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Investigating human abnormal behaviors in video using image processing techniques and one of the neural network methods

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Abstract. In this paper, using the science of the day and focusing on the correct and perfect performance of the system, it has been tried to reduce the errors that before (those errors) take place. The consequence this action leads to reduction in human resources, reduction in consumption of financial resources, and above all, it leads to a sharp reduction in unrecoverable errors. To achieve the features, first, we seek to find the human object using the shadow detection and background removal in the image. In fact, the background can be eliminated by arguing the without motion pixels which are the background. In order to analyze the motions, some researchers have used the hidden Markov method and dynamic programming in real time. In the tracing section, we proceed to separate the parts of body, in which we are transferred to the next step after each part done, such as in the first layer, above of the body, down of the body and the head are indicated. In the next layer, we discuss about the behaviors that include walking, fighting, gunfire, and take the physical substance from the ground.

Key words. Abnormal behavior, image processing, artificial intelligence.

1. Introduction

Machine learning and perception of the human activities is a challenging, complex and diverse field that has attracted a lot of attention over the past decade. The discovery of human activity, movement tracing, page modeling and perception of behavior (recognition of the human activity and the discovery of the activity patterns) have attracted considerable attention to themselves in computer vision and machine learning, and these sciences include applications such as video surveillance, interpersonal and computers inferences, semantic annotation, and multimedia indexing, etc.

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[1, 2]. Due to increase global security concerns and the growth of need to effective monitoring in public places such as airports, train stations, shopping malls, crowded sports areas, military and civilian installation, intelligence vision has attracted a lot of research consideration to itself. Also, for using in health care facilities, such as day-care monitoring and detection middle-aged people falling on the ground at the house, most of the time, the aim is to detect, diagnose, and learn from desired events [3].

In this paper, the main goal in the human activity recognition field, is to detect abnormal events, while there is no need to learn the different types of activities. The abnormality detection is desirable problem because it has a wide range of safety and health surveillance applications for elderly people. Abnormality refers to the problem of finding patterns in which the data do not have any conformability with the expected behavior. Often, these non-conforming patterns are expressed in terms of abnormality, lay out, inappropriate monitorings, exceptions, deviations, and so on in various application fields [4].

2. Video abnormalities

Abnormalities are patterns that are incoherence with the concept of normal behavior in data. Abnormalities may occur in data for various reasons, which include malicious activities, such as credit card fraud, cyber infiltration, terrorist activities, or failure of a system. According to recently challenges, the general abnormalities detection is not resolved easily. In fact, many of the existing techniques for detecting abnormalities resolve a particular problem. Formulation results from a variety of factors, such as: the nature of the data, access to tagged information, the type of abnormality to be identified, and so on. Sometimes, these factors are determined by the scope of the applied field in which the abnormality must be identified. Researchers have adapted the concepts of various disciplines, such as statistics, machine learning, data mining, information theory, spectra theory, to these types of issues and they use them to formulate a particular problem. Figure 1 shows the important components which are mentioned at the above in associated with abnormality detection by any method [5, 6].

3. Types of abnormalities

According to [5], the investigation of video abusive events can be divided into two groups:

1. Local Abnormal Event (LAE): A person's behavior is different from the neighbors.

2. Global Abnormal Event (GAE): The group's behavior towards the whole scene is an anomaly.

The recognition of suspected behavior involves modeling and the human activities classification with specific rules. Refer to random and complex nature of human movements, in the future; modeling and the human activities classification will be

very important. The idea of dividing the observed motions into separated states and then classifying them is appropriate. It was done in a model which has been written in Matlab software.

4. Abnormality detection method in MATLAB software

In the first step, the separation of the targets from each frame of the video images depends on the type of the camera motion, it is classified to the two sets which are included separation of the target from the image in the fixed cameras and the separation of the target from the image in the moving cameras. In the fixed camera mode, the camera stays in a fixed location at a constant angle, so the point of view fix to the target objects and background. The most popular method in fixed camera, is the separation of the background and the target objects [4] which is done due to its simplicity and efficiency. The background image is stored without any object inside it, see Fig. 1, then the program identifies the people in the image.

