TO DETECT ABNORMAL EVENT AT ATM SYSTEMS USING IMAGE PROCESSING AND IOT

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Image Processing, Internet of Things (IoT),Video Acquisition, CNN (Convolutional Neural Network) Algorithm, Frames, Door locker, Buzzer, LCD Display Data Mining, Adafruit IO, Node MCU

Abstract:

Digital image processing has a broad range of applications such as remote sensing, image and data storage for transmission in business applications, medical imaging, acoustic imaging, Forensic sciences and industrial automation and fraud detection investigation. Proposed work is based on image processing and internet of things (IOT), and project is implemented to avoid the robbery caused in ATM systems and also crime cases. Detection of abnormal behavior is an important area of research in computer vision and is also driven by a wide of application domains, such as smart video surveillance. We use the personal behavior model. The main concept of work is to design a model that is based on image processing multiple concepts and to implement some image processing algorithms to examine the abnormal behavioral event detection. Input video is converted into frames before recognizing a abnormal behavior. The project uses IOT server to send indication of the abnormal event happened to authorized users by attached frame where unusual event captured.

Introduction:

Nowadays, ATM are playing a very important role in day to day life as it is available anytime and anywhere, it prohibits to go to bank and waste time there. Automatic Teller Machine (ATM) helps humans for financial transaction emergency.. The project is designed to implement the Digital Image Processing (DIP) module and Internet of Things (IoT) module for security reasons as the robbery, theft, fraud has been drastically increasing. The project usually based on both software and hardware implementation with some amount of accurate results.

Objectives:

The aim of the project is to design and develop a wireless communication link to monitor highly sensitive places that require high security. Following are the objectives of the proposed work-

1. **Design an image processing based solution to detect normal and abnormal events from the surveillance input.**

    The idea of creating such a system was conceived after relative observations of the real life incidents that are happening in and around the globe. The propose a new method to detect abnormal behavior in the crowd scene using multiple behavior models. Each behavior model is based on the information of motion instead of actions or events. The increasing proliferation of the ATM frauds which involves activities like usage of mobile phones, multiple access in the same time is a matter of concern which would be tackled by the proposed system to enable secure financial transaction during anytime of the entire day and night.

2. **Send an alert message after detecting abnormal event using IOT technology.**

    Our proposed ideology is based on this concept to detect the damage exerted on the ATM boxes. To report the damage, this research work utilizes the Internet of Things (IoT) technology, which has worldwide coverage. It is currently the most efficient communication technology. To report the incidence to the authorities, IoT is the best possible solution as it uses internet technology which is already present in the ATMs.

Methodology:

During ATM's transaction processing by a person if his/her intentions are illegal then he/she will try to perform unusual behavior in ATM's. To take it as serious our project is designed to take appropriate action such as locking the door, Buzzer indication, informing to nearby Police station/Authorized users using GSM technology .We propose a new method to detect abnormal behavior in the crowd scene using multiple behavior model. Our behavior model is based on an energy function that expresses the desirability of motion in each location.
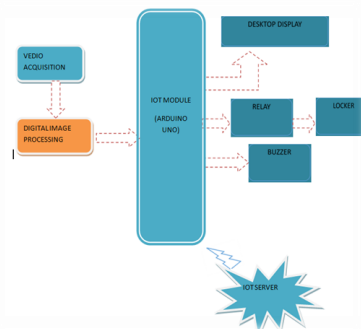
Block Diagram:

Figure 1 Block Diagram For The Project

Figure 1 shows the schematic representation of the components used in methodology. It specifies the various software and hardware components.
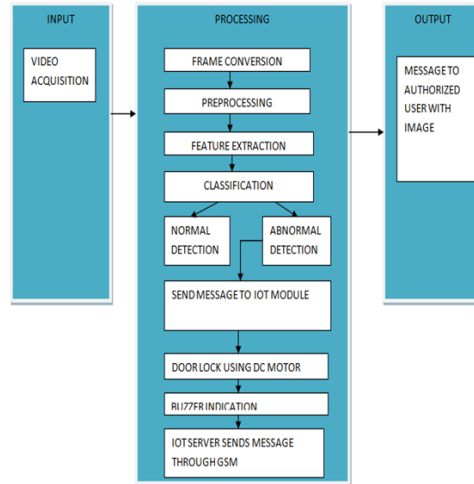
Module Overview:

Figure 2 Module Overview

Input Module:

Video Acquisition: First step deals with capturing the video by any one of the video apprehending devices or a sample video surveillance input.

