

Secureye - ATM Trajectory Based Anomaly Detection System

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ABSTRACT: An ATM is an important measure of our day-to-day activities and people using ATM keep on increasing. Conversely, utmost ATM Machines are inclined to a security risk, security breach, although every ATM is fitted out with CCTV installation. To improve ATM security and to shelter ATM centers from untoward incidents, a new form of security framework needs to be acknowledged. Incorporating image processing in video surveillance systems is a stimulating task that has been tried for the past more than a few decades. Most of the existing systems are prone to provide security for ATMs due to their different environmental conditions like illumination and camera view or crime devices.

This article reviews the previous research using image processing applications that can be used in the ATM-CCTV surveillance system. Here we are introducing a system that can provide more security compared to the existing systems.

Keywords – ATM Trajectory, Anomaly Detection, Image Processing, Open CV, CCTV, Security system, .

I. INTRODUCTION

ATM makes people's life easier as there is no need to visit the bank for cash withdrawal or deposit. Considering users need the establishment of new ATM in the remote location is happen on multiple folds to meet the customer demand. However, this convenience is invited substantial criminal activities like money snatching and attacks on users [2], damaging ATM [3]. In some cases, ATM guard is also killed when he tries to save the victim because attackers are generally equipped with weapons like machete, guns, pistols, iron, and rod and usually are multiple numbers. It was reported that incidents about theft, dacoity, and robbery in ATMs in the past two pecuniary ages have gone up from 303 cases in 2017-18 to 515 in 2018-19, an increase of 70% [1]. For the past three years, Maharashtra has counted the uppermost number of cases associated with scam involving ATM cards and e-banking. During these years, Delhi, Tamil Nadu, and Karnataka continue to report a tremendous increase in the cases along with Maharashtra. Figure 1 shows the number of incidents of theft in ATMs.

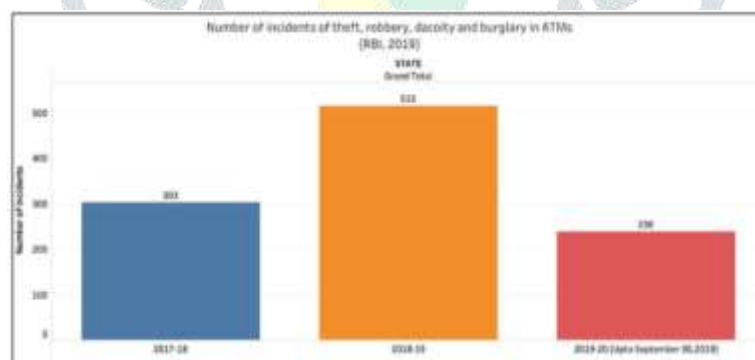


Fig 1: Number of incidents of theft, Robbery, Decoity and Burglary in ATMS

Due to such an increase in criminal acts, advanced security measures need to be implemented for individual and sensitive infrastructure.

To protect the ATM from looters, most of the ATMs are equipped with CCTV cameras. The installation of the CCTV helps prevent crime and may aid in the solution of cases. Its role is also increasing in various forms. The most important technique of this smart CCTV related research is to track and analyze objects within the images. But unfortunately, CCTV is not sufficient to provide security due to their inability to recognize unusual behaviors. In another case, one person needs to monitor CCTV footage 24 hours per day and 7 days a week, which is quite a tedious & time-consuming task. Besides, damaging the CCTV camera by criminals is also on the upsurge [3]. The CCTV video used as forensic evidence [5] for the crime after it has already happen. CCTV video for a real time alarm system has not been considered yet for ATM security.

Significant work has been already done in the aera of integrating image processing in video surveillance systems. Tracking and detection of moving object systems can also help in many applications like robotics, authentication system, media production, biological research [4]. Tracking the object in the low-resolution video is a difficult task, i.e not able to accurately find out the object

of interest because of many discriminative details. The challenges that need to be highlighted are illumination change, dynamic background, camouflage, occlusion, shadow, etc.

By considering all the trouble mentioned above, there is a need for an innovative way that can effectively monitor and automatically recognize unusual crime activities in an ATM room and can also report to the nearby monitoring firm before an offender could run away. This article reviews the previous investigation works on all possible image processing applications that can be used in the ATM-CCTV surveillance environment. This review may assist upcoming investigators to develop vibrant and versatile algorithms for a surveillance system that can identify and prevent ATM crime.

This paper is organized as follows: Section 2 represents Literature Review along with the system's advantages or disadvantages, Section 3 explains the overview of the system that we are going to implement. Section 4 presents the describes Conclusion of the survey.

