QALAAI ZANIST JOURNAL
A Scientific Quarterly Refereed Journal Issued by Lebanese French University – Erbil – Kurdistan – Iraq
Vol. (2), No. (2), April 2017
Speical Issue : The 1st International Conference on Information Technology (ICoIT'17)
ISSN 2518-6566 (Online) - ISSN 2518-6558 (Print)

Alarm system using Microcontroller , GPS and GSM devices

Nadia Mahmood Hussein
Department of Computer Science,, College of Science, Almustansiriyah University -Baghdad - Iraq
nadia.salam97@yahoo.com
Saad Najim AlSaad
Department of Computer Science, College of Science, Almustansiriyah University -Baghdad -Iraq
alsaad6060@ gmail.com

ARTICLE INFO

Article History:

Received: 17 March 2017

Accepted: 1 April 2017

Published: 10 April 2017

DOI:

10.25212/lfu.qzj.2.2.12

Keywords: *SMS, Arduino, GSM, GPS, Sound sensor, Alarm*

ABSTRACT

During last ten years, it is noticed an increasing number of accidents causing losing of large number of victims This paper related to an explosion alarm system to inform the emergency center to make fast response for saving and rescuing life of people. The whole system is controlled by arduino uno microcontroller unit which senesces the environment and gives reaction based on what it sensed. Also GPS (global Position System) is used that gives the latitude and longitude of the event and sends this information as a short message to GSM (Global System for Mobile Communication) mobile using SMS (Short Message Service) . In other side, database of location (latitude, longitude) of each help center place is saved to be used for determining the nearest center to the accident through shortest path formula. Finally the path between emergency center and accident location is tracked through Google map application.

1. INTRODUCTION

With the advancement of human civilization, its safety has a prime concern. Alarm system is one of the most important means of assistance. It alarms the concern persons that an undesired accident is happened. Automatic alarm systems are utilized for decreasing the likelihood of danger occurring. Automatic alarms system operate by using an intelligent devices to detect the accident quickly and to get a shortest time between the moment of the problem occurs and the moment of help responding in order to reduce the substantial losses in a short period of time. The alarm system will give a way to intervene quickly and effectively control on the problem and thus reducing the amount of the losses.

Researches had implemented alarm systems, for example alarm system for earthquake [1] , unwanted events in home [2] and fire detection [3].

This paper focuses on design and implementation of alarm system. The paper is structured as follows: section 2 represents the proposed system as block diagram and flowchart.

QALAAI ZANIST JOURNAL
A Scientific Quarterly Refereed Journal Issued by Lebanese French University – Erbil – Kurdistan – Iraq
Vol. (2), No. (2), April 2017
Speical Issue : The 1st International Conference on Information Technology (ICoIT'17)
ISSN 2518-6566 (Online) - ISSN 2518-6558 (Print)

2. PROPOSED SYSTEM

Figure (1) illustrates the block diagram of the system. It consists of two parts: The transmitting part and emergency monitoring part. The mechanism work of the system is started at the transmitting part. The sensor vibrates to indicate an explosion is occurred. GPS retrieves the location information of the event from satellites in the form of latitude and longitude to the microcontroller. GSM sends the location and other information in the form of SMS from microcontroller to the emergency monitoring unit. SMS is a GSM mobile technology that can perform remote communication wherever they are. Through this facility messages can be sent quickly, accurately and at a low cost. All the modules of transmitted unit are controlled by arduino open source microcontroller.

