

AUTOMATED TRAFFIC TICKET CHECKING SYSTEM USING IoT

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Abstract - The objective of the proposed system is to increase the efficiency of Traffic ticket collection. India uses various methods to spot the traffic rule violators from manual capturing of images by the traffic police to the surveillance cameras capturing photos and automatically generating fines in the web portal. Though India is efficient in generating fines it faces difficulty in collecting them. The process of collecting fines is done manually in India with police employed in check posts between streets to stop and check fines of each vehicle. This creates an inefficient system with constant congestion on roads and economical hassle due to the manpower involved. An automated system will reduce the time spent by the police in finding offenders and the organized stopping of vehicles will reduce the congestion in roads usually caused.

Key Words: IoT, LoRa, Traffic System

1. INTRODUCTION

In India 81.9% of the population use private transport for their livelihood [1]. The private transport is overseen by the nation's traffic control department which regulates the registration, pollution control and policing of all vehicles. Traffic fines are a huge part of traffic department's economy as the funds are used to improve and develop the nation's road infrastructure. But collecting fines is a hassle in India as a recent report by The Indian Express states, 68% of all traffic fines in the subcontinent are left unpaid every year [2]. India depends on traffic check posts on busy streets to manually find traffic offenders. This creates regular congestion on roads and inefficiency in finding riders with pending fines.

To overcome such a complication an IoT based automated traffic fine management system is proposed, where the system consists of a traffic ticket generator which uses the registration number of all nearby vehicles to create a list of all the traffic offenders nearby based on the information from the Traffic Authority database. LoRa is used as the transmitter and receiver where the LoRa in the vehicle is used as transmitter of the registration number of the respective vehicle. LoRa in the police check post is used as receiver to retrieve registration number of all the vehicles in a near 2km radius. The registration number is then web scrapped to find its pending fines. A mobile application uses this information to create a list of the vehicles with pending fines with their registration number. The entire system is controlled using an Arduino microcontroller.

2. PROPOSED METHOD

Development of IoT based Traffic fine management system is designed, where every vehicle is equipped with a circuit board which consists of an Arduino Nano microcontroller, an ESP8266 module and a SX1272 LoRa module which is used to transmit the registration number of the respective vehicle in the form of a string. At the receiver end an ESP32 LoRa WAN module is used to receive the string[3]. Once the string is received in the micro controller, the received data is stored in a cloud database with the help of ESP8266. A web scrapping API uses this information to find insights about the respective vehicle from the traffic authority data base. The retrieved information consists of traffic fines on the vehicle, insurance expiry of the vehicle and Pollution under Control certificate of the vehicle.

At the receiver end a police officer can get the details of all the vehicles present in 1km radius. The received details are sorted in the descending order of traffic fine amount. With this information, spotting a fined vehicle will be more efficient and vehicle's insurance and PUC certificate expiry can also be monitored more efficiently[4].

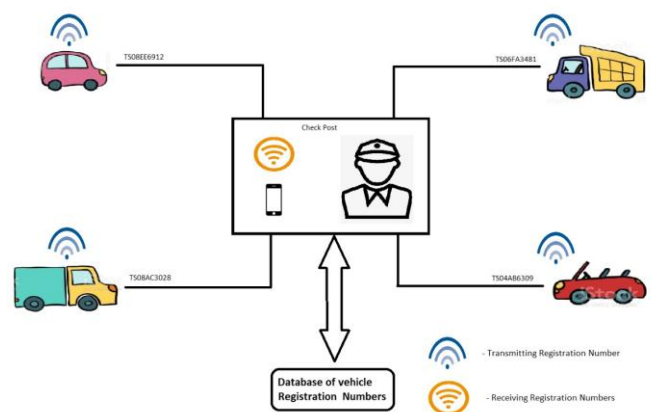


Fig -1: Outline of the Proposed Method

Fig.1 represents the schematic view of the proposed traffic fine management system. Vehicles transmit its registration number which can be received by any check post in 1km radius. The check post uses this information to find the pending tickets from the database of traffic officials.

