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Pilgrim Tracking and Health Monitoring System Using WSN

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Abstract: In India, every year about thousands of pilgrims go to different religious places and participate in pilgrimage to offer prayers. As the count of pilgrims taking part in pilgrimage is random and high, it is very difficult for managing authorities to track the movement and location of pilgrims as they reach to any one destination point. In order to avoid the mishaps/ accidents due to medical emergencies and to discover the exact location of person in need of any help to managing authorities, we are implementing the system which relies on a Wireless Sensor Network (WSN). WSN are consists of distributed autonomous sensors to monitor physical conditions such as temperature, sound, pressure etc. These parameters are sensed and cooperatively transmitted through wireless network to main location. Each pilgrim is equipped with a mobile unit which consists of micro-controller, GPS, GSM module, LCD, heartbeat sensor, temperature sensor, keypad and battery. Server unit will initiate and transmit the query to mobile unit. On receiving the query by Mobile unit, it will transmit its UID, latitude, longitude and a time stamp as a reply of received query to the server. As soon as server receives the reply transmitted by mobile unit, it will update the data of respective pilgrim in its storage memory and re-transmit the information about the individual to their respective relative and Guardian. As the mobile unit held by pilgrim is embedded with keypad, the push buttons provided on keypads can be used to generate and transmit the alarm/message in case of any emergency or difficulty faced by the pilgrim.

Keywords: GPS, Heart Beat Sensor, Temperature Sensor.

I. INTRODUCTION

India is a country with diverse religion, traditions and cultures.As there are numerous holy places situated in different states and regions of the country. Every year about thousands of mystic individual's devotetheir time for procession and cover miles of distance in worship of God. Tracking of such large amount of procession is really onerousand also inconvenient for managing authorities. For example, Pandharpur is a holy place in Maharashtra, the procession of Pandharpur is renowned at every corner of Maharashtra,the pilgrim joining in Pandharpur pilgrimage takes numerous days to cover the avenue and complete the pilgrimage.As it is a long journey, every group takes halts in-between for relaxation. During the halt the rector of the group counts the number of individuals that have been misled or followed the wrong path during the procession.

The information related to missing people is forwarded to rector. Rector ensures that unaccounted individuals reach to the desired destination. Since the rector needs to control the group of people during the procession, below are some problems faced by the rector during the procession.

- Identification of each pilgrim
- Tracking of pilgrims
- Crowd control
- Security issue

It is very difficult for authorities to solve all above issues. But we can reduce these problems up to some extent. However till now numerous technologies are used at different holy places to reduce these types of problems.

One model is described in this paper, which uses WSN (Wireless Sensor Network)

It is divided into 2 sub-parts.

- Mobile Unit
- Server Unit

Before beginning of pilgrimage or procession, details of each and every pilgrim are noted down and then each pilgrim is accommodated with mobile unit, which is identified by its unique ID. Mobile unit consists of GPS chip, LPC2138 micro-controller, GSM module, LCD, sensors, keypad. With reference to received query, Mobile unit transmits its useridentification (UID) and time stamp information to server. Central Server consists of GSM module, PC and LPC 2138 .The central server keeps track of every individual pilgrim location and information. Server will transmit the pilgrim's current location to their respective relative via GSM on request. The design provides optional keys on mobile unit for pilgrims use to request for help in case of medical and food emergency.

II. LITERATURE SURVEY

Previously some engineers have proposed solutions for problems faced by pilgrims and authorities during the holy events. Mohamed Mohandas has developed a mobile device that helps the authorities to identify pilgrim using RFID technology [1]. He has given a solution which is based on RFID technology. It helps the managing authority not only for identification of pilgrims but also for crowd control. He developed a prototype pilgrim identification system that provides a wristband RFID tag, RFID tag and GUI. Pilgrim wears the wristband RFID tag that stores pilgrim data. This data is useful for identification and also for medical