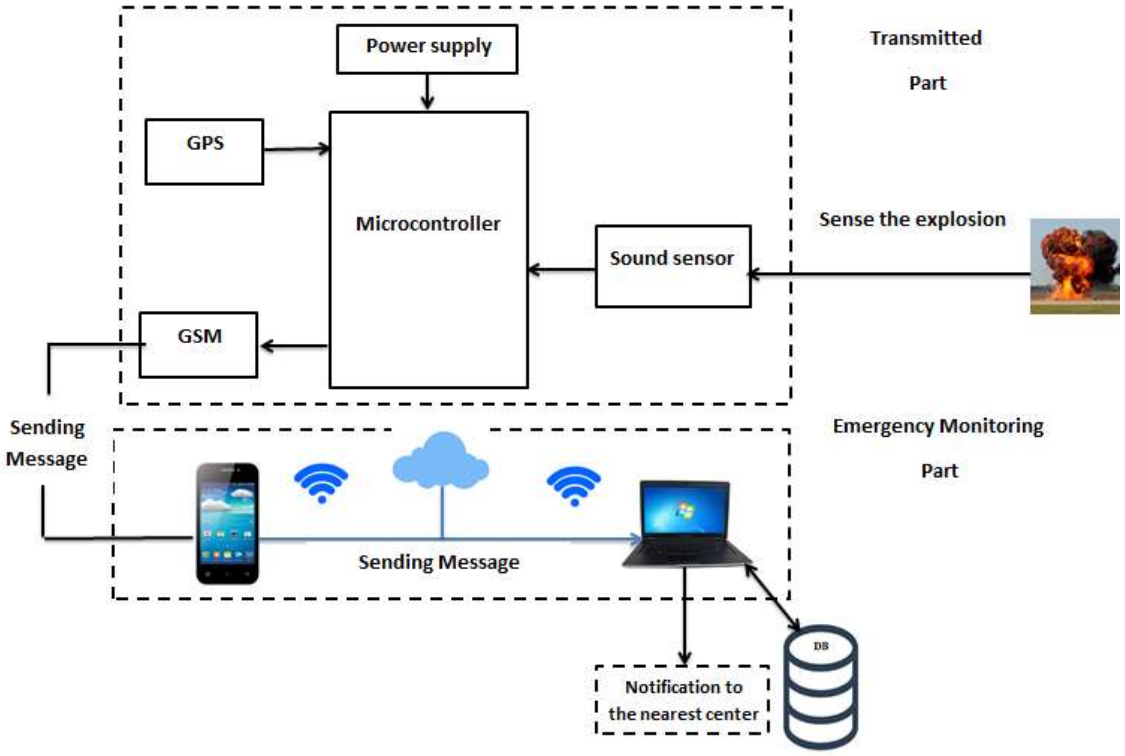

Figure 1: The block diagram of the system.

The emergency monitoring unit received the alarm message by any android phone. This developing system is based on android phone to get much more mobility and user friendly .Android application give a many service to reduce the complexity in receiving and sending gathered information (alarm message). The gathered information is sent and stored on web server (cloud) utilities from android application. Cloud computing is an Internet-based computing, Wi-Fi Internet services used to get the information from android mobile to cloud and from cloud to PC. SMS gateway enables the application to send/receive SMS messages to mobile devices with the computer. Gateway is most fast and reliable way for SMS sending and receiving. Now all the transmitted information arrives in computer to be subjected to analysis and then a formula is run to find the nearest helping center to the explosion place.

QALAAI ZANIST JOURNAL
A Scientific Quarterly Refereed Journal Issued by Lebanese French University – Erbil – Kurdistan – Iraq
Vol. (2), No. (2), April 2017
Speical Issue : The 1st International Conference on Information Technology (ICoIT'17)
ISSN 2518-6566 (Online) - ISSN 2518-6558 (Print)

This is performed by a database of all the helping centers[3] in Province by stored the location of each helping center in form of (latitude, longitude) and the phone number for each one. Also all the alarm messages is stored in database for future reviewing. The transmitted information is send as SMS to the nearest helping center. Finally the path is tracked graphically using Google map application; figure (2) illustrates the shortest path on Google Map.

Figure 2: The shortest path on Google Map

3. FLOWCHART OF SYSTEM

Figure (3) shows the flow chart of the system. It gives the basic idea about how the system works. First of the initialization of the system is carried out in which it checks if the system in normal state (no accident) and it is properly or not. If the system is not in normal state then an explosion detect. Then it tracks position of event through GPS and send SMS through GSM module to the emergency center. In the emergency center checks the shortest path between explosion position and helping center position.

[3] The helping centers is any places that can present help Such as the police center, hospital, etc.

QALAAI ZANIST JOURNAL
A Scientific Quarterly Refereed Journal Issued by Lebanese French University – Erbil – Kurdistan – Iraq
Vol. (2), No. (2), April 2017
Speical Issue : The 1st International Conference on Information Technology (ICoIT'17)
ISSN 2518-6566 (Online) - ISSN 2518-6558 (Print)

