Monitoring and Controlling of Crowd Navigation in Virtual Environment

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Abstract

Yearly, there is an influx of over millions of people in different sites. As this large group of people move between the different sites, safety and security becomes main concern. This paper looks into the integration of different mobile technologies to serve the purpose of crowd management, people tracking and location based services. It explores the solution to track the movement of people via RFID technology. A location aware mobile solution will also be integrated into this. This will be made available to people with mobile phones to enhance the tracking of the people and provide them with location based services.

Keywords: RFID, Zigbee, GSM, UART

1.0 Introduction

At present, there are so many problems regarding the crowd control, security issues, identification and tracking of the people in the crowded areas. Object tracking, which is also called target tracking, is a major field. And it has many real-life applications such as wild life monitoring, security applications for buildings and compounds to prevent intrusion or trespassing, and international border monitoring for illegal crossings. It is a technology used to identify tagged objects using radio frequency mainly composed of an electronic tag attached to the object. Radio Frequency Identification (RFID) technology has emerged as a practical solution to aid automatic object identification and tracking. These wireless system enable non-contact reading from a distance and their deployment is highly effective in manufacturing and other hostile environments where the employment of bar code labels was infeasible. Being a non-line-of-sight technology, RFID triumphs over the bar code labels for tracking mobile objects because they can be read regardless of their orientation. Especially in crowed areas, the individual person authority finds it difficult to manage the situation. Thus, in order to identify track and monitoring people a system is needed.

2.0 Existing System

Tracking and monitoring the people in a crowded area is difficult task. The people and the authorities faced the problems like locating people, guiding lost person, congestion management. Various technologies used for tracking and monitoring people and some technologies consist of fusion.

A) RFID with Zig Bee:

A.M. Nair and S.J. Daniel proposed RFID technology which describes the design and implementation of a system for tracking and monitoring the people. The transmitting section consisted of RFID reader, microcontroller and ZigBee transceiver. The transmitting unit sent the current location and unique ID to the

server unit using ZigBee transceiver. The receiver unit consists of ZigBee transceiver, external EEPROM unit and microcontroller unit. The received location and unique ID will be stored into the external EEPROM periodically. A heart beat sensing unit is connected to the transmitting section to monitor the medical condition in case of emergency. The people were tracked and the medical assistance can be sent in no time.

B) Integrated Mobile with RFID Systems

Mitchell proposed a system designed for tracking the pilgrims during Hajj. In this system, an RFID tag is given to each pilgrim. Pilgrims having Smartphone with GPS used location based services by installing an app. These services included location family members or friends, requesting urgent help, a map of important locations. To be able to transmit the current position, the app must be running in the phone. RFID readers were also installed in different regions to scan the tags. The control centre provides features like visualizing the location of all the pilgrims on a map searching for pilgrims based on several criteria like region, age, etc. sending notification to the mobile device, maintaining the database of places like hospitals, location history and personal information about pilgrims. Smartphone use web services and the RFID readers use middleware software to interface with the control centre. These systems faced problems with RFID tags and readers. The read range of the RFID reader is low; it is also affected by the environmental factors. The signal between the RFID tag and the reader is getting blocked by the tag holders own body, also the read range affected by angle with reader. So they decided to not have a wristband RFID tags.

C) RFID and Smart Watch

M. Yamin proposed the RFID technique to control and manage crowd. The whole area is installed with the surveillance systems, the managers were to continuously monitor the situation and take the preventive measures. The problem related to identification of pilgrims is solved. Whenever a stampede or a fire occurred, identifying badly mutilated bodies became a challenge. Another result of overcrowding is that thousands of pilgrims were disintegrated from their groups or from relatives for days or weeks (and some of them may never found). Reuniting the pilgrims with their groups may take considerable time due to poor identification mechanisms in place. In cases when pilgrims were lost and do not know their place of stay, there is no way offending their details, without seeking the help. If pilgrims do not return to their bases, there is absolutely no technology in place to track them. Hence the RFID and smart watch systems supported by the backend database would be able to track the missing persons, and find all the other details are proposed. Once the people with health risks were identified, they can be monitored throughout the pilgrimage by the established RFID and "smart watch" system. The PDA can be linked with the "smart watch" system, by which the person can clearly see the situation and also the PDA can talk to the "smart watch" system to send the "SOS" signal to the central control station so that the medical aid can be organized on an urgent basis. Smart watches which were not architecturally designed to conserve power, still have to be charged regularly in order to be used. The miniaturized screen on the smart watch can be seen as both an advantage and disadvantage. The problem of interference lies within the RFID system such as stationary-to-stationary readers, stationary-to-mobile readers, and mobile readers-to-mobile readers in denser environments because the RFID system uses the same frequency bands, there is a serious problem of spectrum congestion and interference between various types of networks. Interference problem also leads to misdetection of important tags and reading the same tags multiple times.