Fig. 1. Background image of the video image which is used in the program

In the next step, the database or the same training set has been obtained in the previously step by using image processing, it is fed to the neural network for training. This training set includes abnormal actions and behaviors that have already been obtained, so that the neural network with them has been Upgraded, and when the detection process is done, it can use this trained data to identify abnormal behavior. Then, in the MLP program that is available in the appendix, it is processed to test and practice the neural network. In this program, the size of database which must be allocated to the training and testing data, is specified. After training process by the MLP program, this program has delivered a trained neural network to the main program.

Now, after the neural networks has been trained, the biological geoscience algorithms (Roulette Wheel Selection) must be used to optimize the neural network. The optimization process is done by changing (increase or decrease) the value of the weighs bios that has been mentioned previously. These values must be between –1 and +1. By changing these numbers in different ways, we must reach the point where the error value reaches the desired level. Now, an optimization network has been created and has entered in the main program, So, there is no necessity to the mlp-test1 program, and mlp-test2 will be transferred to the main program.

5. Results

In the next section, there are videos that have been prepared from the different behaviors of people. These films include:

1) A person who in the bending mode passes against the camera (Fig. 2a).

2) Two people who enter the scene together, there is a conflict between them, then they leave the scene (Fig. 2b).

3) Two people entering the scene together and one of them is threatened by another by a weapon and then they leave the scene together (Fig. 2c).

4) A person who treat as normal and passes against the camera (Fig. 3).

5) a person who takes back the backpack on the floor and he passes against the camera (Fig. 4).

Then, by the created code has been proceeded to detect their behaviors, and in the cases where the abnormal behavior has been detected the above of the image is written "abnormal" and image, and when the abnormal behavior has not been detected, the "normal" terms is shown at the top of the image. The following figure shows two large images from the two cases (normal and abnormal) which have been received from the results of the MATLAB code processing.

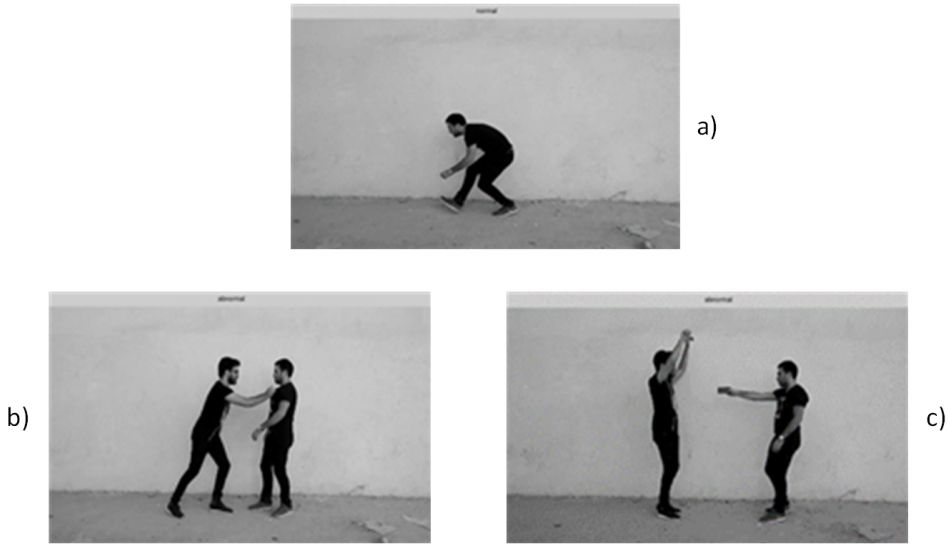

Fig. 2. Samples of abnormal and normal behaviors images have been detected in the tested films: a)–a person who in the bending mode passes against the camera, b)–two people who enter the scene together, and then conflict between them, c)–two people entering the scene together and one threats another with the weapon

The extracted images from different frames of a movie in which a person, with normally behavior, passes against of the camera is shown in below. As can be seen, none of the photos is identified by the MATLAB code as an abnormal behavior.