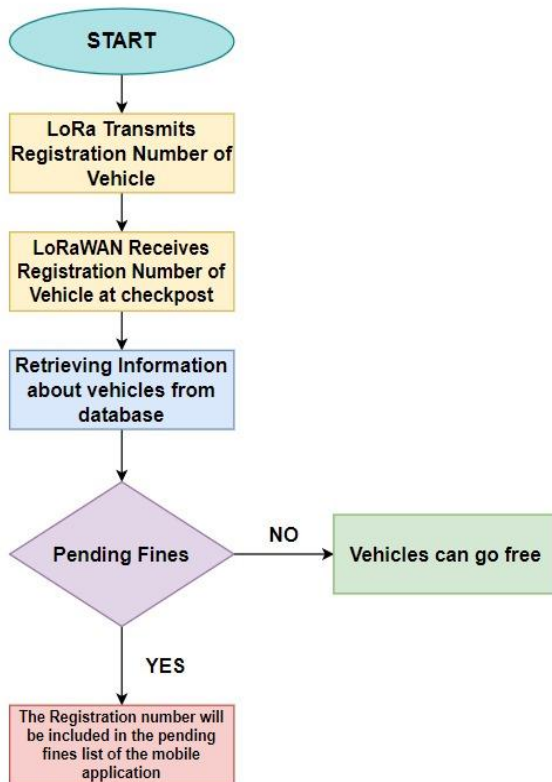


Fig -2: Flow Chart describing the Implementation

Fig.2 represents the step by step process that takes place in IoT based traffic fine management system. The LoRa present in the vehicle transmits its registration number. The transmitted signal can reach up to 1km. Once the signal is received it starts retrieving information about the respective vehicle from the data base. The information consists of all the details of vehicle including the pending fines. If the vehicle has any pending fines then the number will be added to the list of pending fines and the list will be shown in the app in the decreasing order of the fines. If the vehicle doesn't have any fines then the vehicles can go without any interruption.

3. COMPONENT DETAILS

3.1 RF Module:

RF Module (short for Radio Frequency Module) used for wireless transfer of data/information over a certain distance with a working voltage range between 3V to 12V. This module consists of a transmitter and a receiver, fabrication of these modules is done using RF CMOS technology. When mounted to the vehicle, the module provides alerts when the vehicle is in proximity of 10 meters.

3.2 Mobile App:

Users can find the analytics of pending traffic tickets of nearby vehicles and their registration numbers. Fig., The application in developed in MIT app inventor platform and using Firebase as the cloud storage platform. When user desires for fines of all vehicles in a location the app uses the data provided by LoRa WAN of the respective area to create a list of traffic fines of the vehicles by web scrapping the traffic authority internet database.



Fig -3: Mobile Application

3.3 Web Scraper:

Web scraping is a method/process that uses software with bots that extract data from the websites, this software has direct accesses to world wild web using HTP (Hypertext Transfer Protocol) they extract data from this and stores in database. From the content in the database these websites can be entirely recreated. Using WebScraper API pending fines are scraped from traffic department web portal.

3.4 ESP 32:

ESP 32 is a programmable system embedded on a chip microcontroller which consists of a Wi-Fi module and dual-radio Bluetooth. It's a device with minimal cost which is used for monitoring Lora devices, receiving the information and transmitting that data to the cloud [5]. In this a single channel gateway is made completely with use of LoRa-Gateway. Arduino IDE with the ESP32 Arduino Core is used for ESP 32 programming. It is used as a receiver of all the registration numbers of vehicles sent by SX1272 module.

3.5 SX1272:

The SX1272 LoRa module is used to send the data/information at extremely long range its communication spectrum is widely spread with high interference and it consumes very low power. The SX1272 LoRa module uses

the SPI bus. It is used as a transmitter of the registration number of every respective vehicle.

4 Results:

Research at a location with an average vehicle traffic of 500 per day was done and report is generated based on the number of vehicles found with pending fines using the proposed system versus finding vehicles manually.

