

SMART PUBLIC TRANSPORT WITH FLOW-ESTIMATION AND FARE-COLLECTION USING RFID

Dr. K. KANTHI KUMAR

Associate Professor,
Department of ECE, Holy
Mary Institute of Technology
and Science, Telangana,
India
kkanthik@gmail.com

E. SRI KRISHNA

Assistant Professor,
Department of ECE, Holy
Mary Institute of Technology
and Science, Telangana,
India
srikrishnaenumala@gmail.com

T.KAVITHA

Assistant Professor,
Department of ECE, Holy
Mary Institute of Technology
and Science, Telangana,
India
reddy.Kavitha42@gmail.com

m

Abstract

Transport administration is the most significant capacity of open transportation. To give an agreeable travel understanding, powerful transport booking is basic. This framework comprises of three areas i.e., transport segment, transport stop segment and server segment. In the transport area, there is a RFID Reader Automatically the tally of people who boarded it is known to the Arduino microcontroller of transport segment. In the bus station segment likewise, there is RFID peruser with which labels can be perused. So now the transport segment can know the check of travelers that are going to board the transport utilizing ZigBee. In the event that the check of as of now boarded travelers and going to board travelers is equivalent to the limit of the transport then that isn't an issue yet on the off chance that tally is more than the limit of transport, at that point the transport area makes an impression on the server.

Keyword—Flow estimation, Fare collection System, ZigBee communication, Microcontroller, RFID reader and tag.

I. INTRODUCTION

Assessing traveler stream and inhabitation on open vehicle transports for the most part includes devoted equipment or leading studies, the two of which can be costly and tedious. Transport inhabitation information is valuable for an assortment of reasons. Transport administrators can decrease showing costs and

ecological effect to seeing how to improve the manner in which they utilize their armada. Travelers feel progressively good and are bound to utilize open vehicle when it isn't blocked.

Transport administration is the most significant capacity of open transportation. Other than the significant objective of hauling travelers around, giving an agreeable travel understanding to travelers is additionally a key business thought. To give an agreeable travel understanding, viable transport planning is basic. Conventional methodologies depend on fixed timetables. The wide selections of brilliant card toll assortment frameworks in open transportation give new chances to utilizing the information driven ways to deal with fit the interest of travelers.

The Paper targets building up a Smart open vehicle framework which is to give an agreeable travel understanding, successful transport booking by stream estimation and to improve the nature of transport administration by cutting edge passage assortment framework utilizing RFID. Current practice in Bus Transit System (BTS) administrators shows that manual information assortment endeavors are expensive

and generally pertinent just in little scale. The wide appropriations of shrewd card charge assortment frameworks and following frameworks in open transportation give new chances to utilizing the information driven ways to deal with fit the interest of travelers.

II. SYSTEM ARCHITECTURE

The block diagram of the project and design aspect of independent modules are considered such as Power supply, Arduino Microcontroller, Crystal oscillator, RFID Reader and Tag, ZigBee module, LCD, LED indicators. As we can observe the block diagram of Bus section as well as Bus stop section are almost similar.

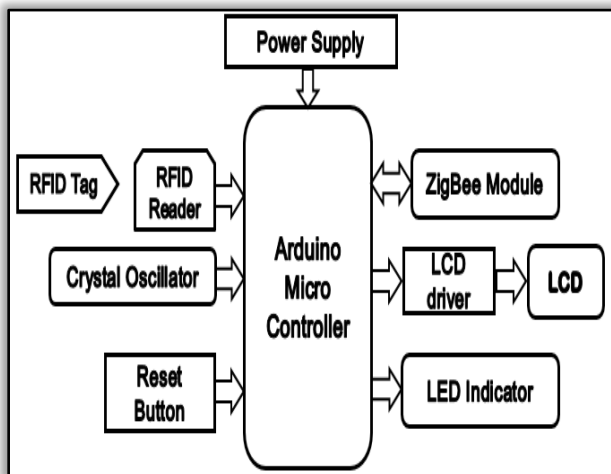


Figure 1: Block diagram of Bus and Bus-stop section

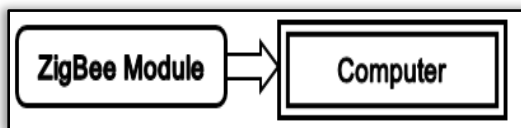


Figure 2: Block diagram of Server section

A. Arduino Microcontroller

Arduino is a solitary board microcontroller intended to make the way toward utilizing gadgets in multidisciplinary extends

