ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 3, Issue 12, December 2017

Retrofitting the Public Transport System for Visually Impaired Users in Smart Cities

Rahul krishnan[1], Jobin Christ M C [2], Vanaja.S [3]

Assistant Professor, Department of Electronics and Communication Engineering, Rajalakshmi Institute of Technology, Chennai, India [1]

Professor, Department of Biomedical Engineering, Rajalakshmi Engineering College, Chennai, India [2]

Assistant Professor, Department of Electronics and Communication Engineering, Rajalakshmi Institute of Technology, Chennai, India [3]

***Abstract*—These Visually impaired people have difficulty in using public transport system , in order to reduce the problem faced by visually impaired people in most of the smart cities ,we developed a system consists of an user module and a bus module to establish a communication between the users and buses in smart cities. When the user gives a one digit number as an input, the user module sends a request to cloud. The cloud compares the request number to the bus number having the nearest location of the user and a bus and gives information to the user and a bus driver. The user will get the information about the bus location and if the desired bus reaches the bus stop, it gives information to the user through voice playback. When the bus module receives an information, it gives a buzzer and the location of the user is displayed in LCD in the bus, which can be notify by the bus driver that the visually impaired people is waiting in the particular location to board to the bus. The hardware prototype was implemented using Arduino uno in both the user Module and Bus module.**

***Index Terms*—Transport system, IoT, user module, Bus module, GSM.**

I. Introduction

The public transport system is the only possible mobility option for the visually impaired people in smart cities.The use of public transport system by the visually impaired people helps them to seek education, work and social connectivity for the majority of the people and it helps to reduce the financial burden on their families [1]. When it comes to smart cities everything is automated and accessible through handheld device. According to the World Health Organization, as of 2014, it is estimated that they are 285 million people are visually impaired worldwide and about 90% visually impaired people live in the developing countries. In developing countries, majority of the people have poor vision and they are over the age of 50 years [2]. The Times of India published an article in 2007, under the heading of India has largest blind population, it says that the India is now home to the world's largest number of blind people, of the 37 million people across the globe who are blind, over 15 million are from India. This indicates that the vision loss and blindness have considerable impact on society.

The visually impaired people face many challenges in accessing the public transport system. The public transport system need to be designed in such a way that it will help to reduce the difficulty faced by the visually impaired people. Some wireless communication system have been developed for the same purpose using Bluetooth, RFID tag and FDMA (Frequency Division Multiple Access) but those will not give the perfect solution while performing in real time.

Our ultimate goal is to retrofit the present public transport system in a way which will not be difficult for visually impaired people to use public transport system, which consists of user module and bus module, in which, the bus driver can notify the visually impaired people, since the location of visually impaired people is known by the bus driver. To facilitate visually impaired people to overcome possible mobility challenges, we believe that the Internet of Things (IoT) infrastructure and API that retrieve data efficiently of "things" from the Internet should be provided, which allows visually impaired people to access the information while traveling.

II. Literature Review

Akira Kawaguchi et al in 2009 proposed a mobile wheelchair which has GIS device for traffic –aware routing protocol, the wheel chair is provided for the Disabled people, using this wheel chair disabled people can move to the desired location. This method will not be suitable for the area which is crowded and in highways there is a chance of accident because on high ways people drive their vehicle at high speed.

Hsiao-Lan Wang et al in 2014 proposed a concept of FDMA which provide one-to-one communication and consists of two modules a user module and a bus module. When the user module gives an inputs as a 4 digit number, the user module sends out the information to the bus module and when the bus module receives the information of the matched bus number, it gives a buzzer and warning LED flashes in the bus which can be notify by the bus driver that someone who is

ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 3, Issue 12, December 2017

visually impaired people is waiting to board on the bus. This system will not give perfect solution for the visually impaired people in the developing countries like India, because the information about the location where the visually impaired user is waiting to board to the bus is not given to the bus driver. In developing countries the population is going on in increase in urban areas, due to rapid increase in population, the public transport system is crowded during the busiest hour, so there is a chance of missing of the desired bus by the visually impaired people.

