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Hidden Faces Detection for Enhancing Security at ATMs

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Abstract: ***Automatic Teller Machine (ATM) plays a vital role in our modern economic society. Around 1,30,000 ATM centers are functioning across India. A real-time intelligent video analytics offers advanced monitoring capabilities that gives sophisticated video surveillance to recognize abnormal activities. A person covering his/her face with a scarf, mask or helmet in ATM center is one of the abnormal activity. In such scenario, an automatic face detection algorithm is required to, warn and alert when the person is trying to cover his/her face in ATM. The detection of face is obtained using Deep Learning Convolutional Neural Network (DCCN) architecture such as YOLOv3 that performs very well in the fast detector category when speed is important. The output of the DCCN is then reported to the ATM to take appropriates steps and prevent attacker from completing the transaction. -***

Keywords: ATM, Face Detection, DCCN, YOLOv3

I. INTRODUCTION

In order to provide security and protect ATM machines, it is necessary to employ an automated surveillance system to avoid robbery in ATM. Video records of each camera scene which is fed into the main server, leads to misuse of memory and late reaction to crisis circumstances. Thus, real time identification of abnormal activities is important to take preventive measures against an advancing theft. Even after installing the surveillance mechanism, the robbers cheat the security system by hiding their face using a helmet, mask and others.

The proposed system detects the anomalous situations inside the ATM, gives warning to the user and alarms the authorities. The detection algorithm to handle the hidden faces in this sytem is YOLOv3 .YOLOv3,the family of convolutional neural networks is a state-of-art, real-time object detection system because of their detection speed, often demonstrated with camera fed input. The proposed framework to detect whether a person is wearing helmet or mask. Dataset collection and annotation is the primary step for training an object detection model. The collection of images containing our custom object and annotation means that drawing bounding boxes around the objects using the LabelImg that creates .txt files for the images in YOLO format and it contain corresponding object classes with images. YOLOv3 used a network called Darknet-53 which is used to perform feature extraction.

YOLO takes an image and split it into an S S grid, within each of the grid take m bounding boxes. For each of the bounding box, the network predicts the confidence that the bounding box actually encloses an object, and probability of the enclosed object being a particular class. The bounding boxes having the class probability above a threshold value is selected and used to locate the object with in the image. The proposed system using YOLO captures the human face and check whether the human face is detected properly or not. If the face is not detected properly, it warns the user to adjust his/her properly to detect the face. The warning is given in the form of an audio message. Still if the face is not detected properly the system sent an alert message to the bank authorities through Twilo app.

II. LITERATURE SURVEY

From the first conference paper, Deep Learning for Enchancing Security at ATMs written by the authors K. Bavithra Devi, S. Mohamed Mansoor Roomi, M. Meena, and S. Meghana in 2019 concluded that the system will recognizes a person wearing helmet inside the ATM from the CCTV camera. The detection of helmet is obtained using Deep Learning Convolutional Neural Network (CCN) architecture such as VGGNET (Visual Geometric Group) and ALEXNET. If the helmet is detected, then the image is fed into the RCNN for finding the location of the helmet in the image. Based on the helmet location, the system will find whether the person is wearing or holding the helmet. Suppose if the person is wearing the helmet, the alarm will be generated.

The second paper, Face Detection based ATM Security System using Embedded Linux platform by the authors: Jignesh J. Patoliya and Miral

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M. Desai in 2017 is about a System that was implemented on the credit card size Raspberry Pi board with extended capability of open source Computer Vision (OpenCV) software which is used for Image processing operation. Initially the system captures the human face and check whether the human face is detected properly or not. If the face is not detected properly, it warns the user to adjust him/her properly to detect the face. Still if the face is not detected properly, the system will lock the door of the ATM cabin for security purpose. As soon as the door is lock, the system will automatically generate 3 digit OTP code. The OTP code will be sent to the watchman's registered mobile number through SMS using GSM module which is connected with the raspberry Pi. Watchman will enter the generated OTP through keypad which is interfaced with the Pi Board. The OTP will be verified and if it is correct, then door will be unlocked otherwise it will remain lock.

The third conference paper YOLOv3: An Incremental Improvement by the authors Joseph Redmon and Ali Farhadi in 2018 tells about the YOLO (You Only Look Once) detector. It is a family of convolutional neural networks, fast object detection algorithm and its most recent variation is YOLOv3. It recognizes

80 different varities of videos and images, but most importantly it is superfast and nearly as accurate as Single Shot Multibox .