II. LITERATURE SURVEY

Title: - "Sequence of the Most Informative Joints (SMIJ): A New Representation for Human Skeletal Action Recognition".

Author: - Ferda Ofli, Rizwan Chaudhry, Gregorij Kurillo, René Vidal, and Ruzena Bajcsy,

Publication: - In proceedings of the IEEE Computer Vision and Pattern Recognition Workshops (CVPRW), Providence, Rhode Island, USA, PP. 8-13, June 2012.

Method: - Sequence of the Most Informative Joints (SMIJ).

Description: - In this work the authors explained in detail about the SMIJ representation, here the given action sequence is broken down into a variety of temporal fragments. The joints that are considered to be the most insightful inside each chapter are chosen. A series of these most detailed joints is then used to describe an operation.

Limitations: - The insensitivity of the SMIJ representation to distinguish various planar movements around the same joint is one of the drawbacks that has yet to be solved.

Advantages: - The joint angles of two adjacent body parts are measured in 3D spherical coordinates, capturing only a coarse approximation of the body configuration.

Title: - "Head pose estimation for driver monitoring".

Author: - Y. Zhu and K. Fujimura

Publication: - IEEE Intell. Vehicles Symp., 2004, pp. 501-506.

Method: - Principle Component Analysis (PCA)

Description: - The author applied the approach of the PCA to classify the eight most common sitting postures. After conducting various experiments and putting in a lot of effort the authors are able to get these most common sitting postures respectively. Moreover initially, moving objects were monitoring the technique that mainly includes attenuation of background contrast process. The surface of a moving target's skin was extracted using the ellipse-like projection in the XY plane to create a clustered skin surface in a fixed region of a color space field. Finally, using PCA on a gray-scale projection of skin, the face movement was evaluated considering the time variance of pixels quantity in the facial skin surface, and behavioral recognition was applied.

Advantage: - Through analyzing the subject's appearance on the internet, the algorithm accurately predicts the subject's pose.

Title: - "Video Event Detection Using Motion Relativity and Feature Selection"

Author: - Feng Wang ; Zhanhu Sun ; Yu-Gang Jiang ; Chong-Wah Ngo

Publication: - IEEE Transactions on Multimedia

Method: - optical flow method, Trajectory Extraction Algorithm, Multiple forbidden regions

Description: - Author perform surveillance, the author used a network of cameras at sensitive and strategic locations which provided instantaneous video data. The video was analysed using the algorithm Trajectory Extraction 5 to classify the unusual behaviour that occurred along the subjects' path. With the aid of the optical flow tool, path extraction was performed on the video trim to decide whether the individual was approaching the prohibited area. Entry into such an area was immediately classified as an abnormal activity. In case if the objects do not enter the forbidden region then it comes under trajectory categorization. Here they find out if the routes that the objects follow have "regular trajectory" or "irregular trajectory".

Limitations: - Most optical flow approaches, on the other hand, are computationally complex, noise-sensitive, and require sophisticated hardware for real-time applications.

Title: - "Human Activity Recognition for Surveillance System"

Author: - Alok Kumar and Singh Kushwaha

Publication: - IEEE Proceedings of 4th International Conference on Intelligent Human Computer Interaction.

Method: - Template Matching Method

Description: - Using a template matching system, the author introduced a structure for classification and identification of human behaviours in dynamic motion. In each frame, moving objects are observed and their form is created. Second, a template matching-based technique is used to classify the created form, followed by a rule-based classifier to classify human behaviours like running, walking, bending, wrestling, and jogging.

Advantage: - 1. Moving objects are observed and their form is produced in each frame as a benefit.

2. Invariant functions or experimental medical image processing software

3. 3D template matching and search process that is unaffected by orientation, location, or object type.

Title: - "Multiple Anomalous Activity Detection in Videos"

Author: - Sarita Chaudharya, Mohd Aamir Khana, Charul Bhatnagar,

Publication: - 6th International Conferences on Smart Computing and Communications, ICSCC 2017.

Description: - Surveillance cameras are being built in stores, stations, schools, and airports as a result of the exponential rise in crime rates. It's impossible to manually track these cameras to spot unusual activity because they record videos 24 hours a day, seven days

a week. As a result, intelligent surveillance systems are in high demand. Many anomalous events in videos are immediately detected in the proposed work.

Moving target tracking, object control, and activity detection are all included in the current approach for movement recognition. The feature extraction behaviour is explained by key features such as speed, direction, circumference, and dimensions, among others. These options help you monitor moving objects in video clips. Issue domain recognition laws aid in the identification of activities, and dominant activity intervention identifies when a particular activity belongs to the normal or abnormal activity classes.