Jalila Al Kalbani et al (2015) proposed the system, which uses RFID technology in which it consists of two detection subsystem and uses database and a website. One subsystem is placed on the buses and the other is placed on the bus stations. In the bus detection subsystem, the nearby bus station is detected by the bus subsystem and the information of the nearby bus system is given to the people inside the bus through voice message. In the bus station, the information about the coming buses which is nearer to the bus station is given to the people in the bus station through voice message. The information about the user and the bus is transmitted and received from the database. The read range of RFID tag covers a few meter, so we need to develop more number of database to cover larger region and if there is more than one bus boarding at the bus station at the same time, it will be difficult for the visually impaired people to note the voice message and there is a possibility of occurring confusion about the desired bus to the visually impaired people and chances of missing the desired bus if the bus driver not notice the visually impaired people.

M.Babu Prasad et al (2016) proposed a system which consists of two subsystems, one is placed in the bus station and other is placed in the bus. In the bus station, the visually impaired people has a subsystem in which the user gives an input through keypad and the arrival of bus in its range is intimated to the visually impaired people through speaker. In the bus, another subsystem is installed in which the driver receives the information about the request number of visually challenged people and allows the bus driver to send back the signal to the bus station about the arrival of the bus, if the request number and bus number are same. The two subsystems communicate using Zigbee. The range of the Zigbee is limited to few meters and hence it cannot give the perfect result, if the vehicle is moving at speed.

III. MATERIALS AND METHODS

A. System Development

When the user module power is switched on, the power LED is on (Fig.1). The visually impaired people can give a one digit number as an input in the keypad, Because this system was designed to assist visually impaired people, the speaker speaks the number or alphabet which is pressed in the keypad. If the number given by the user to the user module is not correct, the user can press * button to reset. The GPS placed in the user module tracks the location of the user. Then the user module immediately sends out the information about the number pressed in the keypad and the location of the user to the cloud through the wireless transmission module (GSM). The GSM in the user module send the information in the form of packet to the cloud. The cloud stores the location and the number given by the user. The cloud checks the number which matches the bus number which has the nearest location to the user. Once the cloud identifies the bus number and the location of the bus, the cloud sends the information to the user module. Then the speaker is activated and the speaker speaks the location of the desired bus and if the desired bus reaches the bus stop, it gives the information to the user through voice playback. When the power of the bus module is switched on, the power LED is on (Fig.2). The GPS in the bus module tracks the location of the bus continually and send the information to the cloud through GSM. If the bus module receives any request from the cloud ,it gives the buzzer, warning LED and the location of the visually impaired people is displayed in the LCD. The buzzer will sound continually, until the bus driver press the switch1 in the bus module to stop the sound of the buzzer. When the bus driver have taken on the passenger, they can press the switch2 to turn off the warning LED.

B. System Specification

The User module consists of power LED, Speaker(8ohm), GSM SIM 900A, GPS L80, AVR ATmega2560 micro-controller, 4*4matrix keypad, LM386 amplifier to amplify the output of speaker. The software used in AVR ATmega2560 micro-controller is AVR studio 4. The Bus module consists of power LED, 8051 micro-controller, warning LED, switch, GSM SIM 808, LCD, Buzzer. The software used in 8051 micro-controller is Keil uvision version 4.

