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A SURVEY ON DETECTION OF ANOMALOUS BEHAVIOUR IN EXAMINATION HALL

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Abstract-Detecting anomalous behavior of students in examination hall is a crucial subject in surveillance. Factors such as seating arrangement and strength make this task bit more challenging. Video surveillance systems are one of the advanced technologies to detect the Anomalous behavior of students in the exam hall. This mode works well when used with a high density camera and to focus on everyone. This paper surveys methods to detect the abnormal behavior of students in examination hall which can avoid cheating in the hall. Anomalous behavior detection systems using video analytics act against threats before they become critical by sending alerts to the officials. These systems also help to avoid a supervisor in the hall. The system also identifies the abnormal examinees in the exam hall. Reduces the work of an invigilator and provides a proof for cheating.

Keywords- Pattern Matching; KNN Classifier; Confusion matrix; Video Processing; Behaviour Recognition; Anomalous detection

I. INTRODUCTION

The video surveillance technology has developed rapidly in the recent years. The traditional method of students monitoring which includes an invigilator to monitor the examination hall is difficult and not very efficient. It is very challenging to differentiate between a normal behaviour and an abnormal behaviour, as the abnormal behaviour in an examination hall includes many categories such as passing the paper, peeking into others paper, signalling to others etc. Video analytics technologies are now being widely proposed to examine videos to determine the behaviour and data. The technology can not only be used in areas of examination hall but also in other fields like security surveillance and to determine dishonest behaviour. Hence for an anomaly in examination system, there is a need to design a base/core for which the method differentiates the normal behaviour actions and then classify them seeing other several actions which are not normal. However, constructing a structure that

identifies the abnormal behaviour is a challenging issue because of the standard of the video, dimension of territory, certain posture of students. The examination rooms are packed and dynamic which makes it difficult to part the student information. Backdrop due to continuous motion from various objects and scenes makes it difficult in the real time to recognise the activity that deviates from patterns which are normal.

This paper surveys the methods used in automatic surveillance systems used in examination hall, where the abnormal behaviour can be detected in real time. Section 2 gives different approaches to anomaly detection and the state of the art, Section 3 briefs the challenges and Section 4 concludes the paper.

II. LITERATURE SURVEY

Neha soman, et al. [1] proposed a method to detect abnormal behaviour in the exam hall using an automatic supervisor. The students are tracked throughout the course of the video. The HoG features are extracted and forwarded to the K - Nearest Neighbour Classifier. Then the Abnormal or Suspicious Behaviour is reported, but suspicious actions are neither trained nor detected. Asma'a Al Ibrahim, et al. [2] proposed a system that is capable of continuously monitoring the behaviour of students using a fixed camera. The system consists of three layers: Face Detection, Suspicious state Detection and anomalous Detection. The behaviour is measured using a sequence of n-frames based on the Gaussian distribution method. The anomalous behaviour is decided based on how many times the student was found in suspicious state in define time duration.

Wu Song-Lin, et al. [3] proposed a method to classify eight sitting postures using PCA. The first step in the process is to identify the moving object against the contrast background using attenuation method. The skin area associated with YCbCr region in the CbCr plane is considered and its behaviour is also recognised with the help of PCA. Later the face motion is analysed with respect



to the number of pixels in the skin region of the face. This algorithm is weaker in shadow and luminance environment.

The human behaviour and activity patterns recognition is presented by Oluwatoyin P. Popoola, et al. [4] to detect contextual abnormal human behaviour. The anomaly detection, behaviour abstraction, representation, training and learning framework is done in the presence of low video quality, shadows, illumination and complex background challenges.

Pei Xu, et al. [5] proposed a hand gestures recognition method using the convolution neural network. The CNN is used to distinguish the complex gestures and in addition, a Kalman filter is used to determine the position of the hand. The procedure implies a couple of steps to process the image and separate the hand region before treating it as an input to the CNN classifier.

Prateek Agrawal, et al. [6] attempted to make use of behaviour of human based on his/her body gestures. GUI facility using Matlab is used in the system to capture an image of a person and identify the gesture based on the head, hand and leg position. Using Python programming language random gesture generator and its recognizer is implemented which is highly dependent on previous data recognized.

Waqas Sultani, et al. [7] proposed a deep learning based approach for detecting real world abnormalities in surveillance video. Experimental results show that this approach results in significant improvements in anomaly detection compared to other base line methods.

Wei Niu, et al. [8] proposed a framework for detecting and recognizing human activities in outdoor surveillance videos and differentiates the normal behaviour from suspicious ones to aid security surveillance in the parking lot. The Markov chains, hidden Markov models and coupled hidden Markov models are used to find the normal and dangerous categories.

Takeyuki Ishi, et al. [9] proposed a homogenisation method for cubic higher-order local auto-correlation (CHLAC) to detect the behaviour of humans but this process has a disadvantage in classifying abnormal and normal movements.