progressively open. The equipment comprises of a straightforward open source equipment board planned around a 8-piece Atmel AVR microcontroller. Arduino Uno is a microcontroller board dependent on the ATmega328P. It has 14 advanced information/yield pins (of which 6 can be utilized as PWM yields), 6 simple sources of info, a 16 MHz quartz gem, a USB association, a force jack, an ICSP header and a reset catch. The Arduino Uno can be customized with the Arduino Software (IDE). The ATmega328 on the Arduino Uno comes prearranged with a boot loader that enables you to transfer new code to it without the utilization of an outer equipment software engineer.

We are utilizing two Arduino sheets one for Bus segment and another for Bus stop segment, with these wide scope of highlights we are utilizing Arduino as heart of our framework which for the most part controls every single module associated with the board.

B. RFID Reader and Tag

In the introduced framework we are utilizing Low-recurrence RFID frameworks, A radio recurrence distinguishing proof peruser (RFID peruser) is a gadget used to accumulate data from a RFID tag, which is utilized to follow singular items. So here there will be shrewd card type RFID tag with every individual traveler fundamentally utilized for stream estimation just as passage assortment framework.

RFID Tags - have a coordinated chip implanted inside it which will invigorate itself in an electromagnetic field. The chip inside this RFID

label stores special data which we call as the RFID key which is generally a 12 digit code including numbers and letters in order. This code is extraordinary to every single RFID tag. This code inside the chip can be perused by a RFID Reader.

The modulator adjusts the RFID code/key as indicated by the recurrence and transmits the data electromagnetically so the RFID Reader can get the data. The curl additionally fills in as a radio wire to send the balanced data to air medium.

C. ZigBee Communication

ZigBee is an IEEE 802.15.4-based detail for a suite of significant level correspondence conventions used to make individual territory systems with little, low-power computerized radios, for example, for home computerization, restorative gadget information assortment, and other low-power low-data transfer capacity needs, intended for little scale ventures which need remote association. Henceforth, ZigBee is a low-power, low information rate, and closeness (i.e., individual zone) remote impromptu system.

ZigBee is a set up set of details for remote individual territory organizing (WPAN), i.e., advanced radio associations among PCs and related gadgets. This sort of system dispenses with utilization of physical information transports like USB and Ethernet links. The gadgets could incorporate phones, hand-held computerized colleagues, sensors and controls situated inside a couple of meters of one another, in this manner in our framework we utilized ZigBee for Wide correspondence and

interconnection, these ZigBee modules are associated with all the three segments in our framework

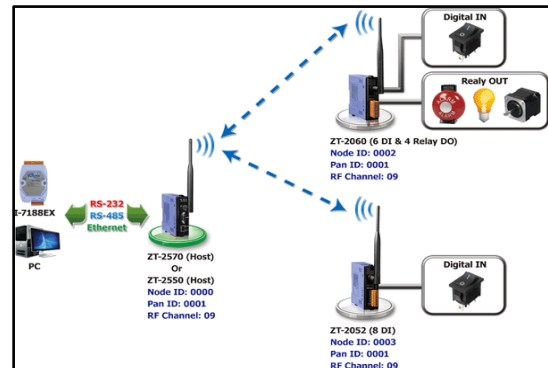


Figure 4: ZigBee Communication Network

ZigBee supports different network configurations for master to master or master to slave communications. And also, it can be operated in different modes as a result the battery power is conserved. ZigBee networks are extendable with the use of routers and allow many nodes to interconnect with each other for building a wider area network.