From these three papers we concluded to make a new system that handles the anomalous situations inside the ATM such as covering the face with mask, helmet, scarf and others. The system uses YOLOv3 and CCTV camera for face detection and capturing images with extended capability of open source Computer Vision (OpenCV) software which is used for Image processing operation. YOLOv3 detects whether the face is present in the input image. If the face is present in the image, to allow for continuation of the transaction. If it is not detected a warning is generated for five seconds to adjust his/her face through speaker. Still the person's face is not detected, alert message is given to the bank authorities through Twilo app.

III. DATABASE

1) *Dataset Collection:* Vision based approaches mainly depends on the image databases. It is essential to analyze object features and to review the performance of detection algorithms. Some database are available for the object, character and scene recognition. But there is no availability of database for person wearing helmet and other things in ATM. So around 2000 images (face and non-face) were collected from internet and some databases.
2) *Dataset Creation:* Face detection using YOLOv3 technique require more number of images for training. To accomplish this a new database is created in this work. Face covering images and without covering images are obtained from Yale Face and Senthil IRTTT databases that consists of 300 images. Images were also downloaded from the internet. The total images are 2000, where 1000 images are face covering images and 1000 images are person without covering face. The collected images were annotated for creating the YOLO formatted images.Dataset collection and annotation is the primary step for training an object detection model. The images were divided into training and testing sets. 70% of the images in dataset were used for the training and 30% for testing.

(a) Face (b) Face

(c) Non-face (d) Non-face

Fig. 1: Sample Images

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IV. OBJECTIVES

The objectives of the proposed system are:

A. To ensure that users of ATM can conduct their transactions safely.
B. To find Imposters under disguise trying to conduct fraudulent transactions which should be immediately and correctly detected and prevented.
C. To find whether the system automatically detects the imposter and avoids the possibility of fraudulent transactions.

V. PROPOSED SYSTEM

This work proposes a computer vision based automated surveillance system. The proposed technique of the system is shown in Fig.2. The system proceeds through the following steps:

1) A CCTV camera captures images which is fed into the pre- trained CNN with YOLOv3 architecture.
2) Then YOLOv3 detects whether the face is present in the input image or not.
3) If the face is detected in the image, further transaction is allowed.
4) If it is not detected ,a warning is generated asking the person to adjust his/her face.
5) Still if the person's face is not detected, alert message is given to the bank authorities.

A. Capturing Images

All the ATMs incorporate a CCTV camera in them which records 247 and capture the footage of their users. We used OpenCV (open source computer vision)which is an open source computer vision and machine learning software library. The library has more than 2500 optimized algorithms, which includes a comprehensive set of both classic and state-of-art computer vision and machine learning algorithms. These algorithms can be used to detect and recognize faces, classify actions in videos and live images. Then the image frames obtained are fed into a YOLO detector for face detection.

B. Face Detection

The image frames obtained from the camera have to be analysed and detected properly. For that,the image frames were fed into an object detector. A popular object detector YOLOv3 was used which accurately helped to detect the abnormal activities in ATM by detecting hidden faces.
YOLOv3,the family of convolutional neural networks is a state-of-art, real-time object detection system because of their detection speed, often demonstrated with camera fed input. YOLO is one of the fastest object detection algorithm. It makes predictions with a single network evaluation which makes it extremely fast when compared to R-CNN and Fast R-CNN. The proposed framework is to detect whether a person is wearing helmet or mask.

C. Convolutional Neural Network

CNN is a Deep Learning algorithm which can take in an input image, assign importance to various aspects/objects in the image and be able to differentiate one from the other. It is a most powerful neural network designed for the input that has an inherent two-dimensional structure like an image.
All neural networks are made up of layers and the information is passed between those layers. CNN is one of the main categories to do image recognition, image classification, object detection, face detection, recognition, etc.

D. YOLOv3

YOLOv3 is the latest variant of a popular object detection algorithm YOLO(You only look once).It is superfast and nearly as accurate as Single Shot Multibox (SSD).
YOLOv3,the family of convolutional neural networks is a state-of-art, real-time object detection system and popular because of their detection speed, often demonstrated with camera fed input. In YOLOv3, a network called Darknet-53 is used to perform feature extraction. It is called Darknet-53 because it has 53 convolutional layers.