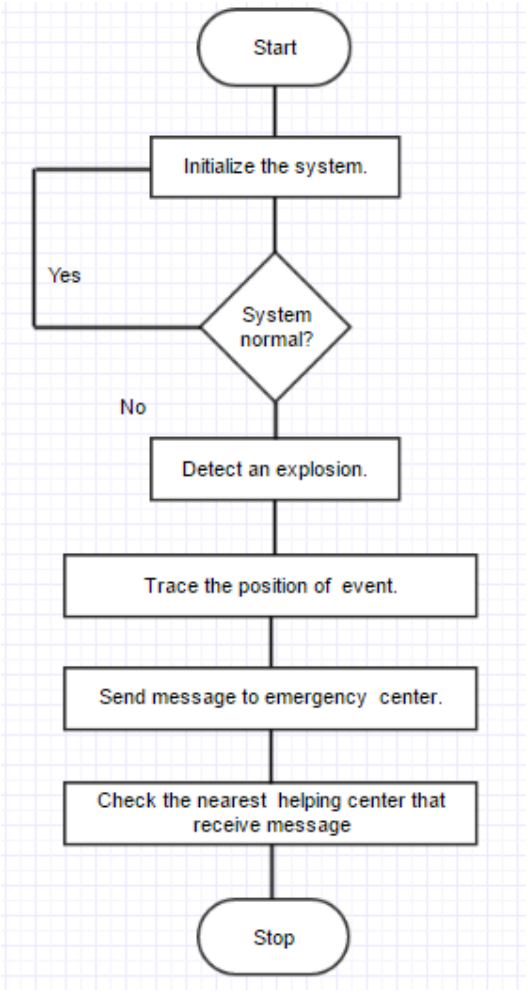

Figure 3: The flowchart of a system

4. HARDWARE REQUIREMENT

The proposed system contains the following hardware components that participate in performing the task of alarm system.

4.1 ARDUINO

Arduino is an open source physical computing platform based on small microcontroller board with simple input/output board. Arduino is composed of two major parts: the arduino board, which is the piece of hardware and the arduino IDE, which is the piece of software. It is multiplatform environment that may run on Windows, Macintosh, and Linux. Arduino is a flexible technique; it can communicate with the computer with an easy way also it is a powerful way to build better prototypes [4].The proposed system used arduino uno.

4.2 GLOBAL POSITION SYSTM (GPS)

GPS is formally known as the NAVSTAR (Navigation Satellite Timing and Ranging). GPS includes 28 active satellites that are uniformly settled on six different circular orbits. GPS is a powerful technique that gives the current date, time, latitude, longitude, altitude, speed, and travel direction [5] . Although receiver can calculate the position, the accuracy of

QALAAI ZANIST JOURNAL
A Scientific Quarterly Refereed Journal Issued by Lebanese French University – Erbil – Kurdistan – Iraq
Vol. (2), No. (2), April 2017
Speical Issue : The 1st International Conference on Information Technology (ICoIT'17)
ISSN 2518-6566 (Online) - ISSN 2518-6558 (Print)

positioning is dependent on the number of satellites in view, signal qualities, weather conditions, etc. It can be used in a many applications including navigation, tracking systems, mapping and robotics. All these information are provided by GPS in any time and in any weather condition [6]. The proposed system is used GPS modem to determine the (latitude, longitude) of the vehicle.

4.3 GLOBAL SYSTEM FOR MOBILE COMMUNICATION (GSM)

GSM is an open, cellular network used for transmitting mobile voice and data services. It is a wireless modem that works with a GSM wireless network [7] . GSM modem is a specialized type of modem that accepts SIM card and operates over a subscription to a mobile operator just like a mobile phone [8] . The proposed system is used arduino GSM shield for sending the gathered information as an alarm message to android mobile.

4.4 SOUND SENSOR

The sound sensor module provides an easy way to detect sound intensity. In this system, it is used to detect the sound of explosion. This module can be used for switch, security, and monitoring applications [9].

5. SOFTWARE REQUIREMENTS

5.1 Arduino software

In the transmitted part the system used (Arduino c language) to perform the connection of the board with PC using serial port such as COM1 or COM2. The ATmega328 on the arduino uno comes with a boot loader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the STK500 protocol [10]

5.2 (c# language)

In the central part the c# programing language is used to design the interface of the system, also SQL data base is used to store the information of the message content, real position of emergency center in the form of (latitude, longitude) and its phone number.

6. RESULT

A figure (4) illustrates the detailed message and its content, the first word (alarm) is a keyword to differ between alarm message and other messages, the second word is (danger) means there is an explosion occur , the (3322.872) is latitude , and (4422.759) is longitude of the event . The proposed system deals with the critical situation, so we should be take into consideration the time span between the moment of detection and the moment of intervene. The maximum time need to transmit the message from GSM to android mobile is 11.5 second and the minimum time is 6 second, the maximum time need to transmit the message from android mobile to PC is 11 second and the minimum time is 5.5 second.