Partha Pratim Debnath et al. [10] proposed a smart system which is used to detect suspicious behaviour of student in examination hall. A knowledge base system server is created to detect the threshold value of suspicious behaviour of the examinee. The camera is turned on automatically at the moment when the behaviour of the examinee is detected suspicious. Vector field of image gradient is used to

detect the suspicious behaviour. Distance variation may not give an accurate result.

Jeji Yin Qiang Yang, et al. [11] proposed a novel two-phase approach where a support vector machine (SVM) is trained to filter the activity that have a high chance of being normal. The result is compared with the common behaviour model through kernel nonlinear relapse (KNLR) to deduce the incorrect rate in uncertain manner. An anomalous activity model is instinctively obtained without any help of explicit label and is demonstrated with the help of real data obtained through sensor network and realistic settings.

Keigo Watanabe, et al. [12] proposed an intelligent system to find the posture and position of human to detect the behaviour of the human. An active vision head is used to analyse the human posture in each frame.

Juan Serrano-Cuerda, et al. [13] used an ambient intelligence system to locate or track the humans by fusion of thermal infrared and color video segmentation. Artificial intelligence techniques such as support vector machines and artificial neural networks, and an infrared spectrum is used in human tracking to be robust to environmental phenomena such as fog or smoke, low lightning.

J. Davis, et al. [14] proposed a method for recognizing human hand gesture using a model based approach. Four distinct phases of a generic are modelled. The motion trajectories are tracked by finger tips in multiple frames. The performance of this method is presented using image sequences. The results are presented using images sampled at 4 Hz to find seven gestures for action of left, right, up, down, grab, rotate and stop.

Ivan Laptev, et al. [15] addressed the limitations and investigated movie data for instinctive notation of human action in video. Local region time feature, region time pyramid and multiple channels for nonlinear SVM methodology is used for classification. The method used in this paper improves the state of results on the data set section by gaining high accuracy. This method is a temporary domain to achieve the best data recognition on the standard benchmark.

Arslan Basharat, et al. [16] discussed about the pattern of the motion and rings of the objects in a fixed surveillance camera. The methodology is based on surveillance pipeline for abnormal detection events and scenario model feedback. A framework for the unsupervised study of scene that captures the object motion with the size at each and every pixel location is defined. This framework provides the means of better level of analysis to increase the older surveillance pipeline.



Louis Kratz, et al. [17] proposed a model for the variation of the motion of local space period volume and spatiotemporal statistical behaviour to characterize the overall behaviour scene. The temporal relationship between local spatiotemporal motion patterns is captured by distribution based on Hidden Markov Model. The method is suitable for crowded scenes.

Huiwen Guo, et al. [18] proposed an approach for abnormal detection that spans period, space, and spatial scale, uses a joint representation as the video appears and dynamics are globally consistent. The Multi Disciplinary Team models outperform classical optical flow detectors. The challenges were introduced for the abnormal detection using the data set, and is composed of difficult scenario of pedestrian motion. The data provides the frame and pixel-level truth.

Ramin Mehran, et al. [19] proposed a novel method for detecting and localising abnormal behaviour in a crowded video with the help of social force model, in which grid of items are placed on images and is transported with space-time average optical flow. Considering the particles that are moving as individuals and their interactions is estimated with the help of this model. Later interchange forces are plotted to image plane and to get the flow of the particular pixel in particular frame. The normal behaviour is modelled using randomly selected spatiotemporal volumes of force flow. Interaction forces are used to localise the abnormal frames. The results show that this method is accurate in detecting and localising of anomalous behaviour in the crowd.

Parvin Deraiya, et al. [20] analysed the live surveillance videos to detect actions like institution exchange, arrival of a new candidate and also sneaking into paper sheets with the adjacent person. The process includes face detection and hand recognition and actions between them of the same person or among different.

J-C Terrillon, al. [21] proposed a real time system designed primarily to detect and track multi human face and also simultaneous recognition of multiple hand postures in colour and complex scenarios. The features used are colour, shape and motion to which three mutual subsystems are attached to achieve higher rate of detection and recognition. The face is detected with 90% accuracy in addition to which tracking increases robustness of system through illumination conditions and partial occlusion.

Sugla Vinaayagam Rajenderan, et al. [22] proposed a prototype for appropriate abnormal human behaviour detection from surveillance videos. The system extracts human behaviour information by localizing people in real time with help of Gaussian mixture model (GMM). Morphological operation supports detecting movements of human without

noise. After extracting the noiseless information, the frames are then post-processed to recognise whether the result is suspicious or not which includes loitering and looking around more than usual time period.

Dan Xu, et al. [23] proposed a novel unsupervised deep learning method for detecting anomalous persons in complex video scene. Appearance and Motion DeepNet (AMDN) uses a deep neural network to automatically learn the features. A double framework benefits older fusion and future fusion combination plan. The SVM models predict anomaly scores from input and integrates a future fusion plan for detecting the final anomaly detection.

