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HUMAN ACTION CLASSIFICATION USING ADAPTIVE BOOSTING ALGORITHM

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ABSTRACT

Monitoring human activities is an important process in various areas such as hospital, schools, colleges, public places etc. We use surveillance camera to monitor in most of the areas. But these data are stored in a hardware that can be accessed later and some of the latest camera has facilities to share the recording activity to the mobile or other devices live. But when abnormal activity is recorded the other person cannot be known about the incident. In this paper when the abnormal action is detected it sends an alert message to the other user. Through this facility most of the accidents can be avoided. Exact recognition of human action is a key enabler for the development of many applications including autonomous robots for medical diagnosis and surveillance of elderly people and children in home environment. Human actions are monitored using camera, when an abnormal activity is detected the alert message will be sent to the mobile through GSM.

Keywords: FSM, Adaboost, WLS, GSM, HDR

1. INTRODUCTION

Monitoring suspicious activities in various places is important and has become a major research area. Suspicious activities if monitored properly then we can mitigate or avoid many unwanted incidents. The system is designed to detect a human abnormal activity in home environment. Whenever the system detects a abnormal activity it will generate an alert message and sends to the mobile. The camera will be in a fixed position to capture the motion. The system is trained with the positive and negative samples. Based on the input video data the MATLAB program checks whether the motion is normal or abnormal. Digital image processing, the manipulation of images by computer, is relatively recent development in terms of man's ancient fascination with visual stimuli. In its short history, it has been applied to practically every type of images with varying degree of success. The inherent subjective appeal of pictorial displays attracts perhaps a disproportionate amount of attention from the scientists and also from the layman. Digital image processing like other glamour fields, suffers from myths, misconnections, misunderstandings and misinformation. It is vast umbrella under which fall diverse aspect of optics, electronics, mathematics, photography graphics and computer technology. It is truly multidisciplinary endeavor ploughed with imprecise jargon. Several factors combine to indicate a lively future for digital image processing. A major factor is the declining cost of computer equipment. Several new technological trends promise to further promote digital image processing. These include parallel processing mode practical by low cost microprocessors, and the use of charge coupled devices (CCDs) for digitizing, storage during processing and display and large low cost of image storage arrays.

Analog or visual techniques of image processing can be used for the hard copies like printouts and photographs. Image analysts use various fundamentals of interpretation while using these visual techniques. The image processing is not just confined to area that has to be studied but on knowledge of analyst. Association is another important tool in image processing through visual techniques. So, analysts apply a combination of personal knowledge and collateral data to image processing.

Digital Processing techniques help in manipulation of the digital images by using computers. As raw data from imaging sensors from satellite platform contains deficiencies. To get over such flaws and to get originality of information, it has to undergo various phases of processing. The three general phases that all types of data have to undergo while using digital technique are Pre-processing, enhancement and display, information extraction.

To recognize the abnormal motions in the given input dataset and to analyze the performance of adaboost algorithm. Here the motions are classified using adaptive boosting algorithm. Adaboost algorithm provides a strong classification mechanism combining various weak classifiers resulting into strong classifiers which then is able to increase accuracy and efficiency. Final learner will have minimum errors and maximum learning rate resulting

to the high degree of accuracy. Hence, adaboost can be used in such where misclassification leads to dire consequences very successfully at some extent.

The paper has been organized as follows, section 2 deals with the related works, section 3 deals with the system design of the developed system, section 4 deals with the performance analysis of proposed algorithm. Section 5 deals with conclusion and future work.

2. RELATED WORKS

In paper [1] analyses the possibilities to implement a supervision system, which is capable of monitoring a person's activity in his/her home without violating intimacy. The main idea is to collect information from various sensors placed in house and on mobile devices and infer a most probable sequence of activities performed by the supervised person. A Hidden Markov chain method is adapted for the activity chain recognition. The goal of this paper is to investigate the possibility of implementing a supervision system that infers sensorial data from multiple and variable types of sources in order to recognize a sequence of routine activities performed by a person in his/her home. We propose a methodology with three levels of data processing and recognition: raw data collection and processing, observations of actions generation and activity chain recognition. This paper proposes a system architecture and a number of processing steps needed for activity recognition. We consider that the main contributions of this paper are regarding the hierarchical approach for recognizing activities from sensorial data and the use of multiple Hidden Markov models for determining sequences of activities a person is performing in a given period of the day and in a given location.