QALAAI ZANIST JOURNAL
A Scientific Quarterly Refereed Journal Issued by Lebanese French University – Erbil – Kurdistan – Iraq
Vol. (2), No. (2), April 2017
Speical Issue : The 1st International Conference on Information Technology (ICoIT'17)
ISSN 2518-6566 (Online) - ISSN 2518-6558 (Print)

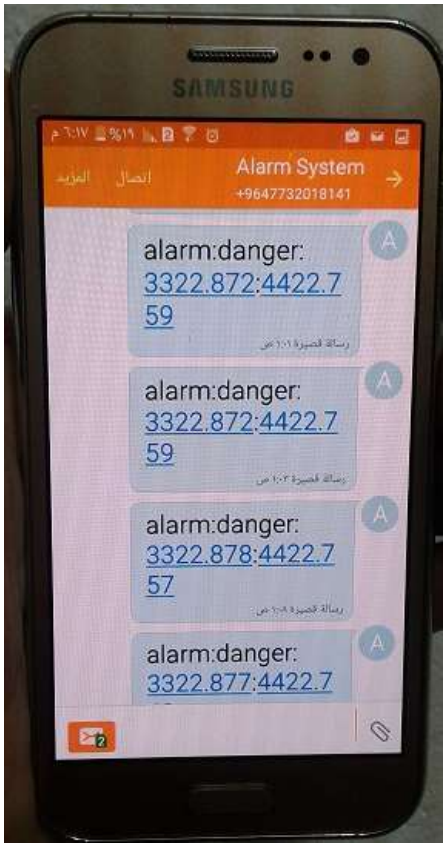

Figure 4: The alarm message contains in

7. CONCLUSION

Our prime objective in this system is to reduce the numerous losses in human life beside of the economic loss , this system can detect the problem that occur by using sensors that integrated with a microcontroller , GSM and GPS modules . SMS is used to alert user via mobile phone when possible problem occurs. The message sent to center emergency that decided the nearest helping center to the vehicle, also it view the shortest path on the Google map application.

8. RECOMMENDATIONS

The system can be further developed with added hardware like camera in transmitted part to describe the situation online and send it as a video to emergency monitoring part.

9. REFERENCES

[1] Hima MS, Josphin Subha, Kalyani Devi G, Karthika Sankaran, Naveen S, "Earthquake Indicator Using Arduino," *International Journal of Research in Advent Technology, Vol.4, No.*, vol. 4, no. 8, 2016.

[2] A. Gupta, "Intelligent Home security using GSM communication module," Vols. 13 No. 1 Jan. 2015, pp. 239-242, no. 1, pp. 239-242, 2015.

[3] Omar Asif , Md. Belayat Hossain , Mamun Hasan , Mir Toufikur Rahman, Muhammad E. H. Chowdhury, "Fire-Detectors Review and Design of an Automated, Quick Responsive Fire-Alarm System Based on SMS," *Int. J. Communications, Network and System Sciences, 2014, 7, 386-395,* vol. 7, pp. 386-395, 2014,.

[4] M. Banzi, Getting started with Arduino, 2d ed., Make:Books, 2011.

[5] AHMET IRKIN and SERKAN KARAKIS, *Relative distance measurement using GPS and internal vehicle sensors,* CHALMERS UNIVERSITY OF TECHNOLOGY, 2011.

[6] Basavaraj Chougula, Archana Naik , Monika Monu, Priya Patil and, "Smart girls security system," *International Journal of Application or Innovation in Engineering and Management* , vol. 3, pp. 1-4, 2014.

[7] P. Chandra, Bulletproof wireless security GSM, UMTS, 802.11 and ad hoc security, 1d ed., Elsevier,, 2005.

[8] Ramchandra K. Gurav and Rohit Jagtap, "Wireless digital notice board using GSM technology," *" International Research Journal of Engineering and Technology (IRJET)* , vol. 2 , pp. 1-3, 2015..

[9] Jiankai.li, Sound sensor user manual, seeed Grow the di_erence, 2015.

[10] Santoso Budijono ,Je_ri Andrianto and Muhammad Axis Novradin Noor, "Design and implementation of modular home security system with short messaging system," 2014.