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emergency purpose.
Most managing authorities provide training to pilgrims before starting pilgrimage. However they encounter problems which occur during the pilgrimage .This helps pilgrims to take immediate decisions while performing rituals. In such situations pilgrims may take help of guide books or follow other pilgrims. But all the time, experts may not be around to help. So Shahida Sulaimanand Hasimah Mohamed have proposed knowledge based approach that can cover possible problems and solutions from experts and this system is called Hajj-QAES [2]. This system helps the pilgrims in learning process and what to do next without asking to anyone.
Willy WahynMulyana proposed a simulation of crowd's behaviour based on the development of intelligent agent [3].Intelligent agent is applied to each pilgrim to build the crowd behaviour. The results showed that Hajj crowd simulation is able demonstrate more realistic pilgrim's behaviour .Such system can be used to train the pilgrim before they perform actual activities. Practically it is very difficult to know exact position of any pilgrim, it may take several days. The best way to locate a person is by using a tracking system. This paper and its main ideas are taken from "Wireless Sensor Network for Pilgrim Tracking" by Mohamed Mohandas, Mohamed Haleem, Mohamed Deriche [4] .System offers tracking of pilgrims by using wireless sensor network which uses GPS.

III. SYSTEM DESCRIPTION

The block diagram of mobile unit is shown in Fig. 1.It contains ARM LPC2138 micro-controller, GMS module, GPS module, LCD display, Heartbeat sensor, temperature sensor, keypad, battery. Fig. 2 shows server unit which consists of PC, LPC2138, GSM module, LCD display

A. Description of Mobile Unit
Mobile sensor unit consist of GPS module, GSM module, Heartbeat sensor, Temperature sensor and LCD display. Heartbeat sensor and temperature sensor monitor the status of health for every pilgrim using the health parameter of pilgrim continuously. GPS co-ordinates along with health parameters are transmitted through GSM.

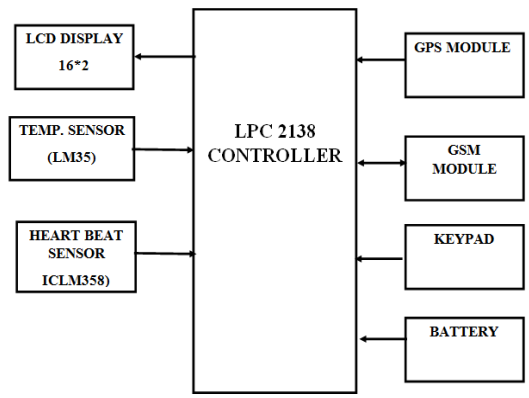

Fig.1. Block Diagram of Mobile Unit

B. Description of Server unit.
Server unit consist of LPC 2138, LCD display and GSM Module. LPC 2138 is performing the task of control. LCD will display the searching UID. GSM is used to transmit the UID message to mobile unit and also transmit the requested information to respective pilgrim's relative.

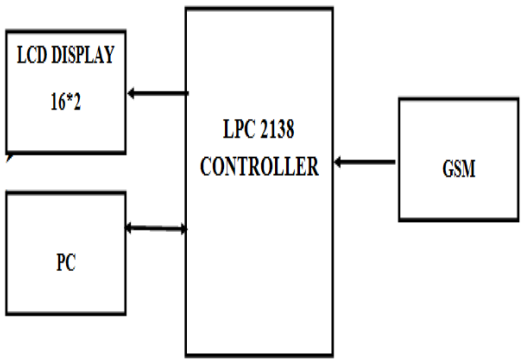

Fig.2. Block Diagram of Server Unit

C.Hardware used
1) LPC 2138:
LPC2138 microcontroller is used for implementation. It is a 32 bit processor with real time emulation up to 512 Kb on chip flash programming memory. It consists of eight channel General Purpose DMA controller (GPDMA), two fast I2C-bus and SSP with buffering and variable data length capabilities, two 8 channels ADC and single 10 bit DAC converter peripherals, two 32-bit timers/external event counters (with four capture and four compare channels each), PWM unit (six outputs) and watchdog[8].