3.0 Proposed System

In the proposed system location details are maintained by using the RFID technology. Each and every person who is entering the place is provided with the RFID tag. This RFID tag has the person's details like name and family name. The area is divided into number of zones. For each zone a controller unit with a RFID reader is installed. Whenever a person enters in a zone the reader will fetch the data in tag and sent it to the database unit along with zone details via ZigBee module. If the people has entered in another zone then that zone detail is updated in the database by taking the time as reference. Thus management process is done. For the purpose of location aware, the database unit is provided with GSM modem. Whenever a person wants to find their family member who is missing in the crowd, they have to send a text message to the database section with their name and family name. By cross checking the updated database the zone details of the missing person is sent back to the person as a text message. For further assistance crowd

control processing is done. When a specific zone has been filled with more number of people, then the database controller will intimate the assistance booth to send more security persons to that zone.

4.0 Block Diagram

As proposed, the system consists of two units: Zone Unit and Server Unit. The zones will have the RFID tag. Every person will have a unique ID. The reader unit will send the current location and unique ID to the server unit using zigbee transceiver. The server unit consists of zigbee transceiver, microcontroller and PC unit. The received location and unique ID will be stored into the server periodically. So the information can be collected for every second.
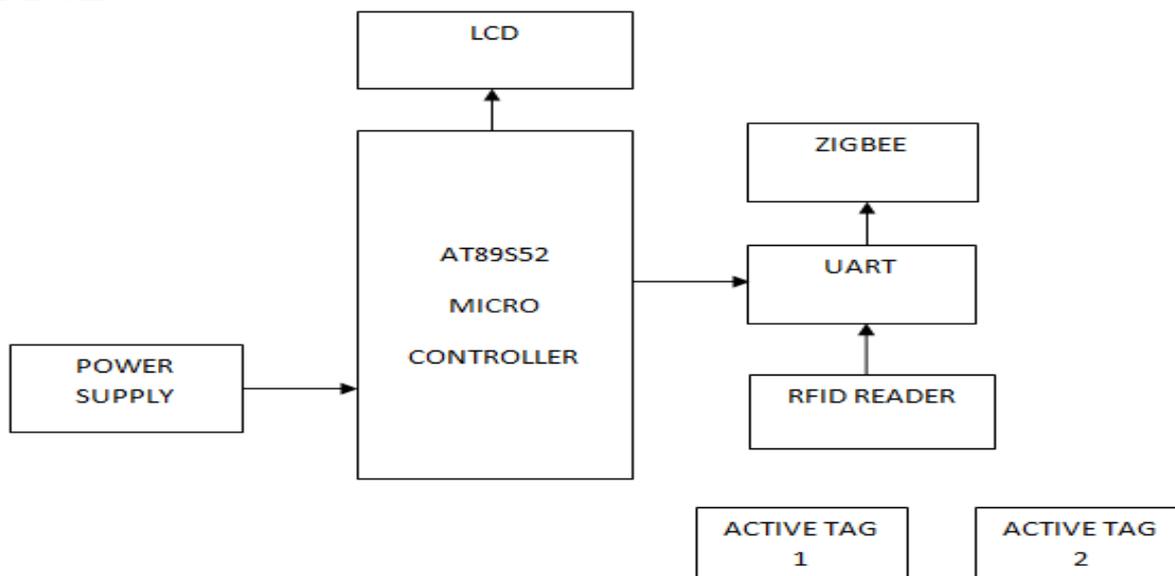
5.0 Zone Unit

Fig.1 Zone Unit

The zone unit comprises of RFID Tag and Reader, Microcontroller. Each and every person who is entering the place is provided with the RFID tag. This RFID tag has the person's details like name and family name. The area is divided into number of zones. For each zone a controller unit with a RFID reader is installed.

