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ELECTRONIC TOLL IMPLEMENTATION WITH AN APPLICATION DEVELOPMENT

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Abstract— **This paper focuses on the developing an Android application for purchasing a toll ticket beforehand. Today, because of the expansion in the Automobile industry, there is a considerable measure of waiting activity at the toll stalls. The principle explanation behind this movement at the toll stalls is because of the manual working of the toll impose accumulation of vehicles. Every vehicle on a average needs to stop at the toll stall for about a minute or two for purchasing the toll ticket. With a specific end goal to diminish this activity, we chose to deal with the development of a project which lessens the manual work. We chose to build up a task which permits the vehicles just to go through the toll stall without the need to stop. This will increase the speed of the vehicles that passes through the toll and enables them to go through the stall without halting and furthermore will decrease the manual work and subsequently lessening the long queues that are caused by the toll booths.**

Index Terms— **Microstrip filter, Stepped Impedance Resonator, Ku-Bandpass Filters**

I. INTRODUCTION

Our life is changing at a quick pace and the part of automation in our everyday life is expanding at a quick rate. "Automation" it is the motive behind our project. As the days go on the quantity of vehicles on the move is growing because of which the street condition is being depleted. The government allot funds for the repairs to the roads caused and the source of these funds come from Toll Station. In the present period of innovation, where machines are by and widely utilized as a part of the considerable number of fields we are attempting to be in parallel with the upcoming technology. Today a person has to travel long distances into vast unknown territory into immensely obscure regions for employment, business, or even for tourism. As the number of vehicles increases, roads fall shorter, nowadays we see frequent traffic jams or long queue at the toll stations wait for paying the toll. Paying the toll each time through cash or card takes a lot of time. And today Time is more precious than money . Therefore, our project is aimed at reducing the time consumed for manual transactions and human effort.

A. *Concept of Toll Stations*

A toll street, otherwise called a toll way or toll pike, is a street for which a driver pays a toll (that is a charge) for utilization . Correspondingly, there are toll bridges and toll tunnels. Non-toll streets are financed utilizing different sources of income, most ordinarily gasoline tax or general tax funds. Tolls have been put on streets at different circumstances ever, regularly to create reserves for reimbursement of toll income bonds used to fund development and activity. Tollway, is an open or private street for which an expense (or toll) is surveyed for the section. It is a type of street evaluating normally executed to help recover the cost of street construction and maintenance.

Two varieties of toll streets exist, obstruction (mainline) toll plaza and entry/exit tolls. On a mainline toll framework, all vehicles stop at different areas along the interstate to pay a toll. While this may save funds for the absence of need to build tolls at each exit, it can cause lots of movement clog, and drivers could avoid tolls by driving through them as the ways out don't have entryways. With entry/exit tolls, vehicles gather a ticket when entering the expressway, which shows the passages it will pay when it exits, expanding in cost for separate voyaged. Upon exit, the driver will pay the sum recorded for the given exit. Should the ticket show a travelling infringement or be lost, the driver would commonly pay the maximum sum workable for going on that highway. Current toll streets regularly utilize a mix of the two, with different passage and leave tolls supplemented by infrequent mainline tolls.

II. RELATED WORK

A complete RFID system consists of a transponder (tag), reader/writer, antenna, and computer host. The transponder, better known as the tag, is a microchip combined with an antenna system in a compact package. The microchip contains memory and logic circuits to receive and send data back to the reader. These tags are classified as either active or passive tags. Active tags have internal batteries that allow a longer reading range, while passive tags are powered by the signal from its reader and thus have a shorter reading range. Passive RFID has no internal power source and use external power to operate.

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These tags are powered by the electromagnetic signal received from a reader. The received electromagnetic signal charges an internal capacitor on the tags, which in turn, acts as a power source and supplies the power to the chip [1].