2) Liquid Crystal Display:
LCD (Liquid Crystal Display) screen is an electronic display. Hitachi manufactured 16 X 2 LCD is selected by us for our implementation. A16 X 2 LCD signifiesthat it can display 16 characters per line and has 2 lines of 16 characters. LCD has 2 registers they are Command register and Data register. Command instructions are stored in Command register, For example Command instructions like initializing LCD, clearing screen, setting cursor position and controlling display etc. The data register stores the data which is to be displayed on LCD. The data is the ASCII value of the character to be displayed on the LCD.

3) GSM Module:
GSM provides terminal mobility, with personal mobility provided through the insertion of a subscriber identity module (SIM) into the GSM network (mobile station).The SIM carriers the personal number assigned to mobile user [6]. To exchange the message between mobile unit and server unit different technologies are available like RF, Zigbee, Bluetooth and GSM. But comparing all these technologies has some range limitation except GSM. By using GSM we can transmit message in all over the world. SIM900 GSM module is used in the design. GSM module is used for transmitting pilgrims current location and health status to their respective relative and server .If any relative want to know its pilgrims health status or location, then relative will send the query to server via GSM.

4) GPS Module:
To track pilgrim location different types of positioning technologies are available like Passive and Active RFID,

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Bluetooth, Wi-Fi, GPS. But GPS is having very huge coverage than other positioning technologies. The GPS module used in this project is SKG13C. GPS module continuously receives information from satellite and this GPS module is connected to mobile unit which is with pilgrim. GPS receiver calculates its location by analysing signals it receives from GPS satellites [7]. Each GPS satellite continuously broadcast stream of data that contains

- Status of the transmitting satellite
- Clock / time data
- Ephemeris(describes location of transmitting satellite)
- Almanac data(describes the orbits of all GPS satellite)

5) Temperature Sensor:
Temperature sensors are used to measure temperature by sensing physical characteristic. Temperature sensor working is depending on physical property that is to be measured. Different types of temperature sensors are available in market like thermocouples, RTD, thermistors, and bimetal switches .In this design we had considered LM35 temperature sensor which is an integrated circuit sensor [9]. Output of LM35 is more precise than thermistor, Because of LM35 circuitry as it is sealed not subject to oxidation. Output of LM 35 is higher than thermocouples hence it will not require amplification. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature.

6) Heart Beat Sensor:
To measure heartbeat of everyindividual pilgrim, insert the finger into the heartbeat sensor. Output of sensor is in digital form which can be directly interfaced to microcontroller to measure Beats per Minute (BPM) rate. Heartbeat sensor used in this project is LM358. It contains dual operational amplifier. Heart beat sensor consists of Bright LED and light detector [9]. Out of this one will act as amplifier and another will act as comparator. Output of LED must be as strong as light should pass through finger and detected at other end. Finger became slightly less transparent as heart pumps a pulse of blood. So less light reach at detector. With each heart pulse detected signal varies this variation is converted to electrical pulse.

IV.RESULT

A. Mobile Sensor Unit

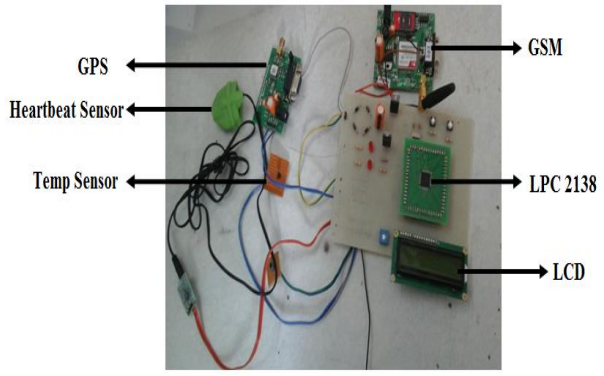

Fig.3. Hardware of mobile sensor unit

Fig. 3 is hardware of mobile sensor unit which consist of GPS, GSM, heartbeat sensor, temperature sensor, LPC 2138, LCD

