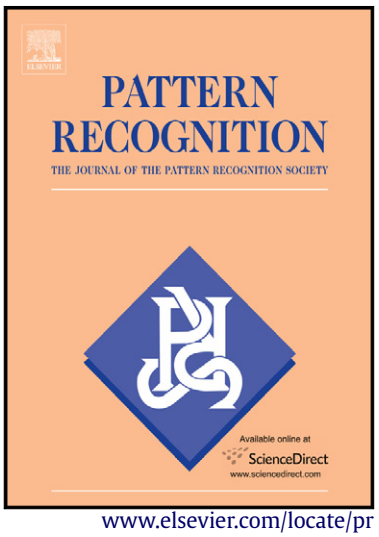

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A Hybrid Mobile Object Tracker Based on the Modified Cuckoo Search Algorithm and the Kalman Filter

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Abstract

Most revolutionary algorithms are inspired from the behaviour of natural species. This inspiration can be drawn from their reproductive behaviour, flying mode, or even their ways of communication. One of the most efficient metaheuristics in a discrete search space is the Cuckoo Search algorithm, inspired by the Cuckoo's reproductive behaviour and combined with the Lévy flight pattern adopted by many animals and insects. In this paper, we present a new tracking approach, the Hybrid Kalman Cuckoo Search tracker, using a modified version of the Cuckoo Search algorithm combined with the well-known Kalman Filter. The Cuckoo Search algorithm is combined with the prediction step adopted by the Kalman Filter to enhance the initial population's quality. Using the Hybrid Kalman Cuckoo Search tracker, we can efficiently explore the search space in order to locate an object's position from one frame to the next. The Lévy flight model is also modified in order to re-adapt the Lévy step size as the algorithm approaches the desired solution. The Hybrid Kalman Cuckoo Search tracker is tested on a variety of datasets including one where we incorporated different situations, as well as some videos from the CAVIAR, SPEVI, and other datasets. The comparative study results show that the proposed algorithm outperforms the Particle Swarm Optimization based tracker, especially in terms of computation time.

Keywords: Object Tracking, Bhattacharyya Distance, Cuckoo Search, Lévy Flight, Kalman Prediction, Population Based Metaheuristics

1. Introduction

Mobile object tracking has become one of the most important tasks in the field of computer vision and video processing. An entire new research area has

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