D. LCD Display

LCD (Liquid Crystal Display) screen is an electronic showcase module and locate a wide scope of uses. A 16x2 LCD show is extremely essential module and is ordinarily utilized in different gadgets and circuits. These modules are favored more than seven sections and other multi fragment LEDs. The reasons being are LCDs are efficient; effectively programmable. A 16x2 LCD implies it can show 16 characters for every line and there are 2 such lines. In this LCD each character is shown in 5x7 pixel grid. This LCD has two registers, specifically, Command and Data.

The LCD requires 3 control lines just as either 4 or 8 I/O lines for the information transport. The

client may choose whether the LCD is to work with a 4-piece information transport or a 8-piece information transport. On the off chance that a 4-piece information transport is utilized the LCD will require a sum of 7 information lines (3 control lines in addition to the 4 lines for the information transport). On the off chance that a 8-piece information transport is utilized the LCD will require an aggregate of 11 information lines (3 control lines in addition to the 8 lines for the information transport). We utilized two LCD show one for Bus stop segment which is utilized to show traveler tally and another at the Bus area which is utilized to show the admission estimation.

III. WORKING PRINCIPLE

In this Paper the main heart of the system is Arduino. It controls each and every module's functionality, the RFID tags are another key component these RFID tags are given to each and every passenger so that they can use it while boarding and departing from the bus.

The project has three main sections namely

- Bus-stop section
- Bus section
- Server section

Bus-stop Section

- When the passenger enters the bus-stop with the RFID smart card he needs to give a tap on the RFID reader which will be present on the Bus-stop entry.
- So that his/her data will be recorded in the system and the passenger count in the bus-stop is known simultaneously in real time and send the data to the bus as well as server through

ZigBee communication attached to the bus-stop section.

- This data can be used to decide whether there are sufficient amount of seats for the passengers that are waiting in the bus-stop.

Bus Section

•After the appearance of the transport the traveler again need to tap on the transport and afterward the include in the transport is recorded and traveler information with his boarding point is noted which is utilized to ascertain the admission to the separation that he has voyage.

• The passage assortment framework through keen card likewise assumes a fundamental job here as it empowers traveler's for a cashless exchanges so the traveler need to stack some cash ahead of time with the goal that admission can be consequently deducted from the traveler's shrewd card.

• When the goal purpose of traveler shows up at that point while boarding off the traveler need to tap on the RFID peruser, so that Arduino utilizes his boarding point and goal focuses to figure the charge of the specific traveler and it consequently deducts from the shrewd card cash that is preloaded in the card by the traveler.

• So that is the manner by which a cashless exchange is made by the traveler utilizing the RFID keen card and the module present in the transport area.

Server Section

• The fundamental activity of the Server segment isn't just to screen the total transport organize yet additionally ready to discover the issue in certain bus station

- For instance when there is enormous gathering of traveler's trusting that the transport will come yet the transport limit is practically full so at this circumstance the ZigBee module present in the bus station make an impression on the cut off segment that there is a need of additional transport in that specific bus station utilizing ZigBee correspondence in message design.

- When there is appropriate correspondence in the transport organize it is extremely useful to the traveler for a sheltered and agreeable travel and furthermore the officials can undoubtedly distinguish where issue is found, Also we can keep up the best possible transport timings.

- The Server segment is generally situated in the transport warehouse with the goal that it very well may be utilized as a center point for the specific zone and have the option to send any additional transports in the specific territory if fundamental.

Let us consider a simple flow chart in order to understand the working.