Drawbacks of RFID:

RFID proves to be too expensive for many applications as compared to other tracking and identification methods, such as the simple barcode [2]. It is difficult for an RFID reader to read the information in case the tags are installed in liquid or metal products. The problem here is that, liquid and metal surfaces tend to reflect radio waves, which makes the tags unreadable. In such applications, they have to be placed in various alignments and angles for taking proper readings, which may be too cumbersome and time-consuming.

Interference has been observed to take place in RFID systems, when devices such as forklifts and walkies-talkies are in the vicinity. The presence of mobile phone towers too has been found to interfere with these radio waves. The retail sector giant Walmart, which has installed billions of RFID tags in their products throughout the world, have reported such problems in their systems.

RFID signal frequencies across the world are non standardized. For instance, the US and Europe have a different range of frequencies at which RFID tags function. This makes it mandatory for international shipping companies and other organizations to be aware of the working pattern in other nations.

III. LITERATURE SURVEY

[4] Automatic license plate recognition (ALPR) plays an important role in numerous real-life applications, such as automatic toll collection, traffic law enforcement, parking lot access control, and road traffic monitoring ALPR recognizes a vehicle's license plate number from an image or images taken by either a color, black and white, or infrared camera. It is fulfilled by the combination of a lot of techniques, such as object detection, image processing, and pattern recognition. ALPR is also known as automatic vehicle identification, car plate recognition, automatic number plate recognition, and optical character recognition (OCR) for cars. The variations of the plate types of environments cause challenges in the detection and recognition of license plates. The license plate extraction stage influences the accuracy of an ALPR system. The input to this stage is a car image, and the output is a portion of the image containing the potential license plate. The license plate can exist anywhere in the image. Instead of processing every pixel in the image, which increases the processing time, the license plate can be distinguished by its features, and therefore the system processes only the pixels that have these features. The features are derived from the license plate format and the characters constituting it. Two methods are used to extract the image License Plate Extraction Using Boundary/Edge Information and License Plate Extraction Using Global Image

[5] Tag collection is one of the major functions in radio frequency identification (RFID) systems. ISO/IEC 18000-7 defines the tag collection algorithm using the anti-collision algorithm, based on the framed slotted ALOHA for active RFID systems, but it has efficiency problems that reduce tag collection performance.
It focuses on improvement of tag collection performance in active RFID systems that comply with ISO/IEC 18000-7. To overcome the efficiency problems and improve tag collection performance, two mechanisms are provided: (1) a new slot size decision mechanism to allow the reader to choose the optimum slot size flexibly and (2) a broadcast-based sleep mechanism to put collected tags to sleep effectively. These mechanisms require modification of the standard tag collection algorithm so that they can be readily applied to standard-compliant active RFID systems. But the proposed system is not a cost- efficient way. This method requires the installation of RFIDs on everyone's car which increases the cost.

IV. PROPOSED TECHNIQUE

Each user should register their account with details like name, address, phone number, vehicle registration number and email id in the android application for a mobile device. The user is required to enter his starting point and ending point of travel, the application finds the shortest path and then displays the number of toll stations in that path respectively. The user can choose between single trip or round trip, and then the toll stations along with their price and the total price of all the toll stations are shown.
It can be paid with the help of PayU money, the application uses PayU money for a secure transaction. As the vehicle passes through the toll station the cameras set up there will use an image processing technique to get the characters on the number plate of the vehicle. This captured data and the data in the database which consists of the details of the registered users are compared with the help of a microcontroller. The microcontroller processes this information and indicates the result with the help of a LED where green represents that a registered user has passed and has a successful toll payment and red would indicate failure of payment. The proposed system uses separate lanes to avoid traffic congestion and confusion for

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the travelers. There would be a manual toll collection for the unregistered users to pass through

