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A Survey On FAScam: FAStag Fraud Detection System

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***Abstract*—The use of FASTag is prevalent in modern society. However, it is clear that the number of FASTag frauds in the global integration and existing protection system is constantly increasing. This is why the issue of FASTag fraud detection is very important. Various FASTag frauds occur and there is no means to detect or prevent them. Among the many frauds, we will try to reduce the fraud where drivers of heavy vehicles issue and use FASTags that are intended for light vehicles. In this way, drivers of heavy vehicles are exempted from paying the higher tolls that are set for heavy vehicles. FAScam is used to solve this problem. The system will be able to identify the type of vehicle and the FASTag amount paid. Using this data, FAScam detects if any anomaly has occurred and alerts the system accordingly.**

***Index Terms*—FASTag, Fraud, Image Processing, RNN**

I. Introduction

As there is an increase in the number of vehicles, the traffic at the toll booths aslo increases. There are long queues on busy highways. Most toll booths are operated manually by an operator in each lane to collect the toll amount. So the National Highways Authority of India (NHAI), a hub, has taken a step to avoid congestion agencies of the Ministry of Road Transport and Highways by introducing "FASTag". FASTag, which uses Radio Frequency Identification (RFID) technology and ensures a seamless movement of FASTag vehicles attached at toll booths. With growing adoption combined with a limited user experience, it's no wonder scammers are launching phishing campaigns using new social engineering approaches.

A. Aim

The aim of this project is to develop a system that can detect the fraudulent Fastag of the vehicle. To build Model which could help in detecting the size of the vehicle.

B. Objective

- To build a hardware system that can be used to detect fraud in the system.
- To build a fining system to deduct money from the FASTags that have committed fraud.

C. Problem Definition

In today's digitized world with everything becoming automated and online, FASTag is a modern digitized way of collecting toll. Though it is a brilliant alternative to the regular method of collecting toll, people have found loopholes in the system and are misusing it. There are different prices for toll for different types of vehicles. But the heavy vehicle drivers are getting away by issuing FASTags for light vehicles and thus paying less toll. Thus we proposed a system to prevent this problem.

D. Project Scope

a) Functional: The functional scope of this project is to make an operative FASTag fraud detection system that can hence be used At tolls to reduce the overall FASTag frauds occurring.

b) Non-Functional: The non-functional scope of this project is to get ease of access for detecting the fraudulent cases of FASTag.

E. Issues/Limitation

- The traditional system was only concerned with the collection of tolls.
- Many frauds were occurring without the knowledge of authorities.
- There are no previous methods used to detect fraud.

II. LITERATURE SURVEY

Detection of FASTag frauds is a complex task, and in today's world, there is no system that correctly predicts if the transaction was fraudulent or not. The key features of a good fraud detection system are:

1) It should be able to accurately identify frauds.
2) It should detect frauds in real time.
3) It should not falsely classify a genuine transaction as fraudulent.

A. Related Work

1) Hrithik, Sushma. I, Ganesh Karthikeya .M, Meghana. T, Anurag prudhvi studied that in India, from manual collection to electronic collection, drastic changes had been made at toll gates. There are more risks with cash rather than digital money. The introduction of a digital payment system laid a foundation for the present toll collection system. When a vehicle is passed through the tollgate, license plate details are retrieved using image processing. With the help of (Open CV) Open Computer Vision and (OCR) Optical Character Recognition, the system can draw out characters from the image that is captured [1].

2) Lakshmi, K. S., Mr Shantanu Paul, and Ms Shreya Anand research demonstrates the value of requiring FASTag in National Highway and Cross Border Toll Collection Centers and presents the real-world situation of how people are adjusting to new technology and how those providing this service are carrying out their daily tasks. The FASTag service has received very positive feedback following a small change in the toll tax collecting method using the RFID system on the toll plaza. This paper will present us the radiofrequency in FASTag, its use of Sun Pass and Eaze Pass, and its benefits and drawbacks. People are now required to adopt FASTag service and utilise the cutting-edge technology because it has become so mandatory. The improvement in pollution control is the prior positive development that one can notice. Due to this, a laborious toll collection procedure has practically been overhauled, making it more simpler for both the general public and the personnel. You will learn more about FASTag when you read the entire document. [2].