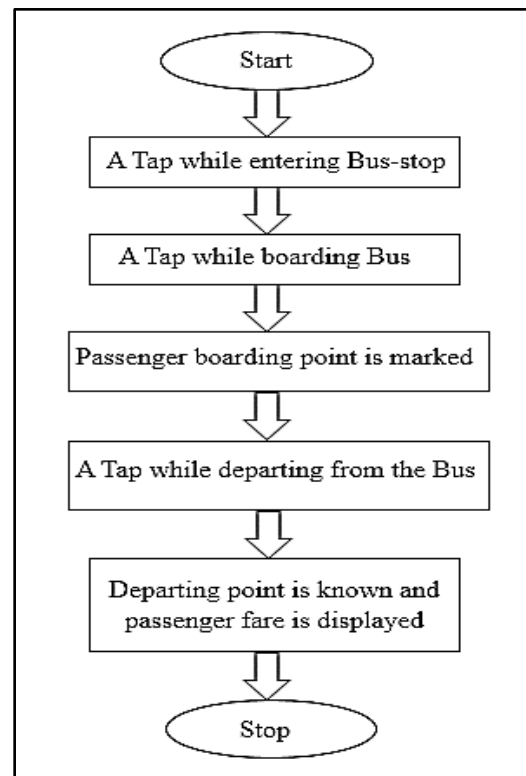


Figure 5: Flow chart of working principle

IV. RESULTS

The passenger count shown in bus section as well as bus section are being observed and displayed on the LCD Screen.



Figure 6: LCD display on Bus section

In the initial stage the count which is displayed in the bus stop section is sent to the bus section in real time.



Figure 7: LCD display on Bus stop section

Later on when the passenger board into the bus his card data is displayed on the screen of bus section.

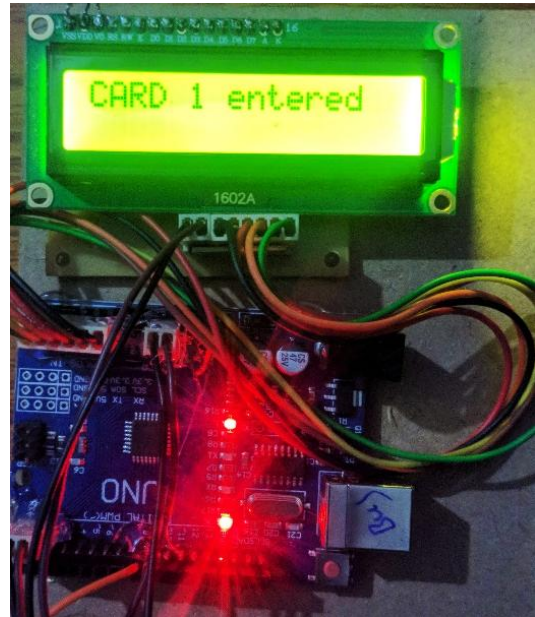


Figure 8: LCD display on Bus section while boarding

While departing from the bus the passenger will tap on the RFID reader so that his fare will be displayed and automatically gets deducted from his smart card



Figure 9: LCD display on Bus section while departing

On the off chance that there are increasingly number travelers holding up at the bus station however the transport limit is practically full so at this circumstance the ZigBee module present in the bus station make an impression on the cut off area that there is a need of additional transport in that specific bus station.

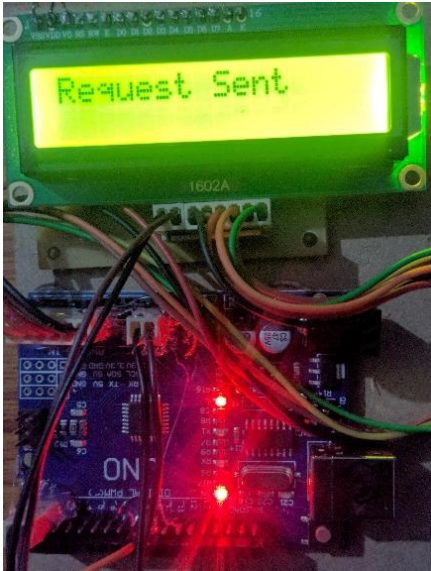


Figure 10: Request is sent to server from the bus section

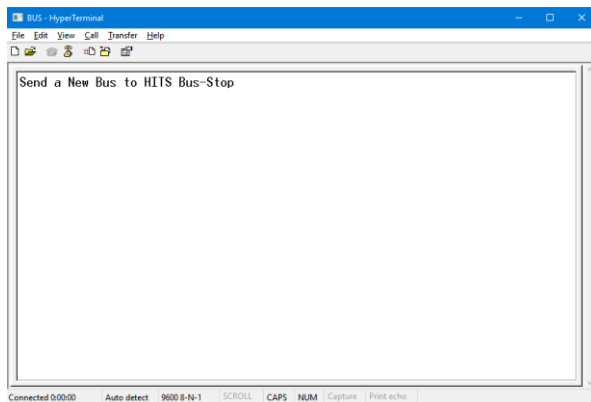


Figure 11: Request received at the Server section

V. CONCLUSION

In general, we met practically the entirety of our desires and adhered to the structure plan we at first set up. We accomplished a working and precise framework where we will have the option to evaluate the traveler stream just as passage assortment technique.

