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Bus Monitoring System Based on RFID Technology with GSM Communication

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Abstract-The innovation in technology today has made our Lifestyle much easier and fun. This research work proposes and implements a solution for enhancing public transportation management services based on RFID and GSM. The system consists of three modules: Bus Module, Super station Module and Bus-Stop Module. The microcontroller based Bus Module consisting mainly of a GSM modem and RFID Readers on the entry and exit gates. When driver press the INIT button, Bus module sends the bus number and license plate number to Super station and starts transmitting its location to Super station Module about a particular bus location out of Bus-Stops. Super station Module equipped with a microcontroller unit and GSM modems interfaced to PCs is designed to keep track record of every bus, processes user request from Android mobile application about a particular bus location out of Bus-Stops and updates buses location on Bus-Stop's LCD display. Bus-Stop Module is installed at every Bus-Stop and consists of a GSM modem, RFID tags and LCD display all interfaced to a microcontroller. This module receives bus location information coming towards that stop from Super station module and displays the information on a LCD display.

Keywords- RFID Reader, GSM, RFID Tag, LCD

I. INTRODUCTION

Radio-frequency identification (RFID) is an automatic identification method, relying on remotely retrieving data using devices called transponders or RFID tags. The technology requires some extent of cooperation of an RFID reader and an RFID tag. An object called RFID tag that can be applied to a product, person or animal for the purpose of identification and tracking using radio waves. Some tags can be read from meters away and beyond the line of sight of the reader. The RFID has come up as emerging technology which started evolving in World War II. A RFID system has several components which include tags, antennas and readers. This set up can be used either in high frequency or ultra-high frequency. In 1946, Leon Theremin invented a toll for the Soviet Union which retransmitted radio waves with some audio information attached to it. Though it was not an identification device it can be considered a predecessor to the RFID technology. The IFF transponder was used by United Kingdom in 1939 which was then used for identifying planes as an ally plane or enemy plane as early in 19th century in World War II. The transponder of this kind is still used in today's aircrafts wherein the transmission and receiving of waves is used. The patent from Mario Cardullo's in 1973 which talks about a passive radio transponder attached to a memory was the true ancestor of modern RFID.

A. What is RFID?

The RFID system is consists of three components:

1) Coil or An antenna
2) RF tags or transponder.
3) A transceiver with decoder.

These components are electronically programmed with unique information. In the market there are many different types of RFID systems. These systems are categorized according to their frequency ranges.

Some of the RFID kits that are used commonly are as follows:

1) Low-frequency (30 KHz to 500 KHz)
2) Mid-Frequency (900 KHz to 1500MHz)
3) High Frequency (2.4GHz to 2.5GHz)

These frequency ranges tell the RF ranges of the tags from low frequency tag ranging from 3m to 5m, mid-requency ranging from 5m to 17m and high frequency ranging from 5ft to 90ft. When designing this system, the following constraints have been considered:

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1) Modularity and expandability constraints: the system must be modular in design. Both software and hardware should be divided into small components or modules to ensure easy scalability for further feature expansions. Modules must be independently produced from each other, so that the crash of one module cannot affect the other ones or changes to module will not affect other.

2) Economic constraint: In economic constraint we should take into account cost to performance ratio so as to design a cost-effective solution.

3) Environmental constraint: In our implementation and design, we should keep in mind the impact on environment. To keep the system power very low, low power consumption devices should be. Energy optimization should be involved in all the design's steps.

II. LITERATURE REVIEW

Due to non-availability of prior information about the buses arrival schedule, in the morning people waits on bus stops. The buses are overloaded for most of the times which often results in some kind of fault occurrence in buses and people get late further. [1] The time required to travel by bus is linked with some parameters like traffic, accidents and snow. In fact, buses are stuck in traffic and the scheduled of buses are hampered by such situations. Because of this the management of the bus schedule is a hard task. Most of the bus station used paperworks or fixed schedules. Supervisors are hired at super station to control the entrance and the exit of buses. They prepare the trip schedules and sheets containing the schedules manually which is inaccurate and time consuming. Subsequently, transport departments have no visibility on real time information about bus timings, which results in un-utilization of resources. So, all these results in dissatisfaction and inconvenience to millions of people. Therefore, accurate and timely transit travel time information is so important.

