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# Literature Survey on Abnormal activity detection in ATM using deep learning

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**Abstract**: Unusual occurrences in restricted spaces like ATM rooms, server rooms, and the like may be detected using this paper's newly proposed supervised approach. This article discusses about the survey of the recent methods used. We are attempting to build a technological foundation for a more secure social infrastructure by using image processing to identify deviant behaviour, and this technology is one component of our overall goal. People who aren't involved in criminal activity won't feel comfortable using ATMs or other social services if we increase the number of security guards and police officers. Image processing methods are used in this work in order to identify aberrant ATM occurrences. Real-time image processing methods may be used to monitor and identify aberrant occurrences in images or movies. The goal of the proposed research is to use artificial intelligence methods to recognise aberrant behaviour in ATM booths. Classification of the activity is done using the Support Vector Machine (SVM) approach, the histogram of gradients coding technique, and the K-means clustering algorithm for feature mapping. The SVM classification algorithm's parameters may be adjusted by the user. Video is broken down into groups of frames in this technique. A video's motion route and speed are calculated statistically by the algorithm. The motion history image (MHI) and Hu moments are used to extract significant information from video in the proposed method. Classification has been done using support vector machines and principal component analysis to minimise the number of dimensions in the features. Analyses of diverse video sequences have been performed by altering the width of the MHI window.

***Keywords***— Automated Teller Machine, Anomaly Detection, Artificial Intelligence, SVM

## I. INTRODUCTION

During the early to mid-nineties, ATMs were widely used and researched. An ATM [8]is a machine that dispenses cash or performs other financial activities, and it has grown in prominence over the previous several decades. Banking[1] has become significantly more convenient as a result of the widespread use of ATMs. ATMs, on the other hand, are a prime target for criminals. Because of this, ATMs are equipped with a video monitoring system. There has been a surge in ATM irregularities over the last several years since ATMs are not certified by banks but are instead outsourced to Managed Service Providers (MSP). CCTV cameras are installed in ATMs [9] to monitor operations. Unfortunately, CCTV does not offer appropriate security since it is incapable of detecting suspicious activity on its own, thus the control authority is forced to monitor these feeds around the clock, which is a challenging task.

The majority of the ATMs, on the other hand, were outfitted with a surveillance camera. When applied to the issue of object localisation in a picture, deep neural networks, sometimes referred to as "deep learning," may provide impressive results in the area of image categorization by automatically detecting ATM objects. Deep learning algorithms[10] make it simple to catch criminals in the act. To identify weapons in the ATM, a neural network is used. Different attack detection methods are explored in a large number of research publications, all of which showed that the digital world is full of anomalies and that machine learning algorithms may be used to catch these anomalies early on and mitigate their effects. The identification[2] of ATM fraud is a more difficult task since the poor image quality makes it difficult to see faces and identify events in video streams in an uncontrolled environment. ADABOOST[3] is an empirical rule-based occluded face identification technique for ATM surveillance that uses skin colour detection and face template matching.

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A video object is defined as either an item or a person in the video. The individual using the ATM machine and the ATM machine itself are the objects if the video is taken from an ATM room camera. Objects in a parking lot video taken from a camera near a gate include the automobile passing through the gate and the gate itself. Event detection in video is the technique of identifying certain occurrences inside a video frame. This is the process of finding out what is wrong with the video. There are many sub-categories of video events that fall under the umbrella of anomaly detection[11]. A novel supervised video anomaly detection technique for limited regions based on the video's colour pattern is presented in this study. Our work uses ensemble processing to learn the motion route and speed of objects in the training movie. It is possible to discover anomalous occurrences in the testing films by analysing the motion route and the quantity of motion in the training videos. A training phase algorithm[4] learns where in a video motion is permitted, as well as the maximum and lowest speed at which it is authorised.

## II. LITERATURE SURVEY

Chella et al. suggested a system for monitoring individuals in real-time while simultaneously identifying aberrant posture, in the area of human-computer interaction. As soon as a person is tracked by the tracking algorithm, an estimation of their posture is made by the system. There have been a lot of studies done on the subject of recognizing posture. The vast majority of this study, on the other hand, relies on colour data gathered by ordinary RGB cameras.

A real-time, general, and practical method for detecting human position[5] using a static camera was presented in Bernard by B. Real-time processing is made possible by the use of 2D approaches that depict the observed person's silhouette. Spatio-temporal patches derived from prior photos are used to create a new image that may be used to identify abnormalities.

Large contiguous data chunks may be used to build testing pictures, which is regarded as a typical result when they are saved in the database during training and during testing. An aberrant picture is one that cannot be generated from the database for use in the testing process. His approach is a three-step process. It includes extraction of the foreground, initial positioning, and ellipse filling. For starters, the previous approach[6] has a poor level of accuracy, since pores and human features may change constantly in seconds, and the backdrop in video sequences constantly changes. Based on digital image processing[7], we offer an algorithm that uses deep learning to identify or monitor images and videos, thereby overcoming these issues. It is possible to identify thousands or a few photographs in this project.

The approach[13] uses cameras to keep tabs on things as they happen in real time. It will sound an alarm if there are any suspicious actions or undesirable items, such as a hammer or a knife, identified. An intelligent security system for ATM crime detection is vital yet a difficult problem statement to solve, according to a recent poll.