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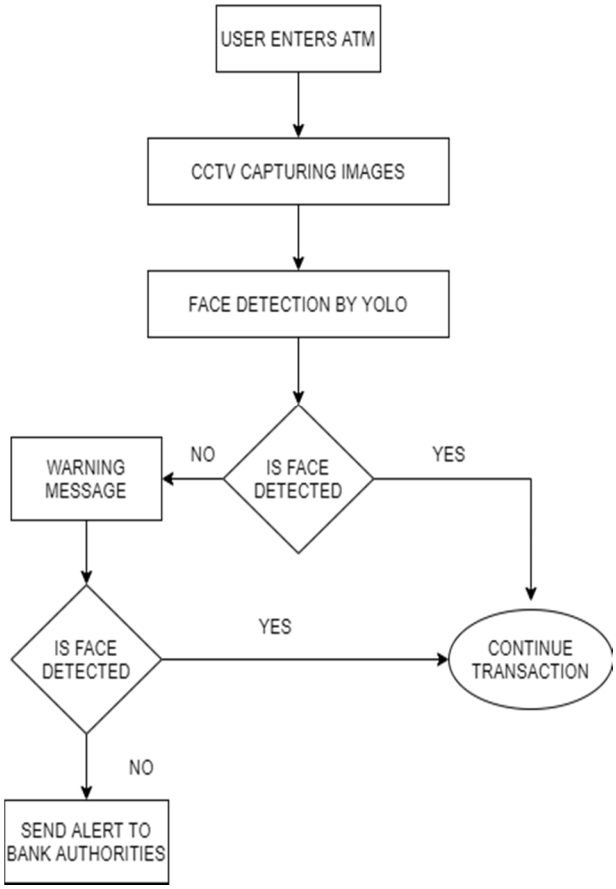


Fig. 2: Flowchart of Proposed System

E. Detection Using YOLO

The annotated image is fed into YOLOv3 which uses a network called Darknet-53 to perform feature extraction. YOLO takes an image and split it into an S S grid, within each of the grid takes m bounding boxes. For each of the bounding box, the network predicts the confidence that the bounding box actually encloses an object, and probability of the enclosed object being a particular class. The bounding boxes having the class probability above a threshold value is selected and used to locate the object with in the image. The following figure Fig.3 shows how YOLO detects objects in an image.

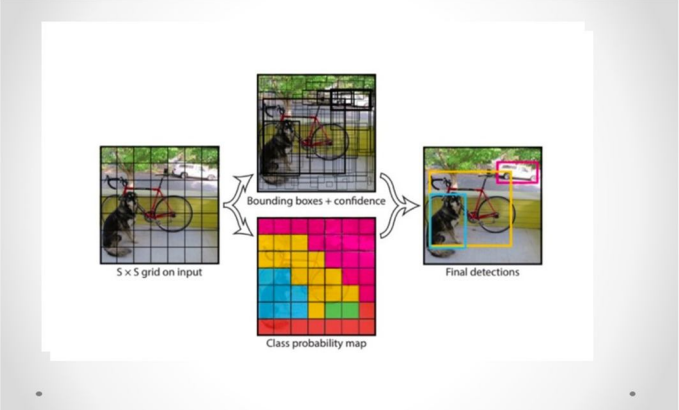


Fig. 3: YOLO Image Detection

F. Warning and Alert System

The output from YOLO shows whether the face is visible or not. If the face is not detected properly, it warns the user to adjust him/her face properly to get detected .The warning is given in the form of an audio message. Still if the face is not detected properly an alert message is send to the bank authorities. The alert message consists of the ATM ID(which is unique to each ATM) and corresponding location. .So when the authorities receive the the sms that contains the ATM ID and location of the ATM, it will be evident that there is a chance for some fraudulent activity and they take the necessary steps. The messages were sent via Twilo app. Twilio is a developer platform for communications. Twilio allows software developers to programmatically make and receive phone calls, send receive text messages etc using its web service APIs.

VI. EXPERIMENTAL RESULTS

The detector of the system,YOLOv3 will detect whether a person entering the ATM is covering his/her face by detecting face and non-face from input images captured by the CCTV camera.