This technology can be used to help the administrator to monitor the buses, the traffic while increasing the satisfaction of the users [1] Well-known examples of identification technologies include Closed-Circuit Television (CCTV) and Global Positioning System (GPS). CCTV can be deployed at each entrance gate and image processing techniques can be utilized to identify the arrival of buses, where image recognition was performed to detect the bus in traffic. Output from these tests has shown poor performance intracking based detection (~20% precision). During the past, GPS integrated to Geographic Information Systems (GIS) was used to monitor buses traffic. GPS receiver communicates with at least 4 satellites before giving the position of the bus. It gives very good results; however, line of sight between the receiver and the satellites is required otherwise the GPS signal is going to be weaker and attenuated. This is a main limitation of this technology especially when it comes to monitor bus traffic inside an underground bus station.

Table 1. Comparison of vehicle tracking schemes

Parameter	Technique Employed		
	Vehicle-card technique	**Pure GPS/GPS–GPRS mixed**	**Proposed GSM and RFID technique**
Accuracy of location detection	Lower	Accurate	Accurate
Cost of installation	Very low	Highest	Much lesser than GPS based techniques
Suitability for real-time applications	May be adopted	Suitable	Suitable
Environmental susceptibility Scope of human intervention	Not applicable High	Moderate Not at all	Most Suited Not at all

Due to the limitation of these technologies, RFID can be used to track public transport service. This technology can be effectively applied for real-time tracking and identification. RFID was developed in the 1940s by the US department of defence (DoD) which used transponders to differentiate between friendly and enemy aircrafts. Since this time, RFID technology has been evolving to change the way people live and work. Use of RFID in different areas is been explored in many previous researches, from toll

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collection, agriculture, access control, supply chain, logistics, healthcare, and library. RFID technology can response to our tracking needs that's why we used RFID in our design to identify buses entering and leaving the bus station.

III. PROPOSED METHODOLOGY

The proposed system architecture for the bus monitoring and management system is shown in Figure 1. A black box containing RFID reader, GSM modem is equipped in the moving bus. As the bus approaches a bus station with an RFID tag, the distance between the reader and the tag decreases and causes them to interact with each other. This network communication results in data and the data obtained is sent to the Super station via GSM.

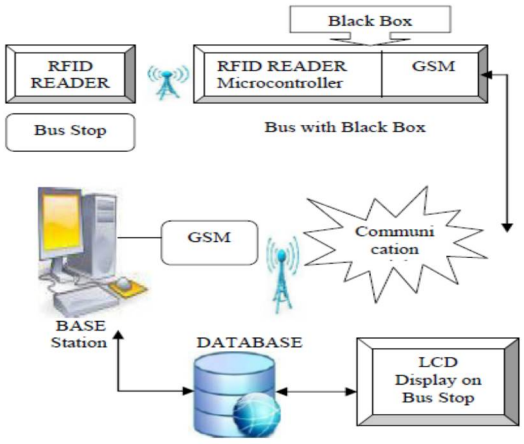

Figure 1: Architecture of Intelligent Bus Monitoring and Management System

The data circulation of the RFID and integrated communication technologies in the constructed system are shown in Figure 3. The system is automatically turned on once the bus is ignited. When the bus nears a tagged Bus-Stop, RFID devices interact with each other. The reader then reads and retrieves the information saved inside the tag once it recognizes the tag. If the communication is successful, the information of the bus and the respective Bus-Stop is saved in the database; with the condition that GSM is ON. The data retrieved are then sent to the Super station via GSM, and this action initializes the data utilization.

