

Chapter 43

New Swarm Intelligence Technique of Artificial Social Cockroaches for Suspicious Person Detection Using N-Gram Pixel With Visual Result Mining

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ABSTRACT

In the last decade, surveillance camera technology has become widely practiced in public and private places to ensure the safety of individuals. Merely, face to limits of violation the private life of people and the inability to identify malicious persons that hid their faces, finding a new policy of surveillance video has become compulsory. The authors' work deals on the development of a suspicious person detection system using a new insect behaviour algorithm called artificial social cockroaches ASC based on a new image representation method (n-gram pixel). It has as input a set of artificial cockroaches (human images) to classify them (hide) into shelters (classes) suspicious or normal depending on a set of aggregation rules (shelter darkness, congener's attraction and security quality). Their experiments were performed on a modified MuHAVi dataset and using the validation measures (recall, precision, f-measure, entropy and accuracy), in order to show the benefit derived from using such approach compared to the result of classical algorithms (KNN and C4.5). Finally, a visualisation step was achieved to see the results in graphical form with more realism for the purpose to help policeman, security associations and justice in their investigation.

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INTRODUCTION AND PROBLEMATIC

The bio inspired is a philosophy that consists to analyse the living world in order to translate biological models of all forms (animals, plants, micro-organism, where ecosystem) to technical concepts or industrial development. The world of living is immense; it represents a large pool of ideas for researchers and companies for this reason, for each encountered problem we must observe the nature (Bouarara, 2014).

The first part of our work is to develop a new algorithm called artificial social cockroaches (ASC) inspired from the lifestyle of cockroaches, their way of communication as a decentralized system without a conductor using the odour pheromone and their antennas. The cockroach is attracted by the darker place (less luminosity), and follows the path of their congeners.

Lately, the security of human and information has become incontestably a major issue globally. Face to problems such as fighting terrorism, strengthening internal security and the rise of cybercrime; our societies are investing more and more to ensure their protection by using the technology of surveillance-video. Nowadays, the surveillance cameras are ubiquitous everywhere (streets, shops, museums, metro stations, ticket machines, shops, airports, and banks....etc.) for the purpose to detect malicious persons (thieves, criminals, terrorists). Roughly, the use of this technology has allowed a drop in crime, either in public and private places. It provides several advantages:

- The resolution of criminal cases with the possibility to film at night with infrared;
- Improving safety by reducing the illicit acts in the streets;
- Dissuade suspicious persons by using the dummy cameras;
- A source of evidence against malicious persons.

The research within this area remains in process, in order to enhance the efficiency of the cameras in term of response time and the quality of videos recorded to obtain a best identification. Merely, the use of surveillance-video in the social security, and law enforcement to identify suspicious person through facial recognition can collide with several drawbacks.

1. The inability to detect the malicious persons that disguise himself, or hide their faces with masks.

For e.g. we have a surveillance camera located in a house and there's a thief with a hidden face that enters this house for stealing, as presented in Figure 1b. The classical systems of surveillance video cannot recognize the identity of this person because they are based on facial recognition.

2. The classical surveillance-video systems are unable to warn people before the malicious act.

For e.g. the terrorists or wanted persons can move in the streets and airports with false identity by altering their looks. These dangerous persons cannot be distinguished by the classical surveillance video system.

3. The assault of privacy individuals.

The employment of classical surveillance-video system (based on facial recognition) in offices, streets, business establishments, and in front of the buildings does not respect the freedom of persons passing closer to the cameras.

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