The authors in [2] investigate the design space of flexible, textile capacitive sensors for applications in human activity recognition. In this paper, they systematically investigate how different design parameters such as electrode size, electric field frequency, and the concrete analog circuit design influence sensor performance. To this end, they combine FEM electric field simulations, circuit analysis, and measurements. Results from four typical activity recognition scenarios were considered, including heart rate and breathing rate monitoring, hand gesture recognition, swallowing monitoring, and gait analysis. in this paper proposed a computer vision-based posture recognition method for home monitoring of the elderly. The proposed system performs human detection prior to the posture analysis; posture recognition is performed only on a human silhouette. The human detection approach has been designed to be robust to different environmental stimuli. Thus, posture is analyzed with simple and efficient features that are not designed to manage constraints related to the environment but only designed to describe human silhouettes. The posture recognition method, based on fuzzy logic, identifies four static postures and is robust to variation in the distance between the camera and the person, and to the persons morphology. With an accuracy of 74.29% of satisfactory posture recognition, this approach can detect emergency situations such as a fall within a health smart home.

This paper [4] proposes a novel method to detect falls which combines four features, Orientation angle, ratio of fitted ellipse, Motion Coefficient, Silhouette threshold. These features act as inputs to K-Nearest Neighbor classifier which recognizes fall events. This algorithm gives accuracy above 95% on stored video sequences of activities and real time environment. The proposed system has proven that its robustness on realistic image sequences of simulated falls. The advancement of sensing technologies, embedded systems, wireless communication technologies, nano technologies, and miniaturization makes it possible to develop smart systems to monitor activities of human beings continuously. Wearable sensors detect abnormal and/or unforeseen situations by monitoring physiological parameters along with other symptoms. Therefore, necessary help can be provided in times of dire need. This paper [5] reviews the latest reported systems on activity monitoring of humans based on wearable sensors and issues to be addressed to tackle the challenges. In this paper [6] described a novel methodology for extracting the power consumption of each appliance deployed in a domestic environment from the aggregate measures collected by a single smart meter. In order to coarsely describe how each type of appliance works, we use finite-state machines (FSMs) based on fuzzy transitions. An ad-hoc disaggregation algorithm exploits a database of these FSMs for, at each meaningful variation in real and reactive aggregate powers, hypothesizing possible configurations of active appliances. This set of configurations is concurrently managed by the algorithm which, whenever requested, outputs the configuration with the highest confidence with respect to the sequence of detected events.

3. SYSTEM DESIGN

Figure 1 illustrates the system architecture. The various parts of figure 1 described as follows.

3.1 DATA PREPROCESSING

In computer science, digital image processing is the use of computer algorithms to perform image processing on digital images. It allows a much wider range of algorithms to be applied to the input data and can avoid problems such as the build-up of noise and signal distortion during processing.

3.2 WLS FILTER:

Weighted Least Squares (WLS) optimization framework is utilized for weight map refinement. Computationally simple texture features (i.e., detail layer extracted with the help of edge preserving filter) and color saturation measure are preferred for quickly generating weight maps to control the contribution from an input set of multi exposure images.