In the extracted images from various frames of a movie, a person enters into the scene and bends down, and picks up the backpack which falls on the ground and

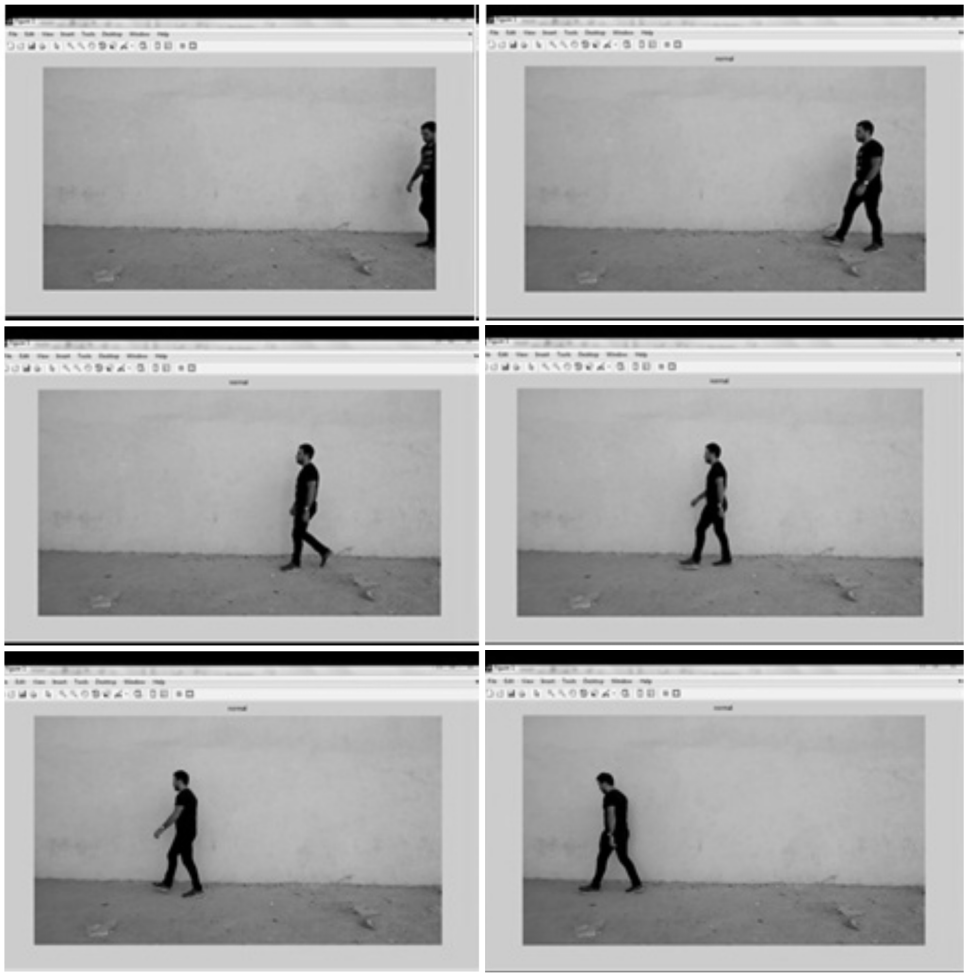

Fig. 3. Images extracted from the various frames of a movie that a person with normal behaviors, passes against of the camera

then he continues on his path, that is shown in below. As seen, MATLAB's code has showed a negative and positive response to this state of behavior, which is presented as "abnormal" and "normal" terms in the image topic. In the standing position before the backpack is picked up, no abnormality is detected and the abnormality is detected by bending and picking up the backpack from the ground, and again with returning to normal state, abnormality is not recognized and the scene is considered normal.