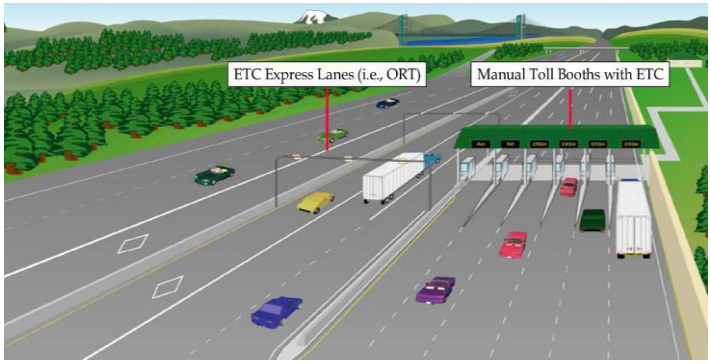


Figure 1: An image of the proposed system

V. METHOLOGY

The various tools that are used in this application development are as follows:

- Android SDK
- Java SDK
- ADK manager
- Google Map' s API

An application is certainly developed by coding both front end and back end.

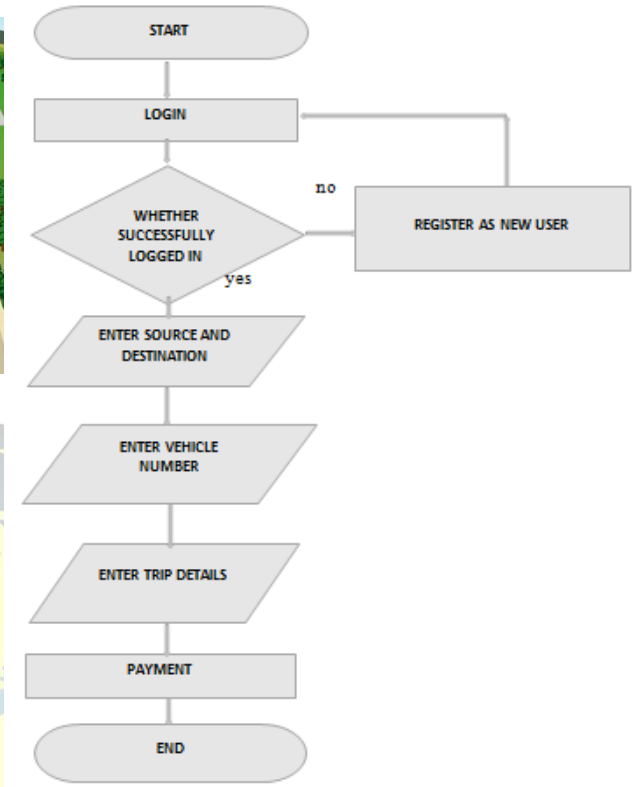
This is done using various coding languages that are available. The languages that are used in this project are

- JAVA
- XML
- SQL
- VISUAL BASIC

The whole process is divided into three modules (1) Android application, (2) Image processing, (3) Integration and comparison of data.

A. Android Application Development

Android is a mobile operating system developed by Google, based on a modified version of the Linux kernel and other open source software and designed primarily for smartphones and tablets. In this project, the Android application was developed using an Integrated Development Environment [IDE]. Android Studio is the officially integrated development environment (IDE) for Google's Android operating system, built on JetBrains' IntelliJIDEA software and designed specifically for Android development. It is available for download on Windows, MacOS and Linux based operating Systems. It is a replacement for the Eclipse Android Development Tools (ADT) as primary IDE for native Android application development



The main concept of this application is to get the user details, their vehicle number and to allow them to purchase the toll gate tickets in advance.

It has the following pages:

Login in : This page enables the user to sign in to the application. This uses email id and password as login details. If these details don't match, then the user cannot proceed with the application. This gives the user their privacy and security. If the user is not an existing user, then it allows the user to register their personal details and become a user.

Register page : If the user is not an existing user, then this page allows the user to register with the application by entering their personal details. These personal details help us to have a track and to identify the user in case of an emergency.

Trip details: After the successful login, the user will be directed towards the page which allows them to select their journey details and to give their vehicle details. Then the

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user has to select their source and destination. From the information given by the user, the desired route for the journey will be selected and then all the toll booths available on that route.

B. Image processing

Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be an image or characteristics/features associated with that image. Nowadays, image processing is among rapidly growing technologies. It forms a core research area within engineering and computer science disciplines too.

