

# Smart Bus System and Smart Toll Booth System

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**Abstract** - There are lots of challenges faced by peoples in daily life which are related to travelling within a city. Smart bus system and smart booth system resolves lots of issues and challenges very effectively and efficiently. This report explains the importance as well as significance of proposed model. Smart bus system resolves lots of issues such as waiting time at bus stop by the passengers, seats availability in the buses, smartly payment of toll tax at toll plaza and so on. Smart bus system and smart toll booth system contains an application which includes lots of functionalities which are explained in this report by which passengers can travel within a city very easily. This report also explains and evaluates benefits as well as implications of smart bus system and smart toll booth system. Apart from this, in order to develop this system advanced technologies as well as advanced sensors are used which governs the non-functionality factors of the system. Non-functionality features of the system like reliability, scalability and security are essential features which are necessary to be presented in the system. Various sensors like RFID (Radio frequency identification) sensor, Arduino board, Raspberry pi, RFID card, accelerometer and advanced technology such as IoT is used.

**Index Terms** - Accelerometer sensor Arduino board; IoT; RFID card; Radio frequency identification; Raspberry pi, Smart bus system and Smart tool booth system.

## I.INTRODUCTION

This report explains and evaluates various functionalities and features of smart bus system and smart tool booth system. Along with this, this report also explains the hardware requirements as well as software requirements which is require to develop the proposed system. Advantages and importance of the system are also explained in this report. Apart from this, this report explains the implementation of the smart bus system and smart tool booth system very deeply and various technologies and tools which are

required to implement or develop the system are also analyzed in this report. In order to develop this system, advanced technologies such as IoT is used and lots of advanced sensors like RFID sensor, accelerometer sensor is used.



Fig- Architecture of smart bus system



Fig- Architecture of smart toll booth system

### 1.1 Background

There are lots of reports, research papers and case studies which explains the concept of smart bus system and smart toll booth system are presented which includes various functionalities of the smart bus systems. This report is the advancement to all the existing reports and papers and this report extends the boundaries of researchers on this research topic. Along with this, existing papers explains various functional requirements of the smart bus system and smart toll booth system such as schedules of the buses at particular bus stops, online payment of bus tickets by the passengers, speed alarm by which driver of the bus get notified by the alarm when it crosses some specific speed limit.

### 1.2 Purpose

The main purpose of this report is to explain the implementation of the smart bus system and smart toll booth system and along with this, this report also explains the functional requirements as well as non-functional requirements of the proposed system.

## II. SOFTWARE REQUIREMENTS OF SMART BUS SYSTEM USING IOT

There are two kinds of implementations in this system means this system needs hardware as well as software requirements for the fulfilment of the desired purpose for which it is made. So, these are some requirements for this:

### 2.1 Arduino IDE:

This is the open-source software which is generally used for writing the codes and also used to compile codes into the Arduino model. It makes the code compilation so easy that the person with less knowledge can also understand it.

Basically, each of them having a microcontroller that is programmed and that microcontroller takes and accepts the data or information in the code form.

Microcontroller basically is IC and it is so compact in design. IC simply means Integrated circuit and it includes a processor and has (I/O) slots on the single chip.

### 2.2 RFID System:

Basically, RFID stands for Radio Frequency Identification System means identifying done without wires and all because it is using wireless

communication. It enables to transfer data between the RF tags that are having attachments to the different Antenna or may be different readers.

Basically, here it requires to check for different things that is:

- Invalid card
- Serial monitor
- Insufficient balance

It simply means if a person is having sufficient balance and may be insufficient balance than it will automatically displayed over the monitor about that.

### 2.3 GPS/GSM technology:

It is also the requirement of the system because when it is smart bus system and identification and all is done over the internet or the wireless system that it is very necessary to connect the bus system to the GPS so that it is known about the location about the bus so that whole system can be managed easily.

