Automated Toll Collection System Using QR Code

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Abstract- **The expressway transportation has become more and more important in today's road network and the manual toll collection system has become outdated due to its number of drawbacks. By employing automated toll collection system, driver of vehicles need not to stop at a window or and waste time for waiting in a long queue to pay their toll. This reduces the consumption of fuel; reduce congestion, increase road safety. An Automated Toll Collection System using QR code (ATCS) system is basically designed for an uninterrupted toll collection, which has become an important part of intelligent transportation system.**

Index terms- **Electronic tolling, Arduino, GPS, GSM, ATC, consumption, congestion**

I. INTRODUCTION

Now a days highway plays a vital role in social and economical development, with a development of economy the growth of highway becoming faster. Number of vehicle passing through the toll plaza, a manual system is time consuming thus there is a long queue of vehicle to pass the toll plaza. To overcome the problem of manual toll system we propose an electronic toll collection system. It is a technology for collection of toll should be such as to ensure smooth flow of traffic in efficient and faster way. Automated Toll System is an element of Intelligent Traffic System which allows nonstop toll collection as well as continuous monitoring of traffic. Automated toll system utilizes QR code and an application to uniquely identify each vehicle which automatically collect the toll and provide traffic monitoring and data collection. Functioning of electronic toll collection allow more efficient electronic monetary transaction to take place between a vehicle and toll agency.

The fact that drivers need not to carry any cash is one of the main reasons why electronic tolling system is becoming popular. There are many benefits of using Automated Toll Collection namely; reduce time, reduction in vehicle emissions, increase in lane capacity and convenience to the users. ATC also helps in controlling the level of congestion with more accuracy, by allowing the road users to use dynamic pricing instead of fixed-step toll schedule. Most importantly, the system allows non– stop service to the road users without bothering about toll rates or money change, generated QR is scanned at toll plaza on all the Highways across the country and we save paper as well as fuel. Automatic toll collection utilizes scanning methodology. It contains QR code and scanner, QR can be either active or passive and each QR has a unique identity number.

II. SIGNIFICANCE OF THE SYSTEM

The scanner contains the ability to scan the code that would be received from the customer on his own device. It will be detected by the QR code reader at toll booth, and will be stored with specific user information in database. The gate will open and message will be send to registered mobile number. User can pay toll amount from wallet or bank account at any time. One more facility of detection of stolen vehicle is supported by application. Database contain stolen directory in which stolen vehicle number is stored by the authority. When incoming vehicle data is matched with the authority database then transaction will be cancelled and immediately message will send to registered police station. It is another advantage of this system.

III. BACKGROUND OVERVIEW

A. Existing system

There are two toll collection system are exist: All vehicle has to stop at toll plaza along the highway to pay the toll, one person collect the money and issue a receipt, after which gate is opened either mechanically or electronically for the driver to get

through the toll plaza. Another is smart card system in which driver show a smart card to access the data to the system installed on toll plaza to pass.

B.   Drawback of existing system

The above system for collecting toll tax is time consuming method; there is long queue of vehicle at toll plaza chances of escaping the payment of toll tax.

IV. PROPOSED SYSTEM

By employing automated toll collection system, driver of vehicles need not to stop at a window or and waste time for waiting in a long queue to pay their toll. This reduces the consumption of fuel, reduce congestion and increase road safety.

Automated Toll Collection (ATC) system is basically designed for an uninterrupted toll collection, which has become an important part of intelligent transportation system. Thus overcoming the disadvantages we come up with this idea.

V. LITERATURE SURVEY

1. A Comparative Study of Toll Collection Systems in India

The RFID Readers mounted at toll booth will read the prepaid RFID tags fixed on vehicles' windshield and automatically respective amount will be deducted. If the tag is removed from the windshield then cameras fixed at two sites at toll plaza take snaps of the front and back number plate. Since every vehicle registration ID is linked to users account, toll can be deducted from the account bank directly.

2. GPS Based Automatic Toll Collection System

The requirement for vehicles to halt for toll fee payment results in traffic congestion and reduces fuel efficiency. In this paper, hardware and software designs were involved to develop a GPS-based highway toll collection system. The system utilised the Raspberry Pi 2 as the microcontroller. Additional electronic modules such as GPS module, LCD module, speaker, wireless Wi-Fi router modem and wireless Wi-Fi adapter were included to perform specific tasks. The system utilised GPS coordinates to track vehicle and toll fees were incurred at predefined points.

3. Automated Toll Management System Using RFID Technology

This paper entitled electronic toll collection system based on Radio Frequency Identification System explained in detail based on current issue toll collection system. There are some obstacles faced every day where the users spent their valuable time in queue at tollgate due to traffic congestion as well as using traditional manual method in most existing toll ETC system to collect toll from road users.

VI. MODULE DESCRIPTION

In this "Automated Toll Cash Collection Using QR Code" the user has to first register to the toll system as a user. For the registration the user has to register it with his name, phone number, and number of his/her car. After this process it will retrieve a QR-Code with its number that would be unique for every user. When the user is on the toll plaza, he just needs to scan his QR-Code on the scanning device. After scanning the QR-Code Card it will retrieve the number of the user and deduct the amount from the account.

Step 1: Register

Step 2: Select your route and the vehicle type, ID before you reach the toll plaza.