Processing Module:
There are mainly two modules in processing phase where the procedure of the DIP and IoT is carried out.

Digital Image Processing:
The DIP module is responsible for taking the video as input and processing it to extract features and predict the output using suitable algorithm

Frame Generation: After capturing the video, it is transformed into frames of suitable type so that further processing could be done conveniently.

Preprocessing: Preprocessing means to find out the "point of interest" or differentiating frames of video. These features are consistent over several video frames of the same scene and after the video scene is changed the value of these features are changed. Preprocessing helps in Data Cleaning process such as removal of Noisy Data, removal of Unusual features from the generated frames.

Feature Extraction: Feature extraction is a part of the dimensionality reduction process. The proposed work utilizes CNN algorithm for extracting features from images to train the dataset. Number of features extracted will have appropriate value with it.

Classification: The values generated during the feature extraction taken as Input for Classifier's. In the project we use Convolution Neural Network classification algorithm to describe the actual dataset with appropriate accuracy. The CNN Algorithm uses multiple layers as shown in figure 3.

Abnormal event: When it is declared as abnormal after calculation, Digital Image processing module sends message by appropriate threshold value where abnormal event gets calculated and confusion matrix is generated.
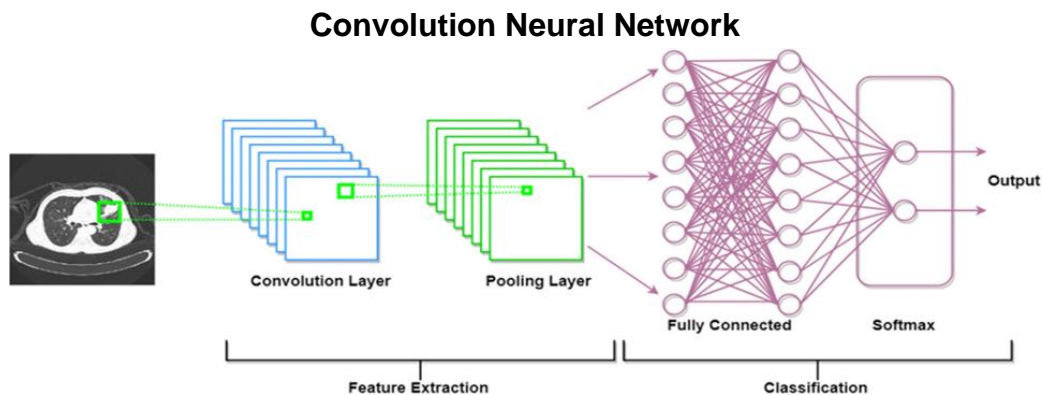

Figure 3 Convolution Neural Network

Internet Of Things (IoT):
When DIP module is sends output about Normal or Abnormal event IOT technology takes it as input to take action. Actuators or components which are used to take appropriate actions helps to catch unusual behavioral person.

Internet of Things (IoT): Message sent by DIP to IOT module results to take action to catch the unusual behavioral person inside ATM. The data which has been processed during whole process carried out is stored in cloud by using Adafruit io platform which continuously monitors the process and transactions.

Output Module:

Door Lock: Door locks using DC motor when Microcontroller indicates to lock the door of ATM through DC motor.

Buzzer indication: After door gets closed the buzzer must be indicated to know that unusual event has happened inside ATM room.

Sending Message to authorized person: Output module elaborates how IOT server uses Node MCU to send message in the form of text when abnormal event is detected in ATM systems to authorized user/nearby police station.

