

Automated Bus Ticketing System using Android Application

S.Venkatraman¹,

R.Gnana Shankar², Cherukuru Chalapathi³

Department of Electronics and Communication Engineering, Vel Tech, Chennai.

¹gnanashankar555@gmail.com, ²c.chalapathy005@gmail.com

Abstract- Android is a slanting working framework utilized as a part of android telephones. It controls in excess of billion cell phones and tablets. Today, state governments are facing financial crisis in running the city buses due to the hike in petrol price and increasing demand of salary increment of bus employees. To add injury to the insult, there are many incidents where bus conductors are cheated by the passenger. The objective of the project is to implement the ticket booking in city buses using android app without the need of bus conductor. It also focuses on minimizing the expenses of the government on the city buses by reducing the need of bus conductors and checking officers. The ticket's QR code is scanned before the passengers boarding the bus and thereby malpracticing is prohibited. By implementing automation in the issuing of tickets in city buses, it can later be implemented in mofussil buses also.

Keywords—Android; QR Code; Bluetooth

I.INTRODUCTION

Mechanical advance does not stop. Beginning late, a frequently growing number of creative things and actions show up in our life. This happens in every float of our life. Android is the winner among the most important zones in the field of headway.

Android is a smaller working framework made by Google, in light change of Linux bit and other programming language of the open sources and shaped on a very basic level for touchscreen PDAs, for example, smartphones and tablets. Additionally, Google has made Android TV, Android Auto and Android Wear, each with a specific user interface. Assistance of Android is additionally used on redirection supports, cameras, PCs and many other different gadgets. Android's architecture is shown in fig. 1.

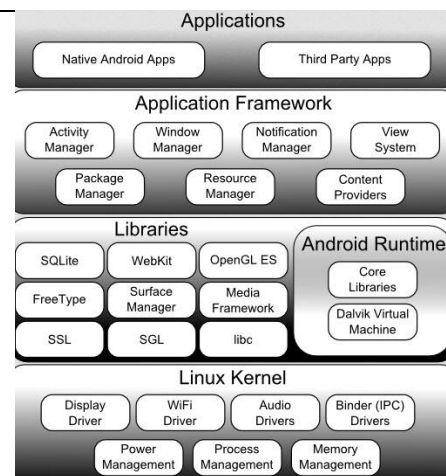


FIG.1 ANDROID ARCHITECTURE

Android has been the highest point of the line OS worldwide on mobile phones since 2011 and on tablets since 2013. As of December 2017, it has more than two and half billion month to month dynamic clients, the best exhibited working structure, and starting at 2018, the Google Play store consolidates more than four million applications.

At first made by Android Inc., which Google obtained in 2005, Android was uncovered in 2007, with the principal business The working framework has since experienced assorted basic discharges, with the present understanding being 8.1 "Oreo", discharged in December 2017.

II. EXISTING PROBLEMS

The cost of the bus ticket has hiked manifold in recent times. This is primarily due to the budget crisis of the state because of the hike in petrol and diesel prices and the hike in the salaries of bus drivers and conductors. The price of the fuels cannot be controlled by ordinary man of society but the government can take actions against them.

Besides, issuing of tickets takes some time and delay occurs primarily during the peak hours of the day. For this reason, bus drivers have to park the buses aside until the tickets for the passengers are issued by the conductor. The schematic diagram of conductor and his ticketing machine is shown in fig. 2.



FIG.2 SCHEMATIC OF EXISTING SYSTEM

The passengers can cheat the bus conductors by giving fake notes or by not giving the right amount for the ticket. Alternatively, bus conductor can also cheat passengers by not issuing the right ticket or by not returning the right change for the amount given by the passengers.

Additionally, some people may travel only for upto two or three bus stops and get down by travelling in the footboard. The people travelling in the road and the other passengers in the bus are also getting affected by this act.