Advantage: - Experiments also represents that the proposed approach is capable of detecting a variety of anomalous events.

Accuracy: - It can detect several anomalous activities up to 90% of the time.

Title: - “Unsupervised activity perception by hierarchical Bayesian models”

Author: - Xiaogang Wang, Xiaoxu Ma, and Eric Grimson.

Publication: - IEEE Conference on Computer Vision and Pattern Recognition

Method: - Latent Dirichlet Allocation (LDA)

Purpose of LDA: - Linear discriminant analysis is a method for identifying data structures and grouping them into meaningful categories.

Description: - LDA and Hierarchical Dirichlet Method are two hierarchical Bayesian methods for language processing (HDP). In this model, surveillance missions such as clustering video clips and anomaly detection have a nice probabilistic explanation. Given the relational form of the data, a hierarchical model should have enough parameters to accurately complement the data while preventing over fitting issues.

Limitation: It adds the first function one by one to each of the other features to find the combination that produces the most discrimination.

III. OVERVIEW OF PROPOSED WORK

By reviewing most of the existing system, here an attempt is made to implement a system that can provide an affordable and quality Surveillance system to every user. A vital feature of the system is to identify invasion within the practical frames and inform the administrator if such things happen. Figure 2 shows the overall flow of the system.

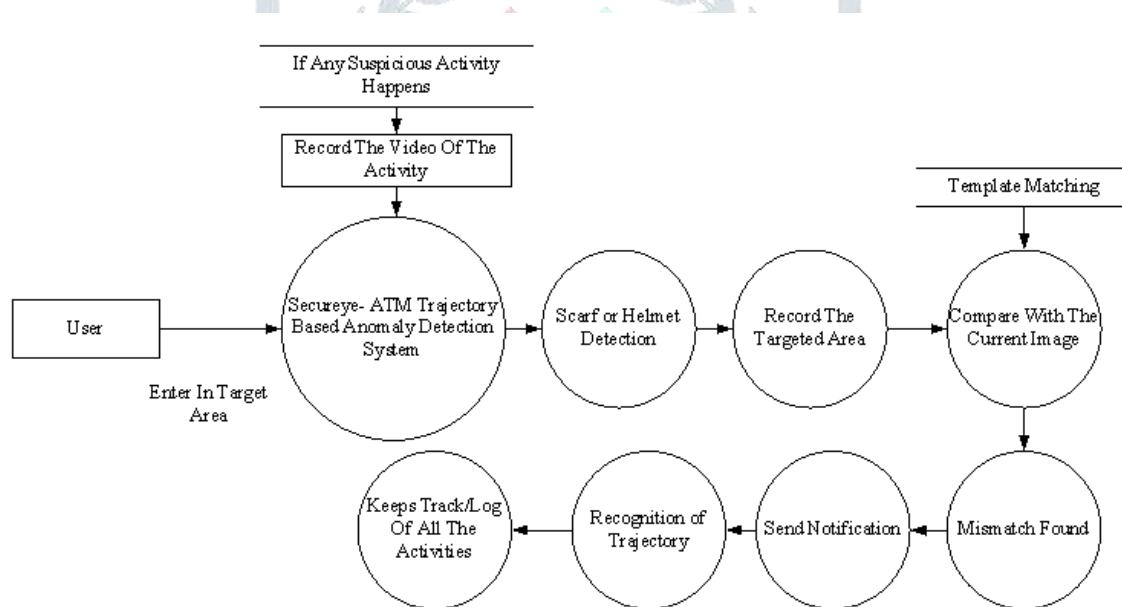


Fig 2: System Data Flow

The system helps to judge the situation and notifies the administrator directly or immediately by reducing the human need. Our method trajectory recognition is relayed on obtaining the Motion History Image (MHI) of the centroid of the moving person and classification based on human moments. This technique gives precise results even when tracking is not very robust. This is as a few stray points won't affect the MHI much and the human moments will be fairly the same. The system can recognize whether a person is entering a prohibited area where he/she is not supposed to enter. The system is quite effective and improves the performance and accuracy of identifying the motion of the object as compared to the current approaches.

IV. CONCLUSION

Video Surveillance helps in preventing crime and may aid in the solution of cases. CCTVs add security to premise at the equal cost of storage. If we see the storage required for CCTV camera for 1 day it is close to 3 GB per day. It's not possible for a person to view

such long video and find out mishaps in the system. So we have studied the various approaches for detecting the abnormal activities with its challenges.

This paper presents a high-level overview of the proposed system. It has some objectives like necessity of Smart Storage in today's surveillance. Proactive Notification to security guards and so on. Hence the system employs notification system in case if something goes wrong.

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