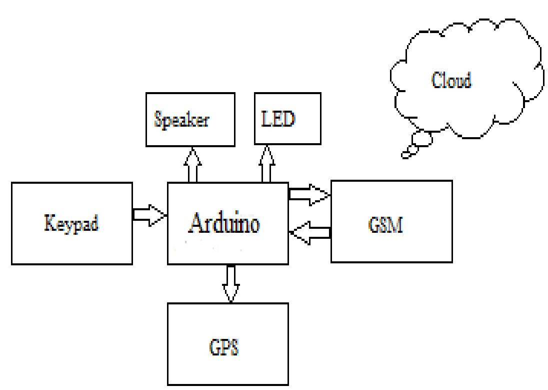

Fig. 1. User Module

ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 3, Issue 12, December 2017

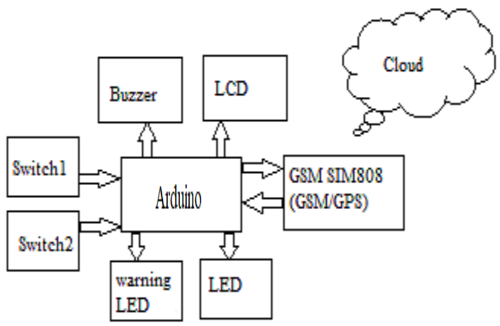

Fig. 2. Bus Module

C. IoT Infrastructure

This work is a part of our system, which includes IoT technologies in real-time embedded operating systems, wireless networks and cloud computing. The positioning can be achieved along with GPS or cellular networks. The information is transmitted or received from the cloud through GSM. The GSM enables GPRS to send and receive information in the form of packet to the cloud. The API that access information of "things" (timetables of nearby buses) is created. These API are available over the Internet, and allow applications to easily access and perform comparison in the cloud.

IV. Results

The system was developed which consists of an user module and a bus module. The position accuracy of GPS changes for every few meters, therefore before the bus reaches the user point, that is, the distance between the bus and the visually impaired people is few meters, the speaker speaks that the "bus has arrived". So the user will be prepared to board to the bus and not miss the desired bus. The implemented bus module and user module are shown in Fig.3 and Fig.4.

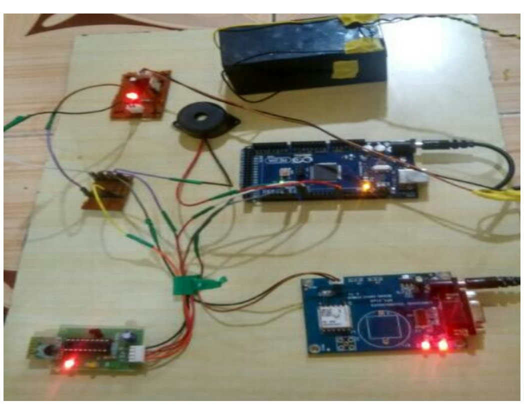

Fig. 3. Implementation of Bus Module

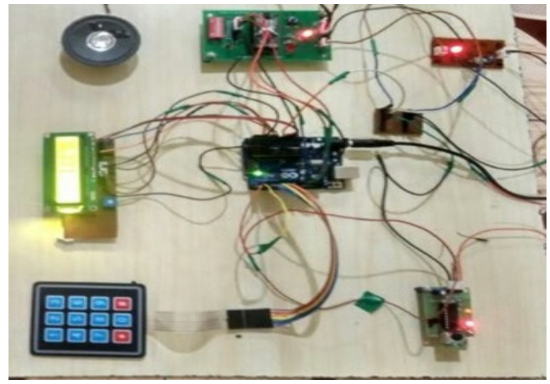

Fig. 4. Implementation of User Module

V. Conclusion

In this paper a public transport system is proposed for visually impaired people consists of an user module and a bus module to establish a communication between the users and buses in smart cities. Both modules are connected via IoT. Here GSM enables GPRS to send and receive information in the form of packet to the cloud. GPS positional accuracy depends on the ionospheric interference in which it causes a satellite signal to change in length as it travels towards the Earth's surface. This means that, depending on the quality of the receiver, accuracy can vary by several meters. The velocity of the vehicle is measured by Doppler shift in which the Doppler shift in the signals that comes from the satellites is captured and this leads to an accurate measurement of speed. GPS gives the position of the place at every few meters. So the user will get the warning that the bus has arrived before few minutes that few minutes can be calculated by speed of the vehicle and the distance of the few meters. Thus it will be very helpful for the visually impaired people to be prepared to board to the bus and can board the desired bus safely. Future work includes calculation of the time that the bus will reach the user bus stop by GPS.