III. PROPOSED METHOD

In order to overcome all these problems that are being faced in the city buses, automation in the issuing of bus tickets is implemented using the Android technology. This technique allows the passengers to take the tickets by themselves in their smartphones. In this way, government can minimize their expenses by reducing the need of employing bus conductors.



FIG 3. USER INTERFACE OF THE ANDROID APPLICATION



FIG 4. QR CODE GENERATION

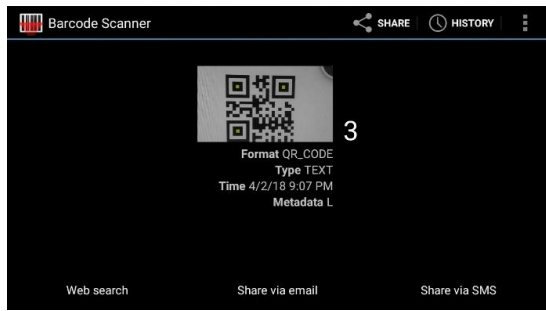


FIG 5. QR CODE SCANNING RESULT

By using the android application as shown in fig.3, passengers can select the destination they need to reach and book the ticket. The android application is enabled with location services and therefore the boarding location can be obtained without any error. The ticket is booked in the application after entering in the destination, number of passengers. The ticket is accompanied with QR code as shown in fig. 4 which contains the information regarding the journey. The QR code is scanned at the entrance of the bus using a smartphone or tablet and shared to the microcontroller via Bluetooth. After scanning the QR code as shown in fig.5, the passengers can board the bus. To check whether the right number of passengers is boarding the bus, a smartphone/tablet is connected through Bluetooth to the microcontroller PIC16F877A with IR sensor, Bluetooth and buzzer as shown in fig.6. The IR sensor checks whether the passengers are boarding as the same number specified in the ticket. If not, the buzzer starts to buzz and alerts the driver.

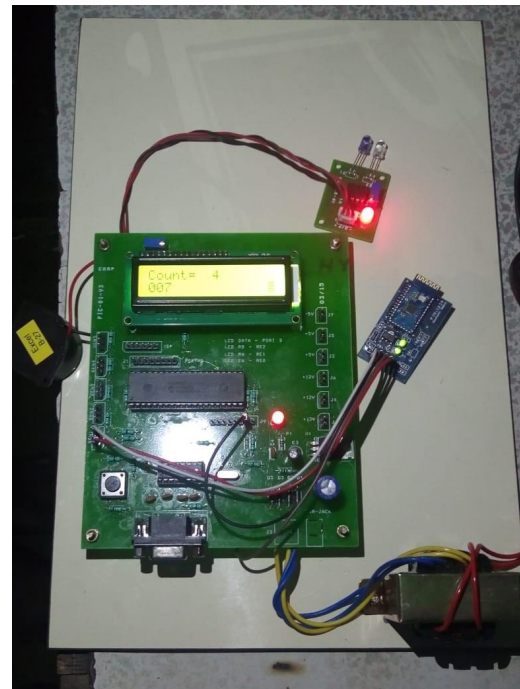


FIG.6 DEVICE TO BE INSTALLED IN THE CITY BUS

When the passenger is boarded into the bus, they should scan the QR code in the QR code reader such as a tablet or a smartphone of efficient specifications and thereby the information regarding number of passenger is loaded into the microcontroller through Bluetooth. Therefore, it checks whether the right number of passengers is boarding into the bus and not exceeding the number given in the ticket using the IR sensor.

With the use of the android application, the need of the conductors and the checking officers is minimized which in turn the expenses of the government on city buses can be gradually reduced.

The destination drop down boxes list the places; passenger drop down box list the number of passengers; payment drop down box lists the type of the payment for ticket.

In case the passengers do not possess the smartphone for using the application, a ticket vending machine can also be installed at for every two or three bus stops for booking the tickets. The ticket from the vending machine is very similar to the one booked using the application i.e. also contains the information regarding the source & destination, date & time as well as the QR code.

The process is carried out as same as when the ticket is booked using the application.