6.0 Server Unit

For the purpose of location aware, the server unit is provided with GSM modem. Whenever a person moves from one zone to other the family members will be informed with a text message.
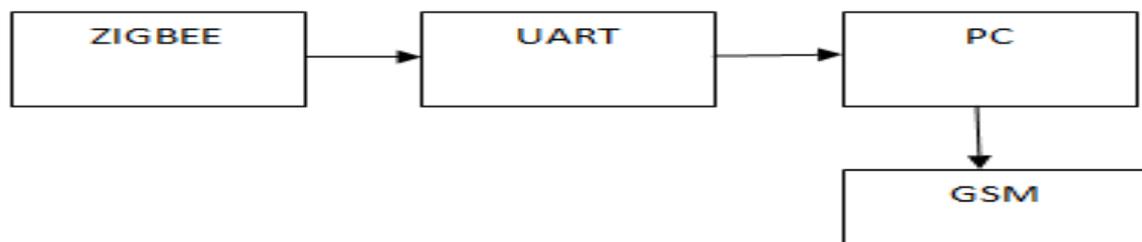

Fig.2 Server Unit

7.0 Components of the proposed system

A) RFID Tag: An RFID Tag is a tiny silicon microchip composed of an antenna, a wireless transducer and an encapsulating material. It contains the unique ID of the people and whenever the tag detects a reader, it

transmits the information stored in it to the RFID reader in wireless mode. The components of RFID tar is shown in figure.
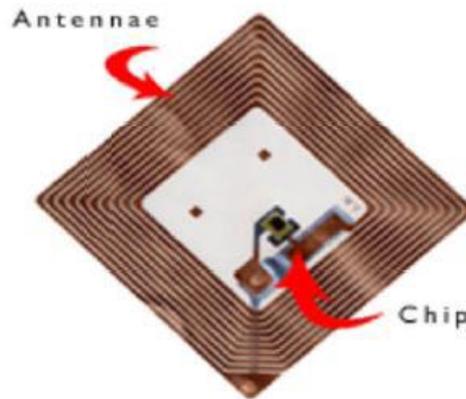
Fig 3: RFID tag

B) RFID Reader: An RFID Reader is an electronic device used to generate and receive RF signals. It can have various capabilities including reading and writing data to tags. These readers have to be deployed in every place where the people need to be monitored

C) Microcontroller: The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the Indus-try-standard 80C51 instruction set and pin out.

D) Server Unit: The server unit receives the people information via ZigBee and show that to PC using RS232 connection.

E) ZigBee Module: ZigBee unit is used to transmit the reader information to the server. ZigBee is targeted at radio-frequency applications that require a low data rate, long battery life, and secure networking.

F) UART: An UART, universal asynchronous receiver / transmitter is responsible for performing the main task in serial communications with computers. The device changes incoming parallel information to serial data which can be sent on a communication line. A second UART can be used to receive the information. The UART performs all the tasks, timing, parity checking, etc. needed for the communication. The only extra devices attached are line driver chips capable of transforming the TTL level signals to line voltages and vice versa.

G) GSM: GSM is a digital mobile telephony system that is widely used in Europe and other parts of the world. GSM uses a variation of time division multiple access and is the most widely used three digital wireless telephony technologies. GSM digitizes and compresses data, then sends it down a channel with other streams of users' data, each in its own time slots. It operates at either the 900MHz to 1800MHz frequency band.

8.0 Conclusion

Many difficulties may occur when a large group of people gather under an area. Especially during crowd season, crowd control, and security issues rise to an optimum point. Most of these problems can be solved with the help of those technological means which are acceptable in society. There is no reason for employing these technologies to solve current issues of human sufferings.

References:

[1]   Rappaport.T.S, 2002, Wireless Communications: Principle and Practice, Prentice Hall, 2nd Edition.

[2]   *Hiroyuki Suzuki, Masamichi Suzuki, Takuya Urabe, Takashi Obi, Masahiro, Secure biometric image sensor and authentication scheme based on compressed sensing, Imaging Science and Engineering Laboratory, Tokyo Institute of Technology, 4259 Nagatsutacho, Midori, Yokohama, Kanagawa 226-8503, Japan*

[3]   *Aladdein Amro, Qasem Abel-Muti Nijem, 2012 ,"Pilgrims "Hajj" Tracking System(emutawiff), "Contemporary Engineering Sciences,Vol.5,No.9,p.p.437-446*

[4]   *Sreenivasa Ravi.k, Mohammed Abdul Aziz, B.Venkata Ramana, 2012, "Pilgrims Tracking and Identification Using RFID Technology," Advances In Electrical Engineering Systems (AEES), Vol.1, No.2.*