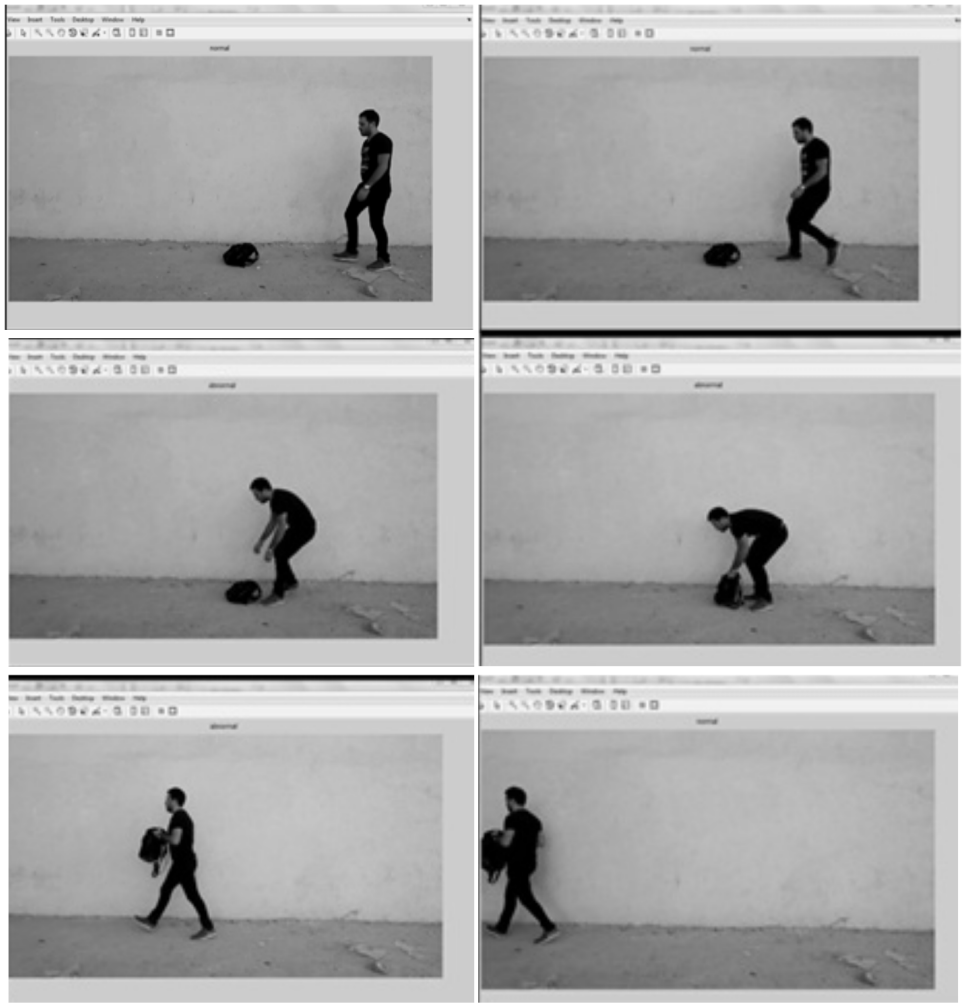

Fig. 4. A person who takes a backpack that falls on the floor in normal mode, and passes against of the camera

6. Conclusion

The purpose of this research is to reduce the manpower applying to improve the control of human behaviors in the public places. Some times, the control of the human behaviors due to neglect and carelessness leading to an incident that is resulting from the untrained manpower or the monitoring facilities. In this project, using MATLAB software and most focusing on the correct and accurate performance of the system, has been tried to reduce the errors that before (those errors) take place. The result of this study, leads to a reduction in manpower, a reduction in the amount of funds and above all, a strict reduction in irreparable errors. To get the features, first, we seek to find the human object using the shadow detection and

background removal in the image. In fact, the background can be eliminated by arguing that the pixels have not any move are the background. Some researchers have used the hidden Markov method and dynamic programming on the real time, in order to analyze the motions. We can use many methods to recognize the normal and abnormal behaviors such as neural networks and SVM. In the tracing section, we divide the parts of the body, which after each part analysis, we are transferred to the next stage. In the first layer, the above of the body, the lower of the body and the head are indicated. In the next layer, we will deal with behaviors that include walking, fighting, gunfire, and physical activity on the ground.

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