References

[1] Upper Saddle River, NJ: Prentice-Hall. World health organization, Visual Impairment and Blindness : http://www.who.int/mediacentre/factsheets/fs282/en
[2] The Times of India, India has largest blind population: http://timesofindia.indiatimes.com/india/India-has-largest-blind-population/articleshow/2447603.cms
[3] Jerry T., Goh H., Tan K., "Accessible Bus System: A Bluetooth Application", *Assistive Technology for Visually Impaired and Blind People*, Springer, pp. 363-384, 2008.
[4] Noor, M.Z.H., Shah A. ; Ismail, I. ; Saaid, M.F. "Bus detection device for the blind using RFID application", *5 th International Colloquium on Signal Processing & Its Applications*, pp. 247 – 249, 2009.
[5] Quoc T., Kim M., Lee H. and Eom k., "Wireless Sensor Network apply for the Blind U-bus System", *International Journal of u- and e Service, Science and Technology* ,Vol. 3, No. 3, September, 2010.
[6] Olivier Venard, Geneviève Baudoin, Gérard Uzan. "Field Experimentation of the RAMPE Interactive Auditive Information System for the Mobility of Blind People in Public Transport" : Final Evaluation. 978-1-4244-5347-4/09/$26.00 ©2009 IEEE

ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 3, Issue 12, December 2017

[7] Akira Kawaguchi, Chiu Chan. "Community Support for Disabled Bus Riders": What Can We Do? , 978-0-7695-3538-8/09 $26.00 © 2009 IEEE.
[8] Hsiao-Lan Wang , Ya-Ping Chen , Chi-Lun Rau , and Chung-Huang Yu 1. "An Interactive Wireless Communication System for Visually Impaired People Using City Bus Transport", *Int. J. Environ Res. Public Health*, 2014,11,4560-4571;doi:10.3390/ ijerph 110504560.
[9] Jalila Al Kalbani, Rajaa Bait Suwailam, Arwa Al Yafai, Dawood Al Abri and Medhat Awadalla. "Bus Detection System for Blind People using RFID", *Proceedings of the 8th IEEE GCC Conference and Exhibition, Muscat, Oman*, 1-4 February, 2015.
[10] M.Babu Prasad and D.Amrish "Designing a Zigbee based communication protocol that enables the guidance system for Visually Challenged people", Issue 6, Vol. 3 (May 2016). ISSN 2249-6149.

Rahul Krishnan was born in kollam, India in 1990.He received the B.E degree in Electronics and Communication Engineering from Rajaas Engineering College, India in 2012 and M.E degree in Communication Systems from Rajaas Engineering College, India in 2015. .In 2015, he joined the department of Electronics and Communication Engineering, Rajalakshmi Institute of Technology, India as an Assistant Professor. His current research interests include antenna design, wireless sensor networks, IoT, cloud automation.

Dr.M.C.Jobin Christ was born in Nagercoil, India in 1982. He received the B.E. degree in Electrical and Electronics Engineering from Manonmaniam Sundaranar University, India in 2003, M.E degree in Applied Electronics from Anna University, India in 2005 and PhD in Medical Image Processing from Anna University, India in 2013. He published more than 35 research papers in various journals and conferences. He is having 12 years of teaching experience. His current research interests include image processing, signal processing, neural networks, wireless sensor networks, IoT, Biomedical Instrumentation.

Vanaja Selvaraj was born in Tamilnadu, India in 1982.She received the B.E degree in Electronics and Communication Engineering from Noorul Islam College of Engineering, India in 2005 and M.E degree in Communication Systems from National Engineering College, India in 2007. In 2010, she joined the department of Electronics and Communication Engineering, Rajalakshmi Institute of Technology, India as an Assistant Professor. She is currently pursuing her PhD from Anna University. Her current research interests include image processing, microwave imaging, and antenna design.