3) V and S. P. Kulkarni mentioned that as there is an increase in economic developments and population, the number of vehicles on the roads are increasing too. Which in turn leads to an increase in traffic. Measure need to be taken to reduce this congestion on roads that are caused by traffic. To do this, various parameters come into account such as speed, number of vehicles, and their tracking. These values are calculated based on set threshold values. The results depend on factors like accuracy, segmenting, complexity, and time required for processing [3].

4) S. S. Kalyan, V. Pratyusha, N. Nishitha and T. K. Ramesh proposed that Nowadays, detecting vehicles and classifying them is very essential. It is very important because of its use in many applications including controlling and managing traffic. Considering its importance, an efficient algorithm is proposed to detect vehicles in an image using image processing. The image captures the front view of the vehicles. So, it detects vehicles using the front view. Each vehicle is detected based on its size. Morphological operations are used to remove noise and as well as to adjust images in order to detect objects in an image. The simulation of this algorithm is done using MATLAB software [4].

5) S.Amrin, The author of this paper sheds light on the challenges faced by the conventional toll collection systems in India. It highlights the need for an automated toll collection system like FASTag. The (NHAI) National Highways Authority of India put forward this program to collect Electronic Tolls on the National Highways [5].

6) Neena Sidhu, Akshita Jain, Yashashwita Shukla, T.B. Patil, S.T. Sawant-Patil, India comprises of a large network of roads and transportations that play a major role in developing the nation economically. The current method, that is the manual collection of toll is not an efficient method of managing highway traffic resulting in congested roads and a waste of time and resources. A system is proposed for this very purpose of automatically collecting toll and also verifying documents of the vehicle. It makes use of components such as Arduino Uno microcontroller, (RFID), GSM SIM 800, EM 18 reader, and a computer host. Passive RFIDs are widely used in transportation and in motor vehicles for automated toll collection [6].

7) Priya Thombare Prof. Gunjan Agre, Nowadays, there is an increase in the rush at toll plazas to pay the toll tax. This calls for the need to reduce this traffic jam to save time and also reduce monetary loss. The author of this paper explains a solution to the aforementioned problem, which is automating the process. In this solution, the toll plazas can detect the number plate, debit the amount deducted from the user's account and help find if the vehicle is stolen. This additionally helps in reducing traffic congestion and lowering fuel consumption [7].

8) PSupriya Sutar, Sayali Chopade, Arti Ekadari, Lomesh Ahire, The electronic toll collection technology makes used of RFID and android application. This technology allows users to make the highway toll payments automatically. It will save time as well as money by ameliorating the queues that vehicles have to wait in. The RFIDs like the license plates can be deployed by

the authority each containing a unique identification number and customer details. In this manner whenever the vehicle passes through the toolbooth, the RFID tag will be read and sent to the server for verification. The server will then check the tag and depending upon the type of vehicle, the toll amount deducted [8].

9) Y. Zheng, M. Li. studies that the Fast searching a specific subset in a large number of products with RFID tags is useful for many applications, but it has not been well explored. Since the cardinality of the items may be very high, it may be inherently wasteful to obtain the tag information directly from each of those tags. In order to satisfy the strict delay requirements in developing fast tag searching protocols, this study provides many techniques to address the tag searching efficiency in large-scale RFID systems. In huge RFID systems, the tag seeking problem is clearly defined. We suggest using compact approximators to quickly combine a lot of RFID tag data, then exchanging that data using a two-phase approximation protocol. The suggested two-phase compact approximator based tag searching procedure considerably reduces the searching time compared to any other potential solutions we can directly borrow from prior studies by predicting the intersection of two compact approximators. We also present a cheap input for our tag searching technique called scalable cardinality range estimation. We run in-depth simulations to verify our design. The findings show that the suggested tag searching technique is very effective in terms of both time-efficiency and transmission overhead, which makes it suitable for use in large-scale RFID systems and is scalable. [9].