Facial feature recognition, anomalous object detection, mask and helmet head identification, and other approaches have all been discussed in the literature, and several of these models have been published. For real-time criminal detection, face recognition alone is not enough; instead, the booth's behaviour must be analysed thoroughly in order to identify the crime in advance. After conducting a survey, the suggested model's goal is as follows: To discern between regular and aberrant ATM behaviour using an intelligent criminal investigation model. A feature selection approach is used to enhance the proposed model's classification performance. Performance measures[8] will be used to indicate that the proposed research is a worthwhile endeavour by comparing the model's outcomes to those of current models. The live video feed from an ATM must be constantly analysed and tagged as either normal or suspicious behaviour in order to undertake online ATM monitoring. Identifying the occurrence is the first step in determining whether or not it is normal or abnormal. For this reason, the model in the proposed research is trained using benchmark datasets such as HMDB-51 and CAVIAR in order to identify the event. When it comes to detecting anomalies[9], low-level characteristics like motion fields and statistics are used. Finally, a PCA approach called motion directed PCA is utilised to extract important features in a certain time period. To conclude, the anomaly is identified using a single-class SVM. This paper proposes three layers of abnormality detection based on the Spatio-temporal context of video objects. Figure 1 shows the three levels of anomaly, namely point anomaly, sequential anomaly, and co-occurrence anomaly.

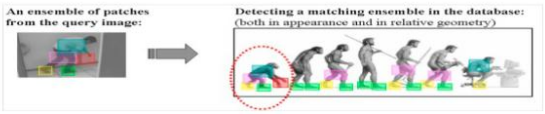


**Fig. 1: Detecting a matching ensemble of patches**

A point anomaly occurs when a single item in a movie suddenly behaves in an unexpected way. When an item exhibits two or more distinct behaviours within a single moment, this is known as a sequential anomaly. It is a kind of anomaly created by the simultaneous actions of many objects. Researchers have come up with a variety of methods for recognising human actions (HAR). For identifying human behaviours, Davis and Bobick have

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discussed the use of temporal templates. Human motion and behaviour analysis utilising MHI and its derivatives has been well documented in references. Figure 2 depicts a variety of techniques to deciphering the representation and recognition technique of human movements, such as Optical Flow and Random Sample Consensus (RANSAC).

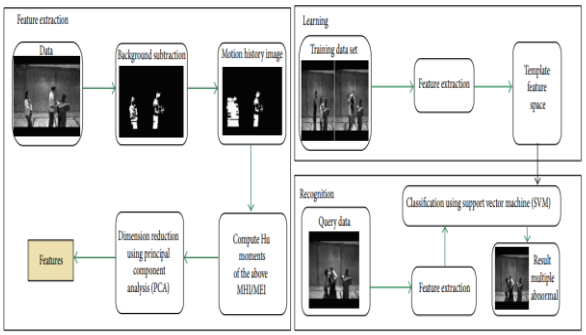


**Figure 2:** Optical Flow and Random Sample Consensus

Many public and private settings, including airports, train stations, retail malls, restaurants, streets, and places of work and education, need sophisticated video surveillance systems to keep an eye out for anything out of the ordinary or suspicious. It is difficult to identify anomalies when there are so many variables, such as anomalous occurrences, backdrop changes, camera motions, etc., that need to be taken into account.

Tadashi Ogino created the frameworks for extracting the two parts. Machine learning, i.e. a neural system, is an alternative to the more traditional methods of manual advancement. Machine learning technology developed for a digital attack detection framework is used in the inconsistency recognition framework. The results show that the two algorithms are able to identify unusual events in trial video data.

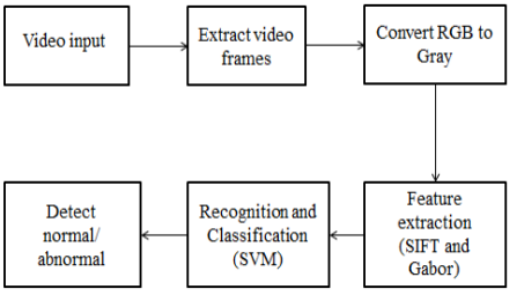


**Fig 3: Workflow of a System**

Jonathan-Christian Kamarainen For over three decades, Gabor filters have maintained their dominance in the extraction industry. Grayscale images are created by converting the RGB images into grayscale. The SIFT and Gabor methods may be used to extract features from a grayscale picture that has been transformed to colour. SVM may then be used to categorise the picture if necessary. Figure 3 shows two basic approaches to the proposed system.

Motion Joint Descriptors (MJD) like angle and radius are retrieved from spherical coordinates and translated into colour pictures using Depth Motion Images (DMI). Since deep learning techniques[12] have shown great promise in general action identification, we are interested in applying and evaluating deep learning in the ATM setting. There are attention-based Dynamic Texture Images (DTI) in the Dynamic Pose Image (DPI) approach for representing action as a series of joint estimate maps, and they were then trained on CNNs one at a time until the DPI and DTI representations' multi-stream CNN scores were finalised.

## III. Conclusion

Posture recognition was utilised in this experiment to demonstrate that an ATM employee exhibiting unusual behaviour may be detected. We were able to do this by using keleton data, which can be obtained from a 3D camera such as the Kinect. Our code was written in Processing, a Java-based programming language. Logistic Regression, a machine learning method, was utilised to determine the likelihood that the subject under observation was in an aberrant stance at the time. The necessity for such a security system arises from an increase in the number of crimes committed at ATM booths and from a lack of protection given by banks for their ATMs. Image processing and motion image processing will be used in the proposed system to determine whether ATM abnormal behaviour occurs or not. The public is well-informed about criminal activity thanks to the alert system. Using real-time approaches, we can also eliminate false alarms from routine tasks. Deep learning methods are used in the suggested model, which improves the system's performance. Optimizing SVM parameters is made easier using a new approach. Two benchmark datasets such as HMDB-51 and CAVIAR are used to test the proposed model's ability to identify human motion. In terms of research, this paper's future is wide open. The accuracy of the system may be tested using a variety of feature extraction approaches. Other classifiers, such as support vector machines (SVM), may be used in the same way.

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