Result and Discussion:
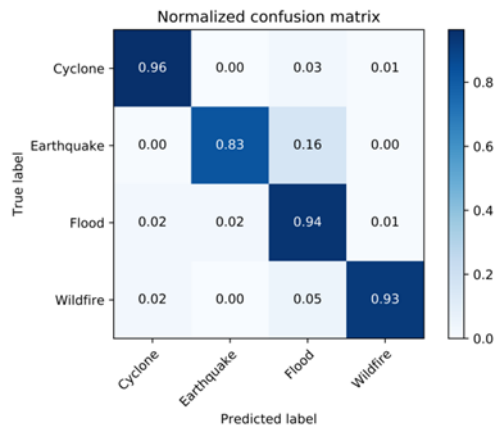The results generated after the process are shown below-
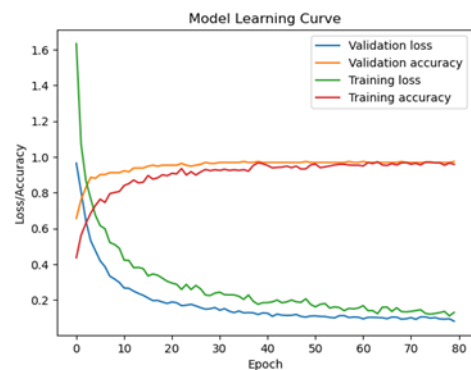

Figure 4 Confusion Matrix

Figure 5 Learning Curve

Figure 6 Probability Of Occurrence Of Normal And Abnormal Event

Figure 7 IOT Design For Implementing Action Against Robbery

Confusion Matrix: Confusion Matrix is generated when appropriate Features are been extracted and epochs for training dataset is been completed. Figure 4 shows Confusion Matrix.

Learning Curve: The Learning curve specifies various loss and accuracy for both Validation and Training the dataset. Figure 5 shows Learning Curve.

Probability Of Occurrence Of Normal And Abnormal Event: Various probability generated during predicting the output and events. Figure 6 shows Probability Of Occurrence Of Normal And Abnormal Event.

Figure IOT Design For Implementing Action Against Robbery: IOT module designed for taking appropriate action against Robbery event. Figure 7 shows IOT Design For Implementing Action Against Robbery.

Conclusion:

An advanced and cost effective approach for ATM security has been implemented. It can be installed in the ATM at some hidden place so that it cannot be approached by thieves. This system is distinctive in many ways from existing ATM intrusion and theft control systems. Existing systems are either very expensive or not reliable. The implemented system is reliable, inexpensive and appropriate.

In the paper, we introduced a method to detect abnormal behaviors in a crowd scene using an integrated multiple behavior model. We showed how our method captured the dynamics of crowd behavior based on the multiple behavior models which consisted of the personal and social model of individuals without individual object tracking or segmentation. The result of our proposed method showed that our method was effective in the detection of abnormal behaviors in a crowd scene. It would be interesting to extend our behavior model by using an explicit model of pedestrian behavior that considers more personal and social property.

Future Scope Of The Work:
1. Automatic Teller Machine (ATM'S) are the main reason for financial organizations of rapid transaction processing , so the security of ATM system are the main concept ,to overcome such concept the criteria for image processing has been implemented so that based on the probability of the moment of a person Abnormal Event can be detected.

2. Digital Image Processing sends the alert message for Internet Of Things (IOT) module to take immediate action.

3. Automatic Teller Machine (ATM'S) are the main reason for financial organizations of rapid transaction processing , so the security of ATM system are the main concept to overcome

with all the theft and robbery. Existing system can be implemented in real time applications to enhance or develop the ATM system Security. Once abnormal behavior is detected, many times researcher's faces problem of mix behaviors when some abnormal crowd behaviors are associated with some others behavior. Those abnormal behaviors are happen at the same time. Examples such as fight causes tumble or panic and tumble causes stampede. This type of behavior is called mix abnormal behavior in which only one behavior is detected and other is ignored.