Step 3: Select the transaction wallet for paying the amount for required route you have selected present in the application itself.

Step 4: After the selection QR code will be generated that you have to scan at toll plaza.

Step 5: When you reach the toll plaza scan the QR code generated in your mobile while   paying and proceed.

Step 6: The money will be transacted to the server after the scanning of QR code
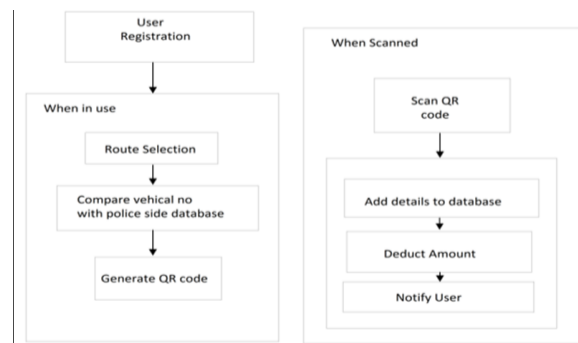
VII. OPERATIONAL FLOW CHART of SYSTEM

Fig.1. Flow chart of ATC system

VIII. PROPOSED SYSTEM MODULES

A. QR-code

A scanner can scan the image of the QR code to display information of a particular user . QR codes also may be linked to a location to track where a code has been scanned. The format information records two things: the error correction level and the mask pattern used for the symbol. Masking is used to break up patterns in the data area that might confuse a scanner, such as large blank areas or misleading features that look like the locator marks. The mask patterns are defined on a grid that is repeated as necessary to cover the whole symbol. Modules corresponding to the dark areas of the mask are inverted. The format information is protected from errors with a BCH code, and two complete copies are included in each QR symbol. The message dataset is placed from right to left in a zigzag pattern. In larger symbols, this is complicated by the presence of the alignment patterns and the use of multiple interleaved error-correction blocks. We will store the entire information of a particular user at each particular QR-code. When we will scan a QR-code we will be able to access the information which is needed for the further process.
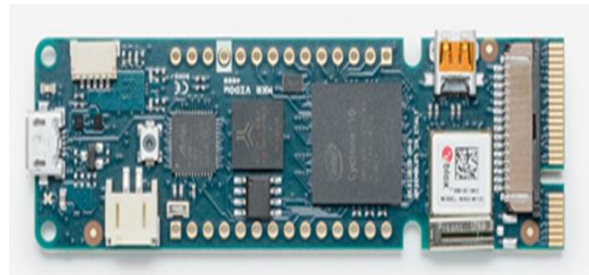

Fig 2. Arduino mkr Vidor 4000

B. QR-code Scanner

A simple QR-code scanner can be made up by using a small motherboard and a camera. A camera will capture the QR-code and the small motherboard will recognition the QR-code capture by the camera. The Arduino MKR Vidor 4000 is a new kind of development board which combines the high performance and flexibility of an FPGA with the Arduino's ease-of-use in a small form factor that is the distinctive trait of the MKR family of boards. It contains the Microchip SAMD21 micro controller and a Cyclone 10 FPGA. This board hosts a number of features: onboard 8 Mbyte SDRAM, 2 Mbyte QSPI Flash (1MB for user applications),

Micro HDMI connector, MIPI camera connector, Wifi & BLE powered by U-BLOX NINA W102 module, the classic MKR interface on which all pins are driven both by SAMD21 and FPGA and a MiniPCI Express connector with up to 25 user programmable pins. The OmniVision OV5647 is a camera module with features of fixed focus 5 megapixel CMOS sensor that provides a maximum 2592x1944 resolution and connects to the Arduino board via the CSI2 bus using a ribbon cable. With the help of OmniVision OV5647 is a camera module we can easily capture the QR-code and send it to the Arduino MKR Vidor 4000 module. Arduino MKR Vidor 4000 module will decode the received data and passed to the host computer
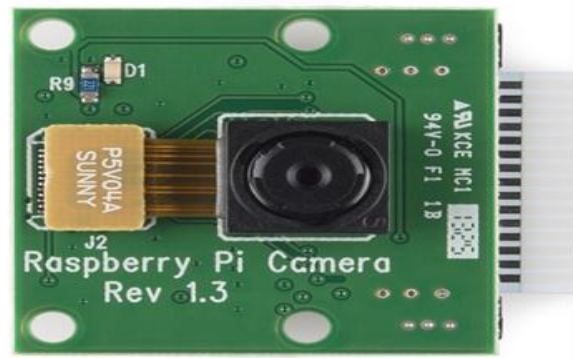

Fig 3.Raspberry Pi Camera Rev 1.3

IX. COCLUSION

In this article, we have discussed about Automated toll collection system using QR code. The camera automatically detect the identities of the vehicles, reading items in motion and tracking of the vehicles can be done accurate. With the elimination of human interaction in the entire toll collection process and also reduction of time at toll plaza, we can create a better ATC system to be implemented. It can also significantly improve the efficiency of toll stations and the traffic solution of the toll road. Using this technology it can provide new capabilities as well as an efficient method to collect, manage, disseminate, store, and analyze information. It also eliminates manual data entry, system improves the better management, leading to lower operational costs and increased revenue generation.

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