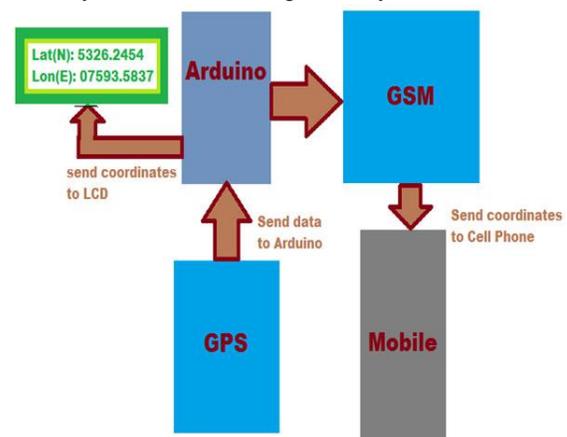


Fig- GPS/GSM system

The SIM CARD is also included in the programming which is required to do things like transmit the location coordinates to server and this process takes the use of GPRS System and these messages are in the form of ASCII character. So, these are some requirements which are very necessary and for the handling all these assets and process requirements of Mobile Application is very necessary. Because it gives the users a friendly environment to check and book for the bus. Overall, Displaying the information and showing the information is necessary and for all this and for all purposes these software requirements are needed.

## III. SOFTWARE REQUIREMENTS OF SMART TOLL BOOTH SYSTEM USING IOT

Toll Booth is a place where we pay certain amount of tax to the government. Smart Toll is need of the time to safe people from undue delay in their journey. Person need not to carry the cash with them. When a person come in the range of the toll booth, you get a notification in advance. The tag is attached to the vehicle of the customer. At the toll Plaza there is a reader which will send radio frequency signal to the short range. If the vehicle come in the range of signal the tag get activated. The read and write action will take place. Information of the tag are sent to the microcontroller where the tax deduction process take place.

For covering the whole module we are using some plastic sheets and some poly material. As per the use of the main hardware module we are using the following equipment's-

3.1 RFID Reader - It is a reader which works as a scanner we can say so RFID reader always receive the information from RF tags which work as an information provider. RFID is just connected with MCU by some pins so that it can work in that way.

3.2 IR Modules - These are the electronic type of sensor we can say IR sensor too. They just sense the surroundings and emit the message. IR sensors are using to sense the motion and then send it to our MCU. IR sensor always plays the main role just because all the activity will be considered by it.

3.3 Microcontroller - Node MCU is a hardware device the combination of node and MCU. We are using it because of its cheap rate and good performance.

3.4 Arduino Board - Arduino is a hardware as well as software device which is best in sensing and working with sensors this will give the whole platform to work under a sensor atmosphere.

3.5 Alarm - We are using an alarm just for the driver so that whenever command they got for the next stop that alarm will let him know to stop and pick.

All the pannel are interconnected through chips and wires the most important work is of sensors because they let us know about Occupancy and about the vacancy of seats.

The sensor will sense and let the RF tag know then it will transmit to other parts of the system with the help

of the microcontroller used. There will be a use of GPS system too. GPS will be connected to the bus so that the exact location can be understood by the passengers willing to go. This will create a much easier way to wait and watch for the passengers. The whole system should be equipped in a much more safe place so that the damage caused should not affect the working of the system and there should not be any lag between the connection. We are using some basic equipment because it is in some small-scale trial phase.

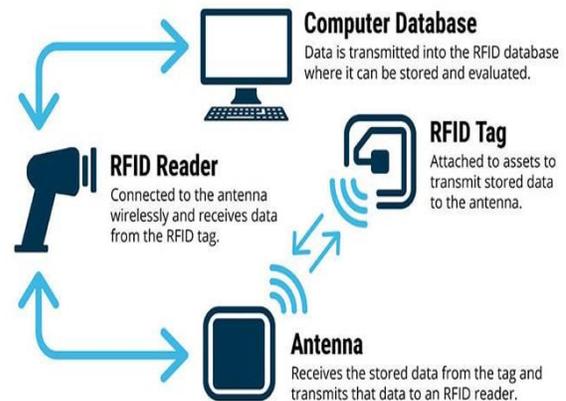


Fig- Architecture of RFID

#### IV. CONCLUSION

After performing lots of discussion on the research topic, it is concluded that various problems and challenges faced by the passengers within a city are resolved with the help of smart bus system and smart toll booth system. Along with this, it is also concluded that this system provides lots of features by which travelling within a city becomes more easier as compared to traditional methods.

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