixture model. Applying the proposed algorithms on benchmark databases gives promising results. The comparison of obtained results with those of classical PF demonstrates that the proposed methods not only improve the accuracy of tracking but also increase its speed by 39%.

Keywords: moving object tracking, particle filter, particles elimination, frame difference, Gaussian mixture model, Bhattacharyya coefficient