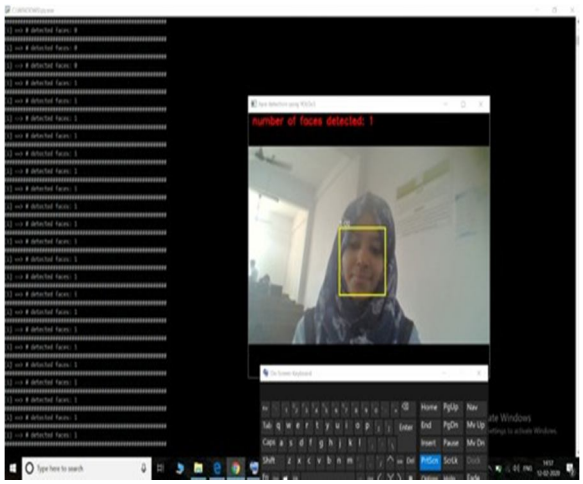


Fig. 4: Face detected with real-time input

A. When Person's Face is detected

If the person enters the ATM without covering his/her face, it is detected by YOLO and he/she can continue the transaction. This is shown as an output in the monitor. The result is shown in figure Fig. 4.

B. When Person's Face is not detected

Inside the ATM,if person's face is not detected, the system will give a 5 second warning message through audio and even after that if no face is detected, an alert message is sent to bank authorities through Twilo app . This message contains ATM id and corresponding location. The process wise results are shown in following figures from Fig. 5 to Fig. 6