III. SYSTEM DESIGN

A. Flow Chart

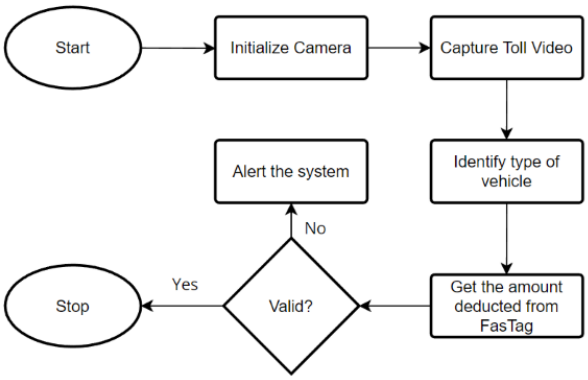

Fig. 1: Flow Chart of System.

B. Block Diagram

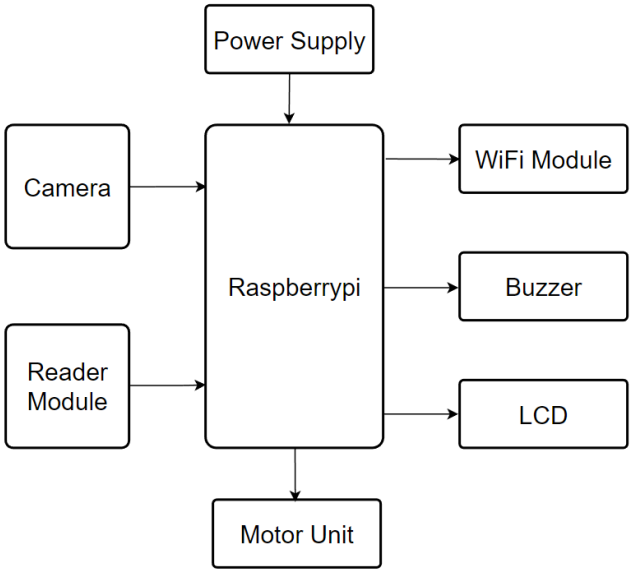

Fig. 2: Block Diagram of System.

IV. IMPLEMENTATION

A. System Requirement

a) Hardware Requirements:

- Raspberry Pi
- Camera Module
- Buzzer
- Motor
- LCD

b) Software Requirements:

- Python
- Raspbian OS
- IDE
- Browser

B. Algorithm

Recurrent Neural Network(RNN) is a form of Neural Network. In this algorithm, the previous steps output is given as input to the current step. Traditional neural networks, the input, and output are independent of each other. The only exception is cases where models have to predict the next word of a sentence. For this case, it is mandatory to remember the previous words. This is where RNN comes in. It cloves this issue with the help of a hidden layer which remembers the information of a sequence. It is the main and most essential feature of RNN.

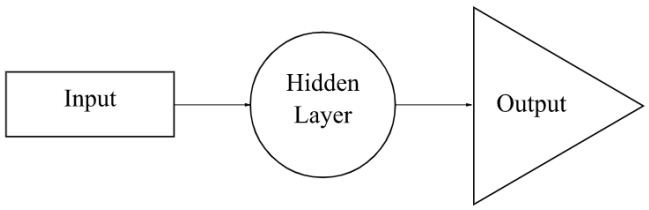

Fig. 3: Recurrent Neural Network.

RNN has a feature that corresponds to human "memory". RNN can remember and recollect all the information that has been calculated. It does the same tasks on all the inputs or hidden layers and hence makes use of the same parameters for each input to generate the output. This aids in simplifying the parameter complexity, unlike other neural networks.

Let's take for instance a deep network with an input and output layer and three hidden layers. Like other neural networks, all the hidden layers will have their own weights and biases. For example, the weights and biases for hidden layer 1 would be w1 and b1. Similarly, for hidden layers 2 and 3, the weights and biases would be w2, b2, and w3, b3 respectively. This means that these layers do not depend on each other and they do not remember the previous output.

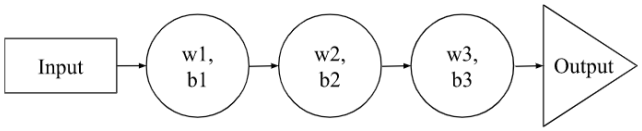

Fig. 4: Working of Neural Network.