PIC16F877A MICROCONTROLLER

Peripheral Interface Controller (PIC) is microcontroller developed by Microchip. PIC microcontroller is fast and easy to implement program when we compare other microcontrollers like 8051. The ease of programming and easy to interfacing with other peripherals PIC became successful microcontroller.

We know that microcontroller is an integrated chip which consists of RAM, ROM, CPU, TIMERS, and COUNTERS etc. PIC is a microcontroller which also consists of ram, rom, CPU, timers, counter, ADC (analog to digital converters), DAC (digital to analog converter). PIC also supports the protocols like CAN, SPI, UART for interfacing with other peripherals. PIC mainly used modified Harvard architecture and also supports RISC (Reduced Instruction Set Computer) by the above specification RISC and Harvard we can easily that PIC is faster than the 8051 based controller which is made-up of Von-Newman architecture. The picture of PIC16F877A microcontroller is shown in fig.7. The simplified features of PIC16F877A microcontroller is given in table 1.



FIG.7 PIC16F877A MICROCONTROLLER

CPU	8-bit PIC
Number of Pins	40
Operating Voltage (V)	2 to 5.5 V
Number of I/O pins	33
ADC Module	8ch, 10-bit
Timer Module	8-bit(2), 16-bit(1)
Comparators	2
DAC Module	Nil

TABLE 1. PIC16F877A –SIMPLIFIED FEATURES

1. BLUETOOTH MODULE HC-05

The Bluetooth module HC-05 is a MASTER/SLAVE module. By default the factory setting is SLAVE. The Role of the module (Master or Slave) can be configured only by AT

COMMANDS. The slave modules cannot initiate a connection to another Bluetooth device, but can accept connections. Master module can initiate a connection to other devices. The user can use it simply for a serial port replacement to establish connection between MCU and GPS, PC to your embedded project, etc. The picture of Bluetooth module HC-05 is shown in fig.8.



FIG.8 BLUETOOTH MODULE HC-05

1.1 HARDWARE FEATURES

- Typical -80dBm sensitivity.
- Up to +4dBm RF transmit power.
- 3.3 to 5 V I/O.
- PIO (Programmable Input/Output) control.
- UART interface with programmable baud rate.
- With integrated antenna.
- With edge connector.

1.2 SOFTWARE FEATURES

- Slave default Baud rate: 9600, Data bits: 8, Stop bit: 1, Parity: No parity.
- Auto-connect to the last device on power as default.
- Permit pairing device to connect as default.
- Auto-pairing PINCODE:”1234” as default.

2. QR CODE

Quick Response Code is the trademark for a type of matrix barcode (or two-dimensional barcode) first designed for the automotive industry. A barcode is a machine-readable optical label that contains information about the item to which it is attached. A QR code uses four standardized encoding modes (numeric, alphanumeric, byte/binary, and kanji) to efficiently store data; extensions may also be

used. A simplified picture of QR code is shown in fig.9.



FIG.9 QR CODE

A significant difference between a barcode and QR code is that a barcode only holds information nicely in the horizontal direction, a QR can do so vertically as well. A QR code can carry up to some hundred times the amount of information a conventional barcode is capable of. QR code can be scanned within micro seconds where bar code takes milli seconds to do so.

3. IR SENSOR

An infrared sensor is an electronic instrument which is utilized to detect certain qualities of its surroundings by either discharging or potentially distinguishing infrared radiation. Infrared sensors are additionally equipped for estimating the warmth being discharged by a protest and identifying movement. The picture of IR sensor is shown in fig.10.