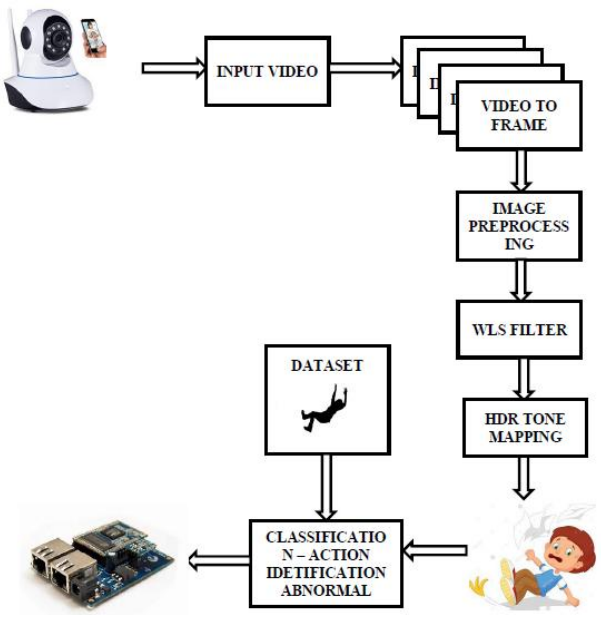

Fig.1 System architecture

3.3 HDR TONE MAPPING:

The camera response function recovered from differently exposed images is used to create HDR image(high dynamic range) whose pixel values are equivalent to the true radiance value of a scene. success of HDR image capture has shown that it is possible to produce an image that exhibits details in poorly and brightly illuminated areas. Moreover, HDR formats have since found widespread applications in the computer graphics and HDR photography.

3.4 EDGE DETECTION

Edge detection is an image processing technique for finding the boundaries of objects within images. It works by detecting discontinuities in brightness. Edge detection is used for image segmentation and data extraction in areas such as image processing, computer vision, and machine vision.

3.5 FEATURE EXTRACTION

In this module we implement independent component analysis to detect the hue saturation value. In this module we find the state of the image. Feature extraction involves reducing the amount of resources required to describe a large set of data. The features extracted will be then classified.

3.6 CLASSIFICATION

A computer-based image processing algorithm is designed to automatically classify microscopic images of yeast cells in a micro fluidic channel environment. The linear support vector machine, distance-based classification, and support vector machine algorithm were the classifiers used in this experiment.

3.7 IMAGE NOISE

Image noise is random (not present in the object imaged) variation of brightness or color information in images, and is usually an aspect of electronic noise. It can be produced by the sensor and circuitry of a scanner digital camera. Image noise can also originate in film grain and in the unavoidable shot noise of an ideal photon detector. Image noise is an undesirable by-product of image capture that adds spurious and extraneous information. The original meaning of “noise” was and remains “unwanted signal”; unwanted electrical fluctuations in signals received by AM radios caused audible acoustic noise (“static”). By analogy unwanted electrical fluctuations themselves came to be known as “noise”. Image noise is, of course, inaudible.

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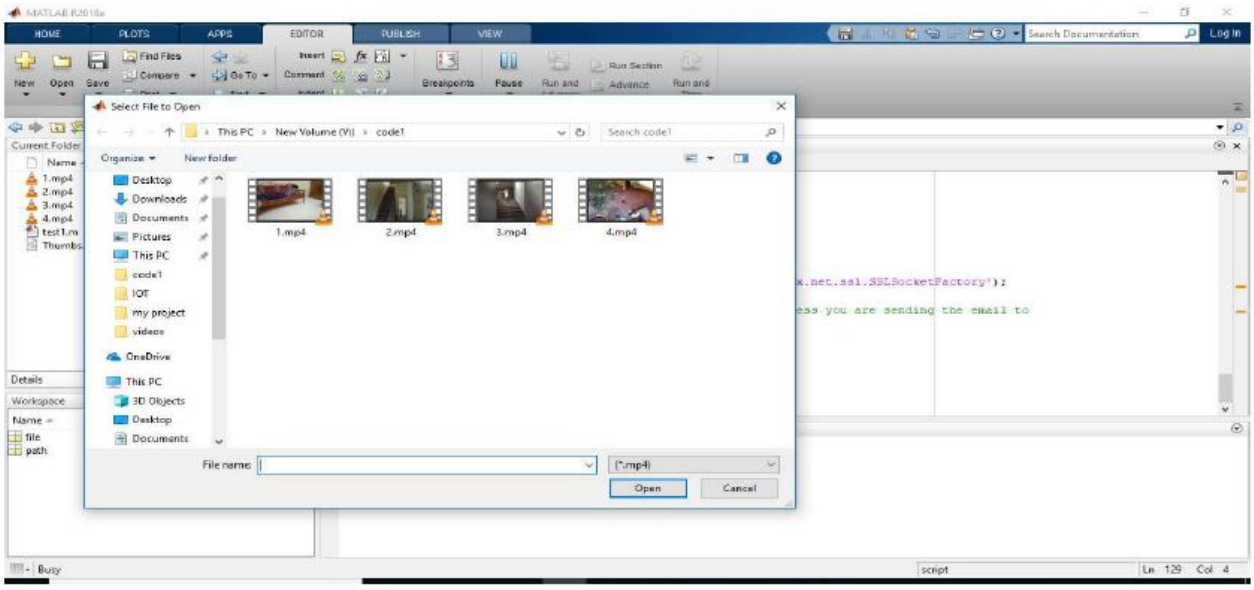