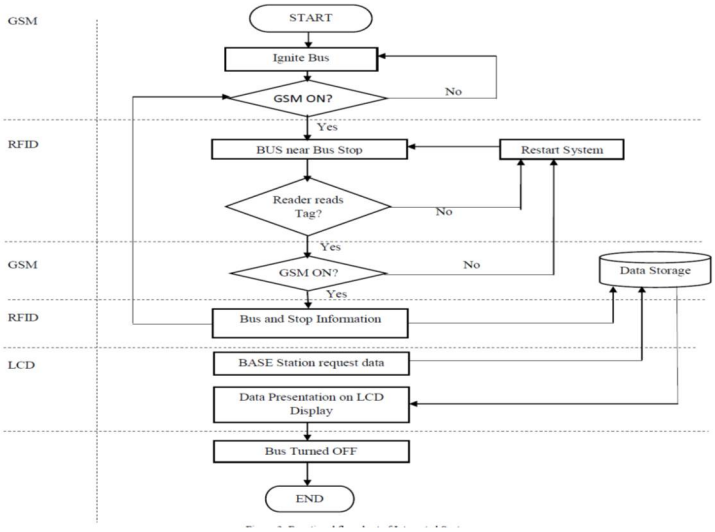

Fig 2. Functional Flowchart Of Integrated System

These data are stored in the database. Filtered, clean information is sent to the Bus-Stop module, which shows the data received from Super station i.e. bus positions on the LCD display. Bus Module is installed inside every bus and consists of a RFID reader, a GSM modem and an emergency button; all interfaced to AT89S52 microcontroller. After sending the initialization signal to Super station Module, this module starts transmitting bus location to the Super station. At each stop, RFID reader reads the RFID tag on

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Bus-Stop and sends data to Super station.

In case of an emergency situation (e.g., when fault occurs in bus), driver can press the emergency button to inform Super station units about the location of bus. The BUS station operator can then adjust the schedule accordingly and send an additional bus for facilitating the passengers. The block diagram for this module is shown in Figure 3. [1] Super station module is the central part of the network. It accepts current location of buses through respective GSM. The PC after processing the data sends desired location information in form of Bus-Stop name to microcontroller at Bus-Stop module. Super station also monitors the emergency situations transmitted from Bus Module.

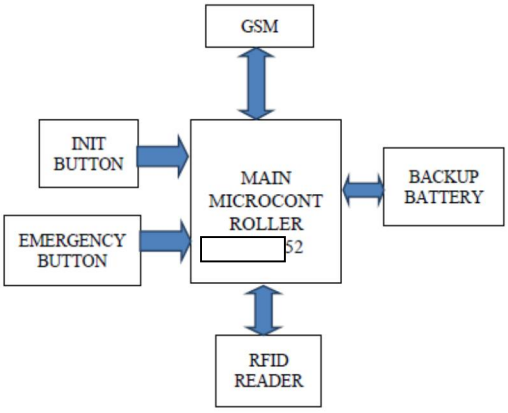


Figure 3: Block Diagram of Bus Module

Bus-Stop module is installed at every Bus-Stop to let the passenger know about the location of buses coming towards that stop. It comprises of a GSM modem, LCD display; all interfaced to pic 16F877 microcontroller. Microcontroller after retrieving the stored information displays it on LCD display.

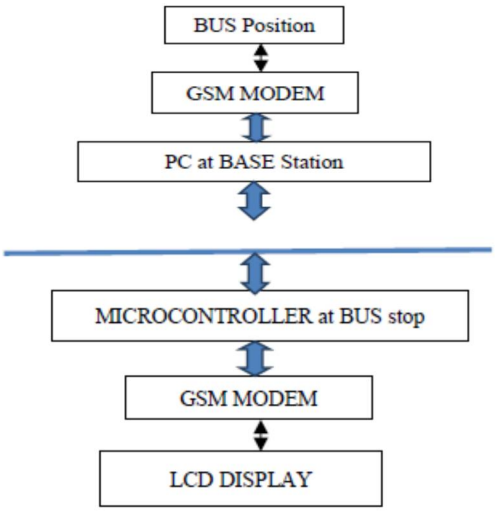


Figure 4: Block Diagram of Super station Module

In case of any emergency, the respective information is displayed on Bus Stops. The block diagram of this module is shown in Figure 5.

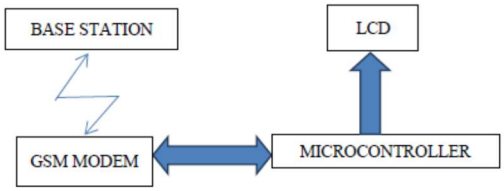


Figure 5: Block Diagram of Bus-Stop Module

IV. IMPLEMENTATION

Several components are used in our tracking system. For identification, every vehicle has been provided with 8 bit RF transmitter. Different 8 bit words are transmitted by buses of different routes. The buses of same route may have same transmitting code if there are large numbers of public vehicles to be tracked in large cities. We have used the microcontroller unit which integrates RFID receiver and GSM unit placed at every bus stop. Every bus stop has 8 bit RF receiver along with GSM modem installed to send and receive data. Whenever any bus comes within the range of about 100 feet of the bus stop, the receiver receives the 8 bit word sent by the transmitter in a bus, which is kept continuously on.