FIG.10 IR SENSOR

Model	IR - Proximity Sensor
Number of Pins:	4 (AO, DO, VCC, GND)
Output Type:	Analog and/or Digital Output
Operating Voltage:	4.5V to 6V
Lead Pitch:	0.1th inch (2.54 mm) Breadboard compatible
Dimension:	0.6" x 1.3" x 0.5" inch (15.25 mm x 33mm x 12.7 mm)
Operating Temperature:	0C to 60C (± 10%)
Range:	0.5cm – 5 cm
LED Indicator:	SIG (Orange or Red), PWR (Green)
Weight:	20 grams

TABLE 2.IR SENSOR SPECIFICATIONS

The important specifications of IR sensor are given in table 2. An IR detector contains of AN IR LED and an IR image diode; along they're known as Photo – coupling or Opto – coupling. At the purpose once the IR transmitter emanates radiation, it achieves the question and some of the radiation reflects back to the IR recipient. In lightweight of the force of the gathering by the IR recipient, the yield of the detector is characterized.

4. ECLIPSE (SOFTWARE)

Eclipse is an integrated development environment (IDE) used in computer programming, and is the most widely used Java IDE. It contains a base workspace and an extensible plug-in system for customizing the environment. Eclipse is written mostly in Java and its primary use is for developing Java applications, but it may also be used to develop applications in other programming languages via plug-ins, including Ada, ABAP, C, C++, C#, COBOL, D, Fortran, Haskell, JavaScript, Julia, Lasso, Lua, NATURAL, Perl, PHP, Prolog, Python, R, Ruby (including Ruby on Rails framework), Rust, Scala, Clojure, Groovy,

Scheme, and Erlang. It can also be used to develop documents with LaTeX (via a TeXlipse plug-in) and packages for the software Mathematica. Development environments include the Eclipse Java development tools (JDT) for Java and Scala, Eclipse CDT for C/C++, and Eclipse PDT for PHP, among others.

The initial codebase originated from IBM VisualAge. The Eclipse software development kit (SDK), which includes the Java development tools, is meant for Java developers. Users can extend its abilities by installing plug-ins written for the Eclipse Platform, such as development toolkits for other programming languages, and can write and contribute their own plug-in modules. Since the introduction of the OSGi implementation (Equinox) in version 3 of Eclipse, plug-ins can be plugged-stopped dynamically and are termed (OSGI) bundles.

Eclipse software development kit (SDK) is free and open-source software, released under the terms of the Eclipse Public License, although it is incompatible with the GNU General Public License. It was one of the first IDEs to run under GNU Classpath and it runs without problems under IcedTea.

V.ANALYTIC COMPARISON

Let’s analyze and compare the existing practice and the proposed technology discussed in this article.

Now, let’s look at the expenses for the government on a bus using the proposed technique as mentioned in the article.

The equipment includes Android application, a smartphone or a tablet, a PIC16F877A microcontroller embedded with IR sensor, Bluetooth module and buzzer. The approximate cost of the device is given in the table 3.

Cost of PIC16F877A microcontroller embedded with IR sensor, Bluetooth module and buzzer	Rs.5,000**
Cost of a tablet with Qualcomm/Snapdragon processor and 4GB RAM	Rs.10,000**
Maintenance cost per year	Rs.10,000**
Total expenses for a year	Rs.25,000**

**approx.

TABLE 3. APPROXIMATE EXPEDITURE ON PROPOSED SYSTEM

From the above two tables, we can easily conclude that the latter system is far better than that of the former. The comparison chart showing the contrast between the systems is shown in fig.11. The capital investment on the proposed system may be high when compared to the existing practice. But on the longer run, say a year, the ratio of the cost for the latter to the cost for the former is quite low.

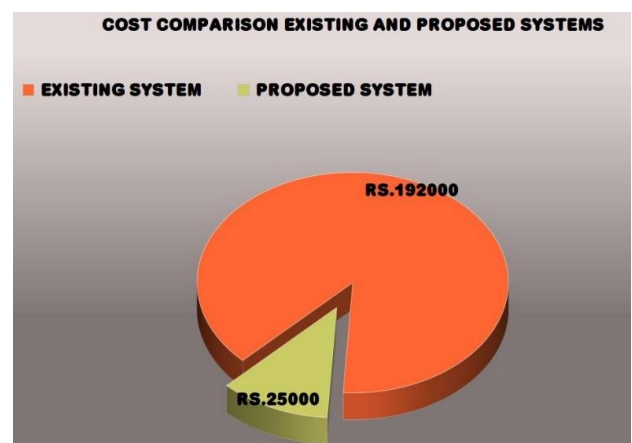


FIG.11 COST COMPARISON CHART

The cost for android application is not included since the app can be made global and downloaded free of cost for multiple times for as many smartphones as possible from the Google Play Store. The time comparison and malpractice comparison between the systems are given in table