B. Server Unit
Fig. 4is hardware of Server unit, which consist of GSM, LPC 2138, and LCD.

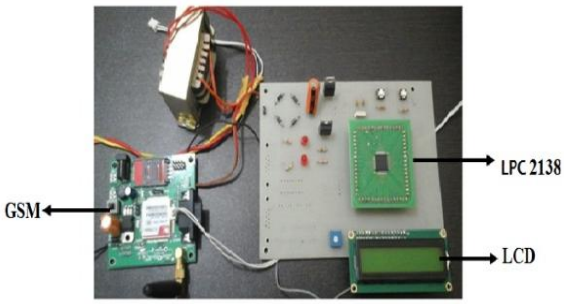

Fig.4. Hardware of server unit

C.Requesting Location at server
As shown in Fig. 5 snapshot is taken when server has entered UID of pilgrim who is need to be tracked. This UID is stored in Terminal Software. After entering UID, this UID will be transmitted to respective mobile unit. When UID is transmitted through GSM, the message displayed at server unit is "Searching Mr. XXX".

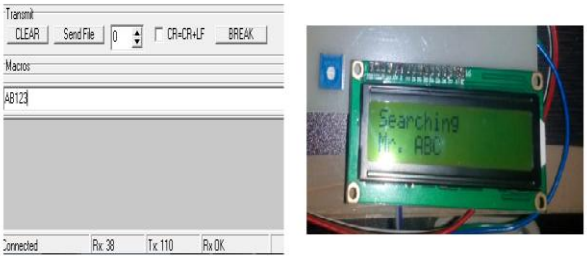

Fig.5. Requesting UID via Terminal Software and displaying it on LCD

D.Results at mobile unit
Temperature sensor is attached to pilgrim's body. Output of temperature sensor displays T=31 C as shown in Fig. 6.

Fig.6.Display of Pilgrim's Body Temp

GPS is connected to mobile unit. GPS provides longitude and latitude coordinates for corresponding pilgrim. Fig. 7 shows output of GPS as 1833.4492 N, 07354.6378 E

Fig. 7.Display of Pilgrim's Location

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Heartbeat sensor is attached to pilgrim's body which is shown in Fig. 8.

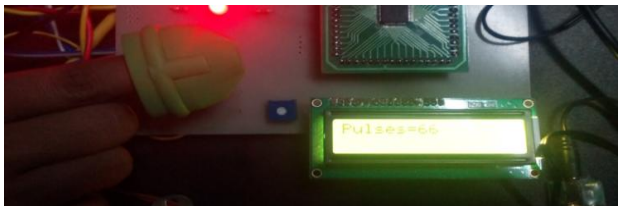

Fig.8. Operation of Heart Beat Sensor

To count the heartbeat 30sec countdown is provided. Fig 9 shows the counting of heartbeats for 30 sec.

Fig.9. Display of Scanning Pilgrim's Heart Rate

After 30 sec of countdown, sensor will shows heartbeat count which is shown in Fig. 10 as Pulses=66

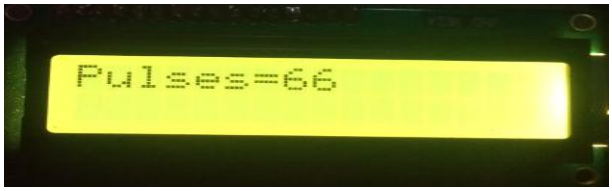

Fig.10. Display of Pilgrim's Heart Rate

E.Response from Mobile unit

Fig.11 shows message/response received from mobile unit. This Response message is displayed on Terminal software. Response is showing location, temperature, heartbeat count. Fig.10 shows Mr.ABC, T=29C, Heartbeat=72, location: 1833.4492 N, 07354.6378 E