In this paper, we present a framework which uses mix procedures to give an answer for simple admission assortment and an agreeable travel understanding through transport with the utilization of RFID brilliant card and ZigBee correspondence, Compared with existing vehicle framework with off base planning and complex passage assortment, the proposed framework with cutting edge correspondence system and toll assortment beats them in precise planning and progressively helpful charge assortment technique.

REFERENCES

- [1]M. Yu, D. Zhang, Y. Cheng, and M. Wang, "An RFID electronic tag based automatic vehicle identification system for traffic IoT applications," in *Proc. Chin. Control Decision Conf. (CCDC)*, May 2011, pp. 4192–4197.
- [2]M Bhuvaneshwari, S Sukhumar, S Kalpanadevi, and N SuthanthiraVanitha. "Embedded system based automatic ticket vending machine for modern transport system," *International Journal of Research in Computer and Communication Engineering*, 2(11), 2013.
- [3] Christian Oberli, Miguel Torres-Torriti, "Performance Evaluation of UHF RFID Technologies for Real-Time Passenger Recognition in Intelligent Public Transportation Systems," *IEEE transactions on intelligent transportation system*, Vol. 11, No. 3, September 2010.
- [4]Maria Grazia GNONI, Alessandra ROLLO, Piergiuseppe TUNDO, "A smart model for urban ticketing based on RFID applications," *IEEM09-P-0572*,



2009 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM).

[5]M. Munizaga, F. Devillaine, C. Navarrete, and D. Silva, — “Validating travelbehavior estimated from smartcard data,” *Transp. Res.C, Emerg. Technol.*, vol. 44, pp. 70–79, Jul. 2014.

[6]J. J. Barry, R. Freimer, and H. Slavin, — “Use of entry-only automatic fare collection data to estimatelinked transit trips in New York City,” *Transp.Res. Rec. J. Transp. Res. Board*, vol. 2112, pp. 53–61, Dec. 2009.

[7]Mauricio Lima Fereira;Claudio Luiz Marte Jorge E.Leal De Medeiros;Cledson Akio Sakurai, Caio Fernando Fontana “RFIDfor Real Time Passenger Monitoring,” *Recent Researches in Telecommunications, Informatics, Electronics and Signal Processing*.

[8]M. Trépanier, N. Tranchant, and R. Chapleau, “Individual trip destination estimation in a transit smart card automated fare collection system,” *J. Intell.Transp. Syst. Technol. Plann., Oper.*, vol. 11, no. 1, pp. 1–14, 2007.

[9] Craig, William C, “ZigBee: Wireless Control That Simply Works,” *ZigBee Alliance*, 2003.

[10] Madhu Manikya Kumar, K. Rajasekhar, B. Chiranjeevini Kumari, K. Pavani, “Design of Punctuality Enhanced Bus Transportation System Using GSM and Zigbee,” *An International Journal of Research in Computer and Communication Technology*, Vol. 2, Issue 12, December 2013.

[11] Juanjuan Zhao, Fan Zhang, Lai Tu, Chengzhong Xu, Dayong Shen, Chen Tian, Xiang-Yang Li and Zhengxxi Li, “Estimation of Passenger Route Choice Pattern Using Smart Card Data for Complex Metro Systems,” *IEEE*, 2016, 1-11.

[12] Gupta K, Singh A, Dwivedi V, Tandon M, “Bus Rapid Transit System: An Effective Mode of Public Transport”, *An International Journal of Innovative Engineering Research*, Vol. 1, Issue 1, July 2014.