4 and table 5 respectively. The comparison charts in terms of time and malpractice are shown in fig. 12 and fig.13 respectively.

SL NO.	NO. OF PASSENGERS	TIME TAKEN BY EXISTING SYSTEM IN SEC	TIME TAKEN BY PROPOSED SYSTEM IN SEC
1	10	100**	20**
2	20	250**	40**
3	50	600**	100**
4	100	1200**	200**

**approx.

TABLE 4. APPROXIMATE TIME COMPARISON BETWEEN EXISTING AND PROPOSED SYSTEMS

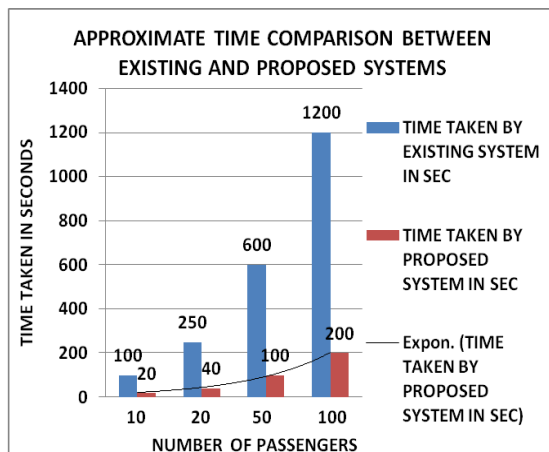


FIG 8. TIME COMPARISON CHART

SL NO .	TYPES OF MALPRACTICE	EXISTING SYSTEM	PROPOSED SYSTEM
1	WITHOUT TICKETS	10**	0
2	PASSENGERS WITH CHANGE ISSUES	15**	0
3	INVALID TICKETS	8**	0
4	LATE ISSUE OF TICKETS	15**	0

**approx.

TABLE 5. APPROXIMATE MALPRACTICE COMPARISON BETWEEN EXISTING AND PROPOSED SYSTEMS

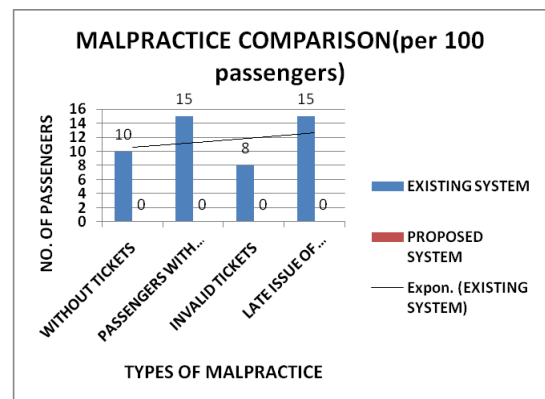


FIG 8. MALPRACTICE COMPARISON CHART

Additionally, when this system is imposed on several or all the buses in Chennai, the expense may even come low as the government can easily negotiate on the cost for buying smartphones or tablets of defined configuration. Therefore, in either way the proposed system seems to be a very good alternative for the existing system.

VI.CONCLUSION

In this article we tried to review such a technology as the Android which helps in reducing the expenses of government on city buses. It remains to be noted that in the world

every day appears more and more promising new technologies. This technology should be implemented taking into account the various factors. This will minimize the negative and maximize the positive moments. Android opens up new opportunities of realization the conception of "smart home" and "smart city", in which all household electronics are integrated into a single information network with centralized control.

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