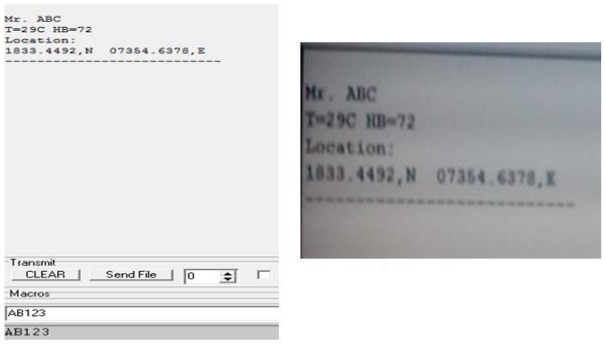

Fig.11. Result of Received Message

F.Result on Relative's Mobile

When the server receives the response from mobile unit, server will transmit that received message to respective relative of pilgrim. Fig. 12 shows received message at relative's mobile.

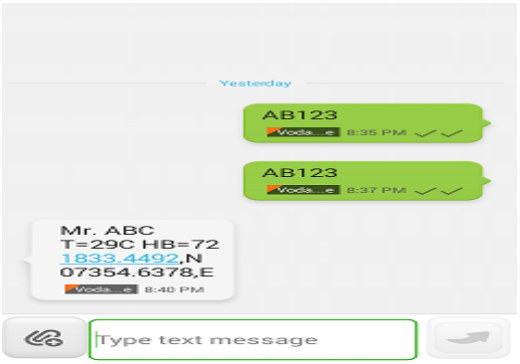

Fig.12. Message Received at Relatives Mobile

V. CONCLUSION

Tracking and health monitoring of individuals in crowded and dense surroundings is a difficult issue. Despite the ever improving technologies in the modern world, we have not been able to solve the most basic issue in any crowded event. In order to overcome this issue, we designed and implemented a system for tracking and health monitoring of pilgrim during pilgrimage or procession, wherein the system is capable to resolve the problems related to the tracking of the pilgrims from the point of origin to destination. The use of WSN, GSM, GPS technologies gives us the cost effective, reliable & flexible tracking & monitoring of pilgrims in dense urban areas. With added technologies propagation time required for health monitor and tracking is approximately 7 sec for 10 meter distance. The location information is mapped onto a server for ease of localization and efficiency in providing help. In future ,with further developments in the system we can reduce the propagation time and increase the distance over which the system becomes functional.

REFERENCES

[1] M. Mohandes, "An RFID-based pilgrim identification system (a pilot study),"in optimization of Electrical and electronics Equipment, 2008.OPTIM 2008.11th International Conference on, 2008, pp.107-112

[2] S.Sulaiman, H. Mohamed, M.R.M. Arshad, N.A.A. Rashid, and U.K .Yusof,"Hajj-QAES: A Knowledge –Based Expert System to support Hajj Pilgrims in Decision Making, "in Computer Technology and Development, 2009.ICCTD 09.International Conference on, 2009, pp.442-446

[3] [3]W.W.Mulyana and T.S.Gunawan, "Hajj crowd simulation based on intelligent agent, "in computer and Communication engineering (ICCCE), 2010 International Conference on 2010, pp,1-4.

[4] Mohamed Mohandes, Mohamed Haleem, Mohamed Deriche, and KaviarasBalakrishnan, "Wireless Sensor Networks for Pilgrims Tracking", IEEE EMBEDDED SYSTEMS LETTERS, 4th Vol,NO. 4, December 2012.

[5] Moe Rahnema, "Overview of GSM System and Protocol Architecture," IEEE Communications Magazine, Pages 92 -100, April 1993

[6] Abid khan, Ravi Mishra, "GPS – GSM Based Tracking System", International Journal of Engineering Trends and Technology, Vol. 3 Issue2, Pages 161-164, 2012.

[7] Rubina.A.Shaikh, "Real Time Health Monitoring System Of Remote Patient Using Arm7", International Journal of Instrumentation, Control and Automation (IJICA) ISSN: 2231 - 1890, Vol.1 Issue 3, 4, Pages 102-105, 2012.

[8] http://www.nxp.com/documents/data_sheet/LPC2131_32_34_36_38.pdf

[9] http://datasheet.octopart.com/LM35AH-National-Semiconductor-datasheet-39623.pdf