The method proposed by Duarte Duque, et al. [24] detects and predicts the abnormal behaviours by using a video surveillance system aiming the concept of intelligent surveillance. The color images are acquired by stationary video camera, moving objects are detected, tracked and are analysed by using the novel method of Dynamic Oriented Graph (DOG) to predict the abnormal behaviours by using the real time unsupervised learning. This method characterizes observed actions and hyperspace attributes based on the moving objects observed, and assignment of a probability to get the abnormal behaviour. A single user can monitor the huge number of video cameras by this method to predict the abnormal actions of humans and to detect some objects (person, group or vehicle).

Y. Benezeth, et al. [25] proposed method in which abnormality is detected by behavioural modelling and location-based approach. Markov random field (MRF) are used to describe the portability observation with the spatio-temporal volume. The MRF takes distribution accounts of speed, direction, mean size of the object passing through each key pixel. The co-occurrence distribution of moving object and normal path are analysed to detect the abnormal behaviours.

Waquas Sultani, et al. [26] focused on identification of existent world anomalies in surveillance videos using extensive learning approach. Experimental results in this paper concludes that the MIL method shows significant improvements in anomaly detection. The method used here performs significantly better than other base line methods.

Subutai Ahmad, et al. [27] presented a novel technique of anomaly detection which is dependent on an online sequence memory algorithm known as Hierarchical Temporal Memory (HTM). Conclusions are seen from a current application which is used to detect the abnormal in a economical metrics in the real time. The algorithm is tested on Neuropsychological Battery, which is published benchmark for the detection of anomaly in real time.



This algorithm is used for identifying spatial and the temporal anomalies which are obvious noisy domains. The system is computationally efficient, can automatically adapt to the changing statistics and it also requires little to no parameter tuning. The algorithm consists of number of possible extensions.

Paulo Vinicius Koerich Borges, et al. [28] presented an extensive overview for the understanding of video-based behaviour, the parameters and analysis of the datasets which is used for the benchmarking. The major aim here is to provide a critical analysis to the reader about the major steps, starting from detection to high-level interpretation, and also for contrasting the key elements using the comparative tables. Devices like RGB Depth (RGB-D) sensors and Microsoft Kinect are used to simplify tasks for the human behaviour analysis. The performance can be increased by using pure vision systems in real scenarios and also considering multi-modal sensing.

Shugang Zhang, et al. [29] proposed approaches for classification of abnormal human activity into three categories: action primitives, action and interactions. There different categories are provided with benchmark datasets for the project representation and for the categorization. The approach for the presentation activity includes the research trajectory taken from global representation. Classification approach method plays a vital role and also prompt the advance of HTTP archive format. The human tracking includes filter-based and kernel-based approach. The HAR always concentrates to identify activities which are from a number of observations on the measures of subject and for habitual condition. This vision-based method of HAR consists of many applications which include video surveillance, human computer interaction (HCI) and health care.

Tian Wang, et al. [30] proposed an algorithm to detect abnormal events. This algorithm consists of an online non-linear classification method and an image descriptor. This technique comprises of covariance matrix descriptor which encodes the gesture characteristic and the nonlinear one class SVM classification technique. This algorithm is tested on a video dataset which had resulted successfully the abnormal events.

III. RESULTS OF LITERATURE REVIEW AND DISCUSSION

Detection of abnormal behaviour is an important factor in an examination hall. Many methods have been proposed in the literature to process the data from the examination hall. Due to material nature of video data, it is difficult for humans to localise the data in a limited time. In traditional method of real time monitoring mode, it was difficult for the

supervisor or for the examiner as the event may be easily passed unnoticed by the invigilator due to inappropriate assumptions made. The set of images captured by the camera is compared with the data sets. Most of the image-based systems are time consuming and comparatively less robust since the images must be first captured and then it analyses the abnormal behaviour. The video surveillance and analysis systems are preferred as they are more precise than human eye and less work for the examiner to detect the student behaviour in the examination hall. Some systems which can automatically detect, capture, analyse and alert the examiner about the anomalous behaviour of students is discussed and are summarized in Table 1. The pre datasets are used for classification of images to train the system where deeper techniques is also acknowledged for making decisions automatically, precisely and accurately at a faster rate. However, the results are not met for larger strength of students but accurate predictions can be made of the student cheating in the examination hall.

IV. CONCLUSION

The field of computer vision is widely utilized in several disciplines of science worldwide, and day after day its applications that touch our daily lives are growing. The student's activities in the examination room is one of the focus that affect many dimensions. Most conventional approaches rely upon the utilization of human beings as the main power for monitoring the student's behaviours. In this paper, intelligent surveillance-based monitoring system are survey to detect the behaviour of the students. These methods can be considered and revised to form new algorithm to detect the abnormal behaviour with more advantages and can be implemented to detect the anomalous behaviour of students in examination hall to avoid cheating in exams and also to avoid an invigilator.

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