In this project, OCR to recognize the data from the capture imaged and segment them separately for further processing. Recognizing text in images is useful in many computer vision applications such as image search, document analysis, and robot navigation. The OCR function provides an easy way to add text recognition functionality to a wide range of applications.

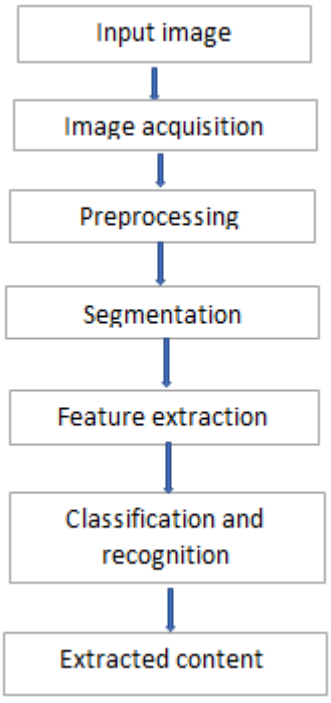

Figure 2. Extraction process flow digram

2.1 Extraction

A scanner generates an image of the paper document and the text is intelligently "extracted" from that image. The document is read by the scanner. This device acts as the "eye" of the computer and sends it to the image. At this step, the document image is only a meaningless cloud of intense points, "pixels", on a lighter background. Intelligent binarization routines convert color and grayscale images into black-and-white images. Page analysis comes next: the zones of interest to be recognized marked on the scanned page. A page may contain a big title, several text columns, two photos, a table and a footer. The OCR software extracts text information from the black-and-white pixels of the selected zones: it recognizes the shapes and assigns characters. This is done in several steps .

2.2 Segmentation

The next step in the OCR process after the line segmentation, word, and character segmentation isolate one word from another and separate the various letters of a word.

In most cases, separating words is not that hard. There's always a distinct white space between them. (Which means that a word often includes a punctuation symbol.)

The horizontal space between words in a line is called "interword space". Which leads us to the phenomenon of justification: typographists adjust the interword space and the inter-letter space to achieve justification. The space between the letters in a word ("inter-letter space") on the 4th line is bigger than the space between two words ("interword space") on the 3rd line.

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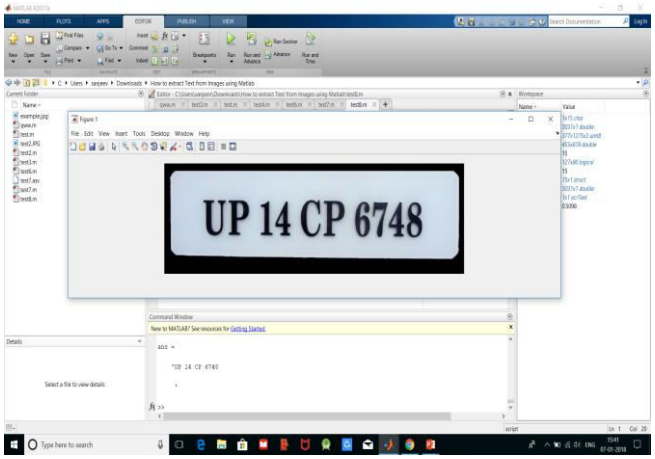

Figure 3. Output of the processed image

VI. INTEGRATION

The third step is to integrate the above two process . Comparison is done between the number plate data that has been acquired form the application and the content that has been captured and processed. If both of them match ,then the vehicle is allowed to pass through else it is not allowed to pass through.

VII. CONCLUSION

The proposed system can successfully implement electronic toll collection with the help of an android application. The technique is based on quick image processing technique which eliminates the possibilities of a lag in computation. Hence this system is well suited for real-time application, this technique also serves as a lost cost technique and can be implemented with a minimal installation of new hardware.

To add on to this work the algorithm can readily be implemented using dedicated image processors to improve the compactness and speed so that these modules can easily be placed on the highways.

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