The chart for plotting differences of old system and proposed system in terms of number of vehicles fined and efficiency is as follows,

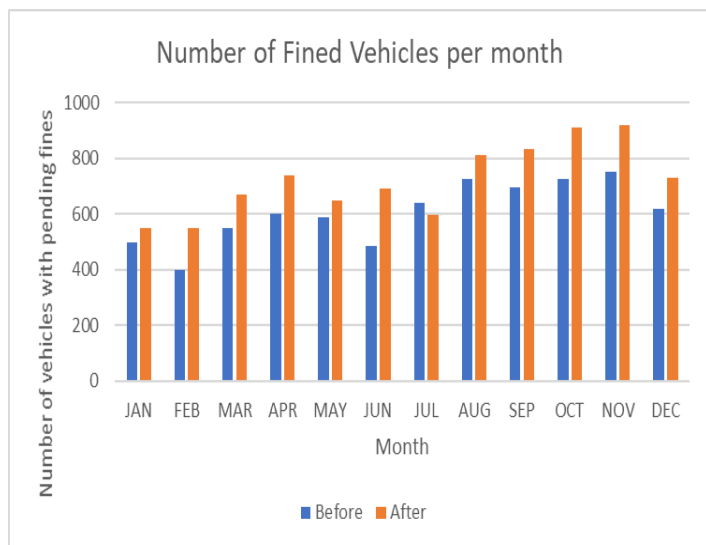


Fig -4: Number of fined vehicles per month

Fig.4 is the comparison of fined vehicles before and after implementation of the proposed method taken every month of the year at a particular check post. The graphs show the increase in number of fined vehicles found when the proposed method is used.

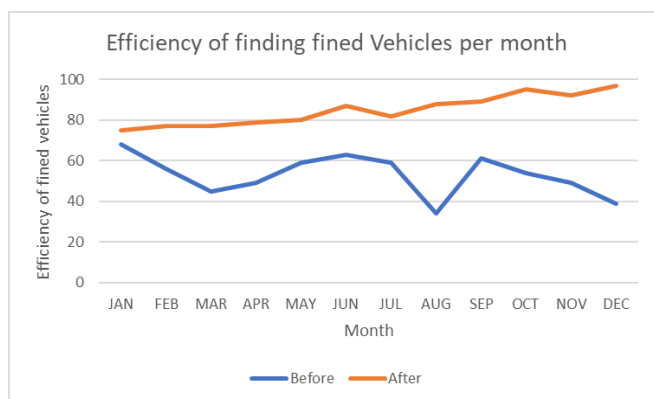


Fig -5: Efficiency of finding fined vehicles per month

Fig.5 shows the difference between the efficiency of finding ticketed vehicles. The graph show that after usage of

proposed method the efficiency of finding fined vehicles increases.

CONCLUSION

An automated system avoids or eliminated the manual load in the traffic ticket collecting system in India. It also acts as a platform where illegal activities such as fake registration, insurance and pollution certificate validity can be regulated. The proposed system also encourages traffic authorities reduce the current load on police check posts. This results in decrease in traffic congestions caused by such check posts.

REFERENCES

- [1] T.Ramachandran: India relies mainly on buses for transportation, but they are being marginalized, The Hindu (2016s)
- [2] Sohini gosh: Traffic rule violators ignore fines worth Rs 60 crores on e-challans in four years, IndianExpress, (2019)
- [3] Ruben M. Sandoval Antonio-Javier Garcia-Sanchez and Joan Garcia-Haro: Performance optimization of LoRa nodes for the future smart city/industry. Sandoval et al. EURASIP Journal on Wireless Communications and Networking (2019) 2019:200
- [4] Oratile Khutsoane1, 2 and Bassey Isong1: IoT Devices and Applications based on LoRa/LoRaWAN. DOI: 10.1109/IECON.2017.8217061
- [5] Jetmir Haxhibeqiri, Eli De Poorter, Ingrid Moerman and Jeroen Hoebeke : A Survey of LoRaWAN for IoT: From Technology to Application. Sensors, 18(11), 3995. doi:10.3390/s18113995 (2018)