RNN will then do the following actions. It will first convert the independent activations to form dependent activations. This step is done by assigning the same weights and biases to all the layers. This step reduces the number of parameters and further simplifies the process. The previous outputs are memorized by giving them as input to the next hidden layer. Through this process, all three hidden layers can be combined together in a way that the weights and biases of all the hidden layers are the same in a single recurrent layer.

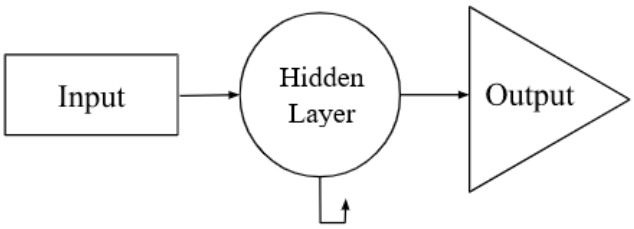

Fig. 5: Working of RNN.

Training through RNN

1) The network is provided with a one-time step of the input.
2) Then its current state is calculated with the help of a set of current inputs and previous states.
3) The current ht then transforms to ht-1 for the upcoming time step.
4) According to the problem, one can go as many times and combine the data from all the previous states.
5) After the completion of all time steps, the ending current state is required to calculate the output.
6) The calculated output is compared to the actual output i.e the target output and the error is generated.
7) The error is then back-tracked to the network to update the weights and finally, the Recurrent Neural Network (RNN) is trained.

a) Advantages of Recurrent Neural Network:

1) An RNN remembers all the information that it gathers through time. Its feature of remembering previous inputs makes it very useful in time series prediction. This is termed as Long Short Term Memory.
2) Recurrent neural networks are also used alongside convolutional layers to expand the effective pixel neighborhood.

b) Disadvantages of Recurrent Neural Network:

1) It has problems like gradient vanishing and exploding.
2) It is a very complex task to train an RNN model.
3) It is unable to process lengthy sequences using tanh or relu as activation functions.

C. Experimental Results

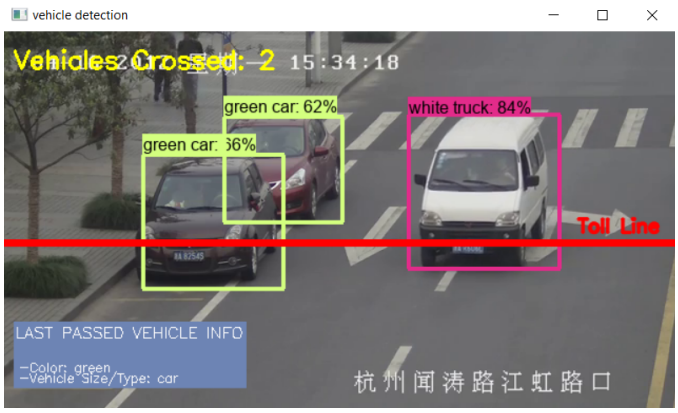

Fig. 6: Experimental results.

In this project we have implemented the software to determine the different colour of various types of vehicles. This is only part of the project as the hardware and other specifications are yet to be added. The current working model detects the colour of a particular vehicle and it's type when it passes the "Toll Line". It also shows the level of confidence given by the percentage. In future expansions, we will add in a camera module to generate real time data and check the toll amount to see if there's any issue when vehicle passes the toll line.

V. Conclusion

The main aim of this project was to design and implement a FASTag Fraud Detection System called FAScam using various technologies such as IoT and Image Processing. The project is partially completed and the rest is to be added in the near future. In this project we successfully implemented the software to determine the colour and type of a vehicle by first detecting the vehicle in the video and determining it's type. Once a vehicle is detected the type of the vehicle is determined with the help of image processing techniques. Thus this project is partially completed and able to display the colour and type of the car with the percentage of accuracy.

Acknowledgment

It gives us immense pleasure to present this report for the project "FAScam: FASTag Fraud Detection System".

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