Anti-Raider ATM System Using Mobilenetv2

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ABSTRACT

Cash vending machines are ubiquitous, and although their technology vouches for its security, they are erratically stormed by the raiders. With the escalating crime counts, the raiders are fleeing from justice by virtue of lacking evidence. This research work proposes a computer vision-based anti-raider ATM system. The proposed approach models the image acquired from the CCTVs against the raider images based on the computer vision and deduces the fact from the MobileNetv2 architecture. Once the model identifies the raider, the image is uploaded to the Google Drive, which serves as evidence for the judicial department. The proposed research is modeled against several optimizers, and the result concludes that among them Adam optimizer has excelled in both computation time and accuracy.

KEYWORDS

ATM, Computer Vision, Facial Recognition, MobileNetv2

1. INTRODUCTION

The Automatic Teller Machines (ATM)/Cash vending machines have eased the human life and have played a pivotal role in enhancing the e-Commerce in a nation. According to the (International Monetary Fund [IMF], 2018) data, the total number of ATMs deployed for one lakh persons is given approximately as 16 for Nepal, 20 for India, 95 for China, 124 for Japan, etc for others. This immense number of ATMs not only facilitates in e-transitions but also resulted in crimes related to ATMs like dacoits/robbery/theft worldwide (Federal Bureau of Investigation [FBI],2019). Accordingly (Ministry of Finance,2020), India in the academic year 2019-2020 has seen almost 1092 ATM crimes which is almost 15.10% higher than the 2017-2018 year, but almost 19.23% lesser than 2018-2019 year, because of the increased installations of CCTV coverage based on the circular in the mid of 2019 (Reserve Bank of India [RBI], 2019).

The impact of these CCTVs could be further enhanced with the aid of Deep Learning. The facial recognition can be deployed in those ATMs so that the presence of raiders/burglars could be identified easily before it has been reported by the beholder. As the crime has been documented, the further investigation comes into action immediately as this plays as key evidence in the investigation.

The major contributions of the paper are:

1. Facial recognition of the raider using MobileNetv2 Architecture
2. Aiding the judicial department with the material evidence

DOI: 10.4018/IJSST.287871 *Corresponding Author

The rest of the paper is organized as follows: Section 2 highlights the closely associated research works whereas the proposed architecture is explained in Section 3. The experimental set-up and the information flow are explained in Section 4. Section 5 and 6 elucidates the conclusions as well as future directions of this research work.

2. LITERATURE SURVEY

In (Kim et al., 2005; Yoon & Kee, 2002), the authors have tried to detect the occulted face using SVM which indeed concluded to use more advanced methods for facial detection. In this paper (Derman et al., 2013), in order to overcome the card and/or cash forgetting (CCF) incidents they are implementing the facial detection. In (Li et al., 2017), the facial recognition is used to avoid the anti-shoulder attacks in ATMs.

In (Wang & Siddique, 2020), it makes use of facial recognition for e-commerce in ATMs, which demands the model to be pre-trained by the customer's facial images to authenticate the transactions that are to be taken in place. Also this paper (Joshi & Surabhi Sunil, 2019) has implemented the same for ATM security, using the popular recognition algorithm HoG. These implementations could not be a feasible solution in a developing countries like India, as the customer ratio to banks are going to be in higher in ratio. Hence pre-training the model to detect each customer couldn't hold true for them.

As the real-world could be tricky in predictions, this paper (C. Zhang & Z. Zhang, 2014) mainly concentrated on predicting the face/non-face detections on the FDDB dataset using multi-task learning (MTL) framework, which has used pose estimator and facial landmarks in parallel. It has shown a remarkable achievement in facial detections. After this method, lot of them has started to concentrate on facial landmarks (Çeliktutan et al., 2013), as there is number of variants available that resulted in different performances, as stated in this paper.

From (Li et al., 2017), it is conclude that facial landmark predictions are quite light weight as compared with facial recognitions. Hence, the proposed work deals with facial landmark as opposed to facial recognition.

3. MOBILENETV2 BASED RAIDER DETECTION

The facial recognition tools are used to classify the civilian and the raiders, based on the presence of mask/bandana in the raider, as they use it to a very greater extend. This characteristic of the raider is taken into account for the classification and once when the raider is predicted, the system would immediately upload the raiders frame into the Google Drive, which was owned by the Security Manager of the concern bank. They could later transfer the image for the cops for further investigation. This reduces the delay that usually occurs in first-incident report (FIR) of nocturnal ATM dacoities. The proposed system is depicted in Figure 1.

For the proposed implementation, TensorFlow, an open-source framework for machine learning which provides wrapper functions for Keras, a deep neural network library is been used. Also MobileNetv2 (Sandler et al., 2019) model has been used due to its built-in support for embedded devices like SoCs, mobiles, tabs. The above mentioned Keras framework would provide models which are pre-trained using Google's in-house dataset, Imagenet (Keras,n.d).

4. EXPERIMENTAL SETUP

This project has been implemented using Intel i5 Core with 2GB of RAM hosted with Ubuntu 18.04.04 LTS operating system. It was efficient enough to classify the presence of raider among the real-time frames and the raider predicted frames were uploaded into the Google Drive successfully.