Thus information routing is done using the microcontroller unit which integrates RFID receiver and GSM unit placed at every bus. The microcontroller units used at different bus stops are programmed such that they contain GSM number of the modems placed at further bus stops. The communication between microcontroller and modem is done using USART (Universal Synchronous Asynchronous Receiver and Transmitter). The interfacing of RF receiver data with GSM modem is done using microcontroller unit. The eight bits signal received at receiver are then sent to microcontroller which decodes it and depending on the bits received sends the AT commands to the GSM modem required for forwarding vehicle location information to central server and next stops. The algorithm used for various microcontroller operations is as follows,

V. CONCLUSION

In this research work, design and development of a low cost transportation management system based on integration of RFID and GSM data is described. The system makes use of various modules which are wirelessly linked with GSM modems. SMS service of GSM network very cost effective so it is used for the transfer of data between the modules. This service provides the user with the information about location of desired buses so that the user can adjust his schedule accordingly.

This technology outdates the need of waiting at the Bus-Stop thus saving a lot of time. Displays are used at Bus-Stop to let passengers know the expected time to arrive and bus locations coming towards that stop. The system made such that it can also handle the emergency situations e.g., tire of bus is punctured, in case some kind of technical or non-technical fault in bus, the operator at bus terminal is informed and the departure time between the buses is reduced.[5]It is believed that by the implementation of this system, problems such as un-utilization of buses and waiting time at the bus station will be reduced. So, both bus station administrators and passenger will benefit from the system as real time information is provided.

VI. DISCUSSION ON LOW COST SOLUTION

Efforts have been taken to reduce the total cost of the system including devices and services. Starting from small transport systems to larger transport systems, the devices and services cost can be made affordable. The different components used are 8 channel Radio frequency transmitter and receiver, GSM modem, interfacing controller unit and display unit which make the overall system cost effective. By using SMS for communication, the service cost has been reduced drastically. Most operators are providing SMS services at very cheap rates. Thus components and service cost of the system is much lesser than other tracking systems available in market.