Fig. 2a) Input data collection

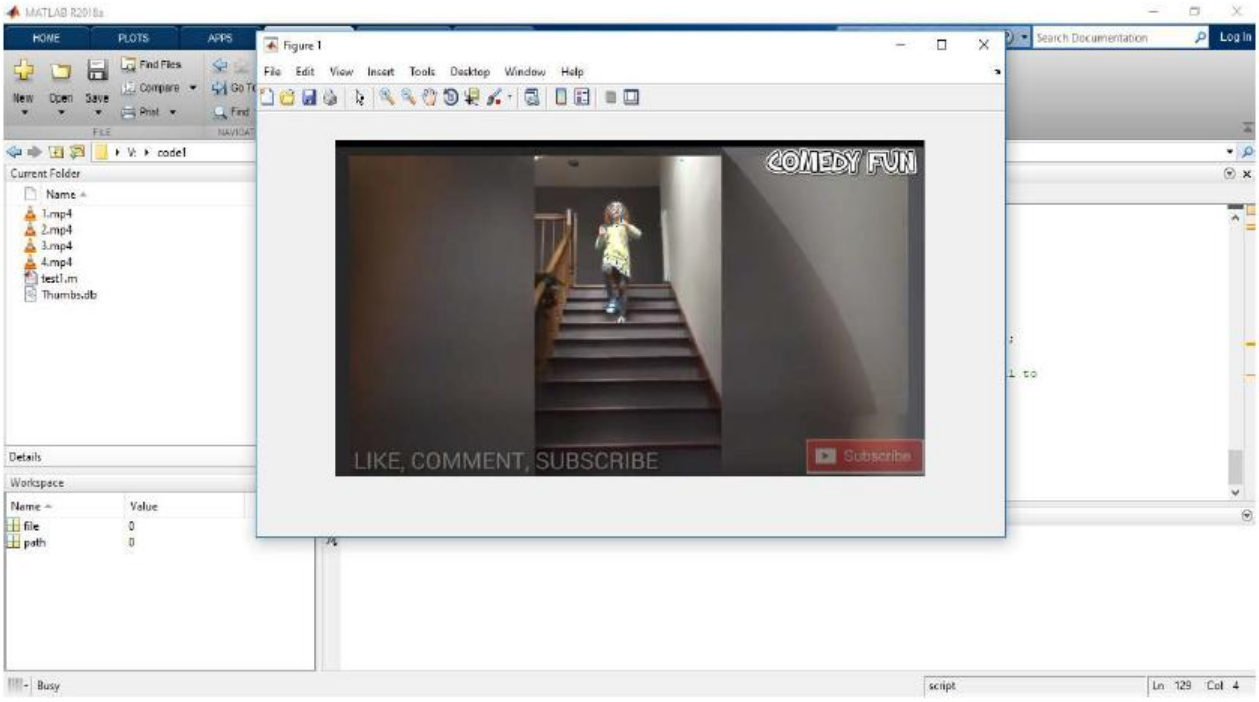

Fig. 2 b) Processing input video

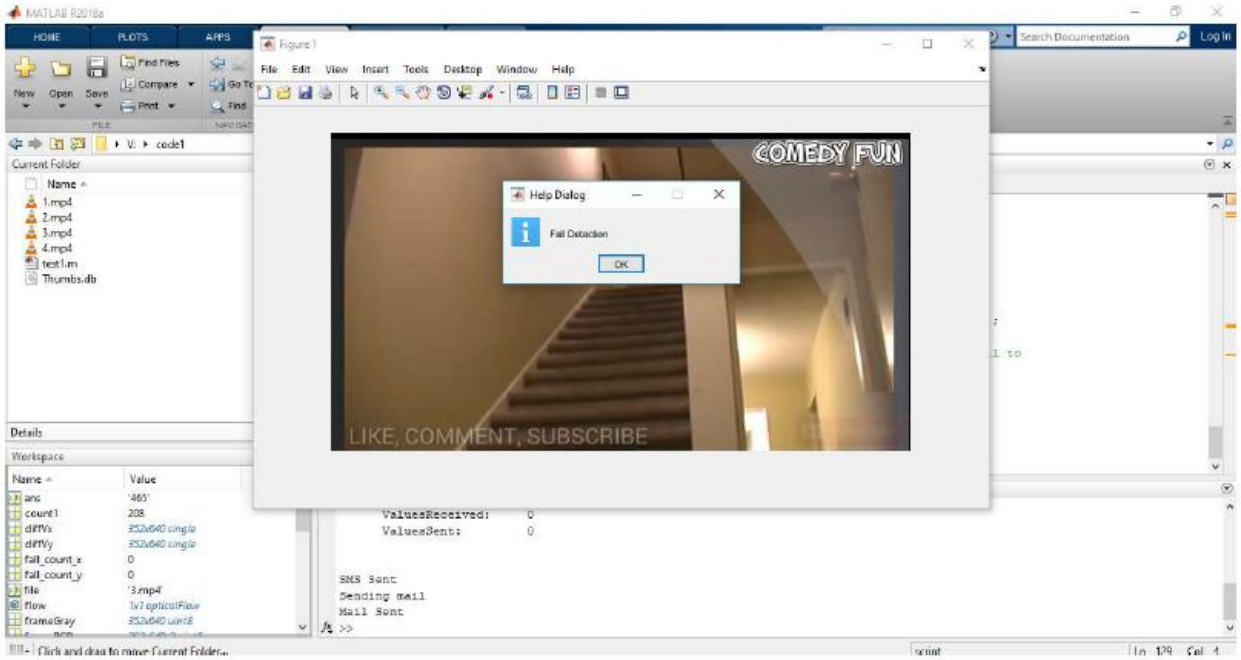

Fig. 2 c) Fall detection

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4. PERFORMANCE ANALYSIS OF ADABOOST ALGORITHM

AdaBoost algorithm is a classifier algorithm which iteratively builds a strong classifier as a sum of weak classifier. It has been observed that AdaBoost algorithm performs well when multiple images containing similar objects are trained together and tested. Here the performance is measured by means of classification accuracy. However, when training is performed with multiple images containing different objects the classification accuracy decreases. The major reason behind the decrease in accuracy is feature sharing between two different objects. For instance, cow and sheep are two different objects, but there is a slight similarity in their texture. In such cases there is a chance for this algorithm to lead to misclassification. As a result of which, the classification accuracy decreases. In order to overcome the above said anomaly it is recommended to integrate either EM algorithm or Decision Tree algorithm with AdaBoost algorithm in order to improve the classification accuracy.

Fig. 2 a) to c) shows the various scenarios of proposed algorithm.

5. CONCLUSION

This paper has focused on classification of human actions category by normal and abnormal actions using adaptive boosting classifier algorithm. The unique characteristics of project are usage of large data sets and significant improvements over the performance metrics of the existing machine learning algorithms and linear classifiers. Further, more complex actions can be considered for the suspicious activity detection. The system can be developed for more robust performance for varying lighting conditions.

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