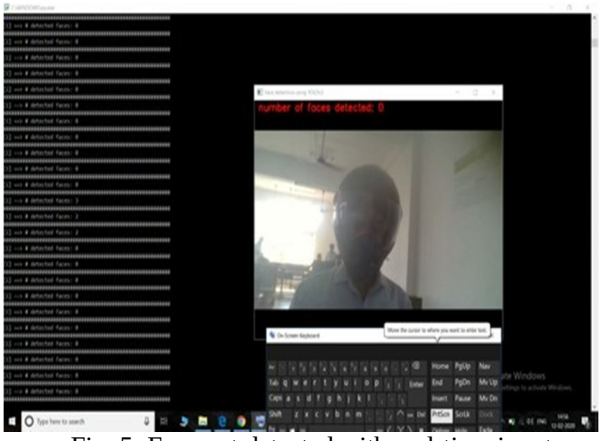


Fig. 5: Face not detected with real-time input

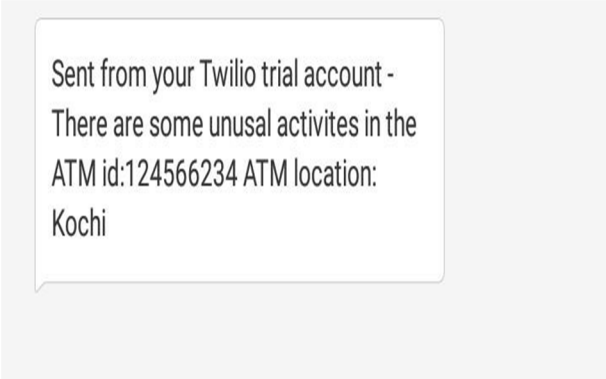


Fig. 6: SMS sent to bank authorities

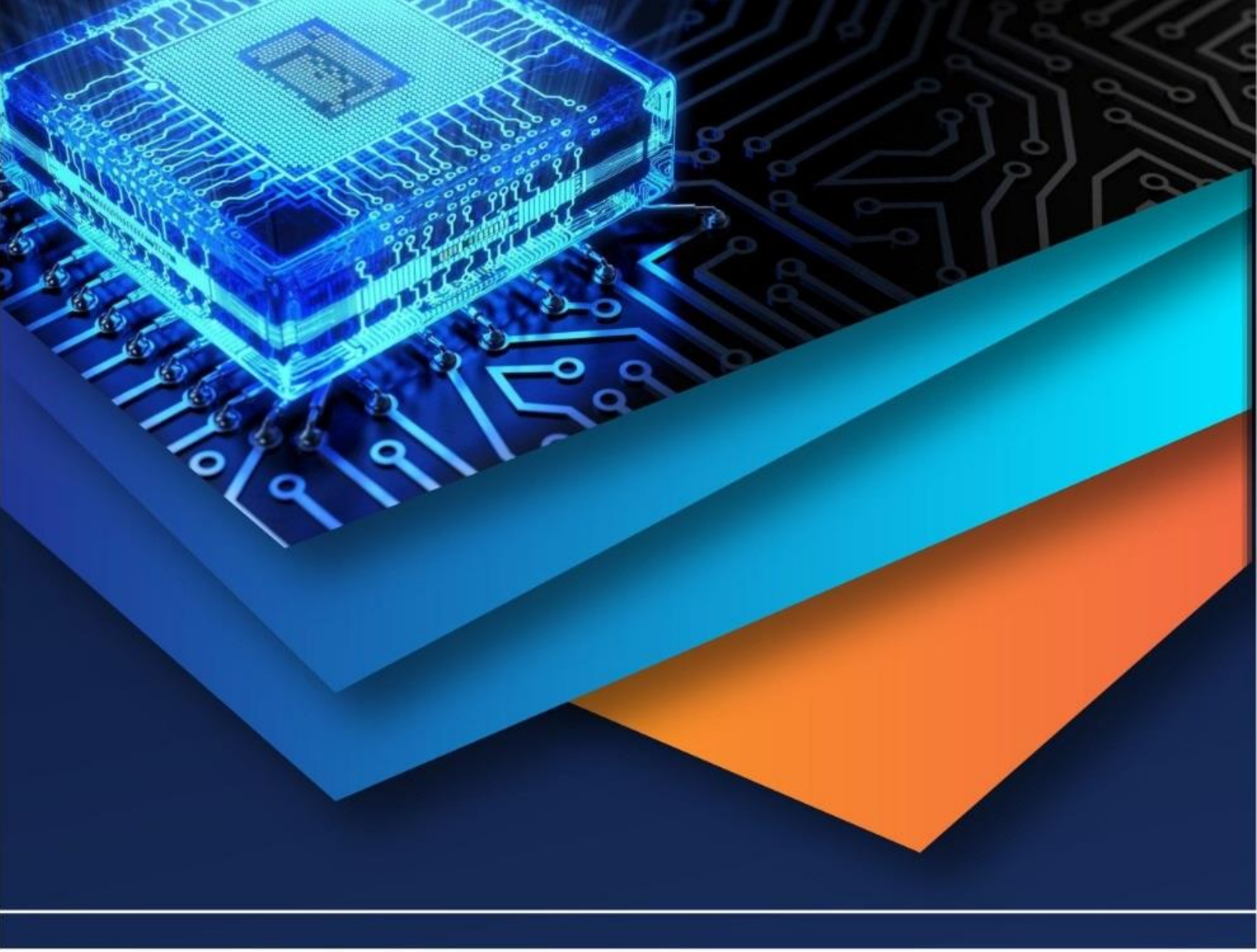
The system was not only tested with real-time inputs. For testing, 500 images(both face and non-face) were used.The images were correctly detected as either Face or Non-Face except 12 images which were blurred. The average time for obtaining output was 20 seconds. It depends on factors such as image resolution, number of faces/non-faces. The Map (mean average precision) of the model was calculated. It is a metric used for evaluating object detectors. It showed that the system was 95% accurate.

VII. CONCLUSION

The proposed system is a real time detection system used to detect anomalous situations in ATMs. The system continuously monitors the users of ATM using a CCTV camera. YOLOv3 is used to detect faces within the images that are recorded by the CCTV camera. The warning system is used to alert the users, if their face is not visible and later alarm the bank authorities. Imposters wearing different types of masks, helmets can be detected. This system hence automatically detects the possibility of occurance of fraudulent activities in ATMs. It makes sure that every user interacting with the ATM shows his/her identity in ATM and security is ensured.

REFERENCES

[1] Jignesh J. Patoliya,Changa Anand,Miral M. Desai(2017),” Face Detection based ATM Security System using Linux Platform “7 2nd International Conference for Convergence in Technology (I2CT)
[2] K. Bavithra Devi, S. Mohamed Mansoor Roomi, M. Meena, Department of ECE Thiagarajar College Of Engineering Madurai, India, ”Deep Learning for enhancing security at ATMs”.
[3] Joseph Redmon, Ali Farhadi University of Washington,”YOLOv3: An Incremental Improvement”
[4] Rupesh Ambatwad , Jaya Dewan, (2017), Helmet and Mask Detection in Videos for Security of ATM Centre , ISSN 23213469.
[5] M.Madhu Smitadey, Swati Sucharita ,(2018), Security Enhancement in ATM Through Helmet Detection Using Inductive Transfer Learning , Journal of Scientific Research Engineering and Technology(JSRET),ISSN 227-0882,Volume 7,issue 4.
[6] Sivakumar T , Design and Implementation of Security Based ATM theft Monitoring system ,International Journal of Engineering Inventions Volume 3, August 2013.
[7] G. Jakeer Hussain PG Scholar (Embedded Systems), Department of ECE, Advanced Anti-Theft ATM Security using Raspberry Pi, International Research Journal of Engineering and Technology (IRJET) Hyderabad, India August 2016.



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