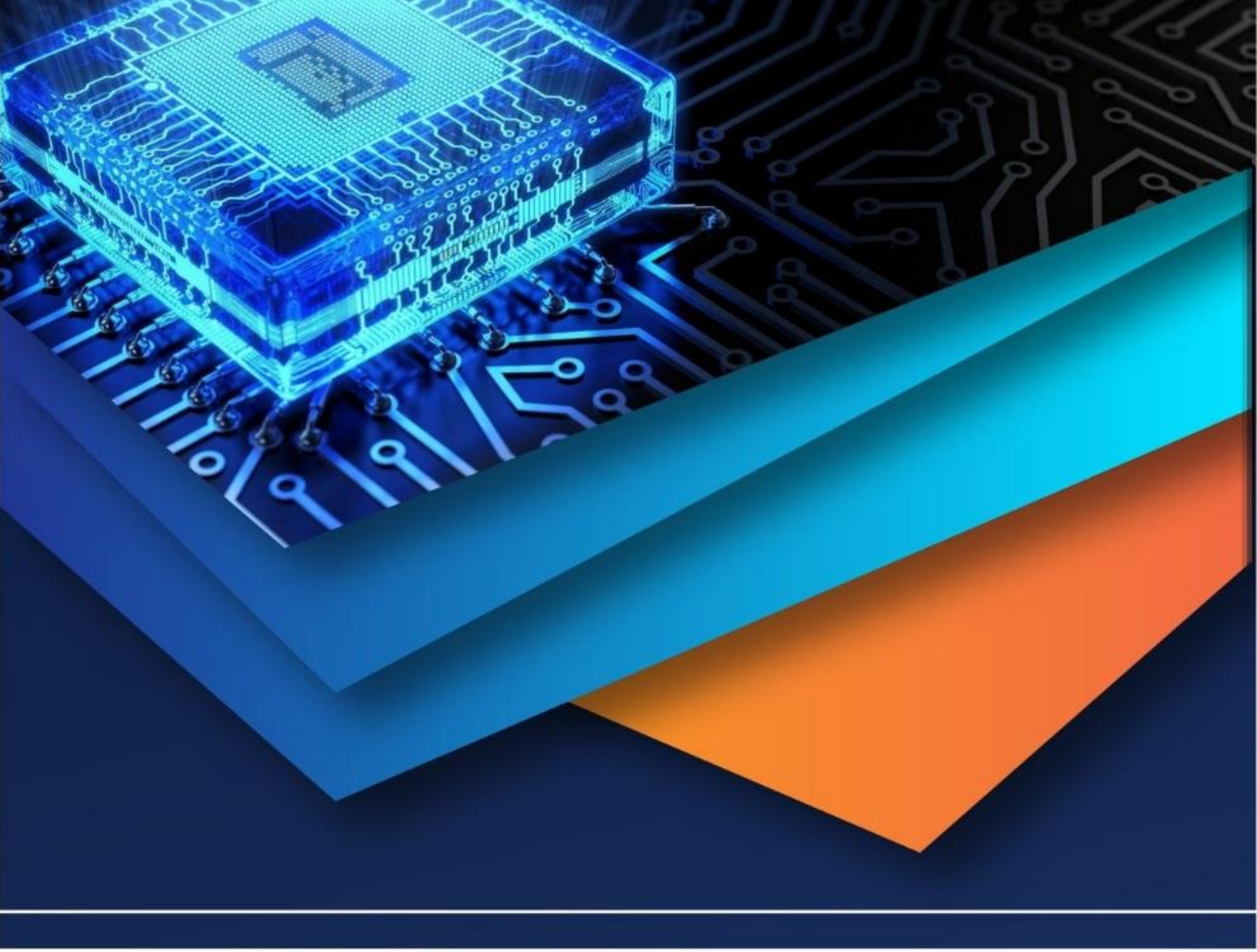
VII. FUTURE SCOPE

An automatic route guider display can be installed in buses to better update the alternative route in case of serious road congestions. We can connect RFID reader wirelessly to the host application. There are many wireless technologies that can be used such as Bluetooth (802.15.3) and ZigBee (802.15.4) to extend the range of an RFID reader. Fare collecting system can also be automated by providing another mobile service to which all the passengers using public transport are subscribed.

REFERENCES

[1] Mahammad Abdul Hannan, Aishah Mustapha,Abdulla Al Mamun, Aini Hussain, Hassan Basri, “RFID and communication technologies for an intelligent bus monitoring and management system”
[2] Ben Ammar Hatem, Hamam Habib, “Bus Management System Using RFID in WSN”, European and Mediterranean Conference on Information Systems 2010
[3] Akshay Bal, “RFID Based Identification System”, April 2009
[4] Lv Zhian Hu Han, “A Bus Management System Based on ZigBee and GSM/GPRS”, 201O International Conforence on Computer Application and System Modeling (ICCASM 2010)
[5] Umar Farooq, Tanveer ul Haq, Senior Member IEEE, Muhammad Amar, Muhammad Usman Asad, Asim Iqbal, “GPS-GSM Integration for Enhancing Public Transportation Management Services”, 2010 Second International Conference on Computer Engineering andApplications
[6] José I. San Jose, José M. Pastor, R. Zangróniz, Juan J. de Dios, “RFID Tracking for urban transportation using EPCGlobal-based WebServices”, 2013 27th International Conference on Advanced Information Networking and Applications Workshops

[7] Teki. Naga. Padmaja, Tejavath. Renuka, Anantha. Sushmitha. Srilakshmi, “Design of GSM Based Smoke Detection and Temperature Monitoring System”, International Journal of Engineering Research & Technology (IJERT) Vol. 2 Issue 4, April – 2013 ISSN: 2278-0181
[8] Bo Yan, Danyu Lee; , "Design of Sight Spot Ticket Management System Based on RFID", pp. 496 - 499, 2009 International Conference on Networks Security, Wireless Communications and Trusted Computing.
[9] Bernard Menezes1, Kamlesh Laddhad , Karthik B. KReSIT, “Challenges in RFID Deployment – A Case Study in Public Transportation” http://www.it.iitb.ac.in/~kamlesh/Page/Reports/iceg06.pdf
[10] Teki. Naga. Padmaja, Tejavath. Renuka, Anantha. Sushmitha. Srilakshmi, “Design of GSM Based Smoke Detection and Temperature Monitoring System”, International Journal of Engineering Research & Technology (IJERT) Vol. 2 Issue 4, April – 2013 ISSN: 2278-0181



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