Implementation of Zigbee and GPS based Tracking Device for Demantia Patients

Vinutha. V[1] Heartlin Maria. H[2] Brindha. R[3] Elakiya[4]
[1,2,3,4]Department of Computer Engineering
[1,2,3,4]Sathyabama University, Chennai, India

Abstract— Location based services are the next major area of growth in the generation of info-communication. This work focuses on developing a patient tracking system for mild Cognitive impaired patients. The proposed architecture of the system integrates GPS-Zigbee technology for tracking dementia patients. The main emphasis of the work is on miniaturization and a cost effective indigenous product. The main aim of this system is to continuously monitor the location of the patients. RF enabled technology is implemented for automatic monitoring. The user can pair their android mobile with the GPS tracker and zigbee so that they can keep a track of the exact location of the patient even from indoor. The design is very sophiscated that, the user has to just search their requirement from their mobile. In case the user wants the location of the patient, they can send a message with a code and the device uses the GPS system to locate and send the information regarding the exact latitude and longitude position.

Key words: GPS based Tracking Device, Zigbee based Tracking Device

I. INTRODUCTION

A computer controlled electro-mechanical system is called an embedded system. Embedded system is different from a general purpose personal computer. Microprocessor is known as the heart of the embedded system for certain tasks. Most embedded systems are designed for low cost productions. Embedded systems are designed for low cost prodoctions. Embedded systems cannot always be categorized based on speed or cost. Embedded systems are usually present in machines that have to run continuously for years without errors. Hence the software is tested and developed very carefully. Many embedded systems do not contain mechanically moving parts like disk drivers, switches or buttons because they are not reliable when compared to solid state parts such as Flash memory. Embedded system has 3 main components embedded within it namely hardware, main application software and a real time operating system. In an embedded development environment the primary components are the host system, target system and the connectivity components. Embedded systems are widely used in industries, automation, defence, transportation and aerospace. In our day to day life we tend to use Embedded system without even acknowledging it. Embedded system can be categorised as hard real time and soft real time embedded systems. Hard real time systems are bound to certain deadlines with a non-zero degree of flexibility. On the other hand soft real time systems also have a deadline but with a degree of flexibility. Embedded Systems are usually built using embedded processors. Embedded processor is cheap and has built-in integrated devices.

The scope of our work is to track demantia patients using GPS up to 50m in outdoor tracking. Previously Bluetooth was used but it covered only 10m.This application can be used indoor and outdoor. It can also be used in hospitals for tracking the patients. Thus useful in hospital management. There are various processors in an embedded system namely general purpose processor, microcontroller, DSP, single purpose processor and application specific system processor, dual core processor and accelerator. These processors are used in various applications like audio operations, video operations, codec operations, control and bus operations, peripherals and devices and to enhance the performance of the system etc.

II. LITERATURE SURVEY

S. H. Chew, P. A. Chong, E. Gunawan, K. W. Goh, Y. Kim and C. B. Soh, have developed a hybrid mobile-based location technique using GPS and cellular mobile network infrastructure which was used to provide the location tracking ability. This Patient Location Tracking System (PLTS) was mainly dependent on Cell ID and GPS data to assist the care takers of the dementia patients.

Another method for demantia patients as proposed by K. J. Kim, M. M. Hassan, S. Na and E. N. Huh. This method operates based on the data collected by the sensor used. The data from the sensor is obtained by using the activity matching algorithms. This method proved to be useful to a certain extent but the area of coverage was lesser than 50m.

S. M. M. Faria, T. R. Fernandez, F. S. Perdigoto worked on a method which depend on a mobile based web server which was used for tracking elderly patients using GPS/GPRS technology. This method of remote physiological monitoring (RPM) system for demantia patients monitors the physiological parameters through ZigBee or GSM network and sends an SMS alert to the caretakers.

S. Nefti, U. Manzoor, S. Manzoor have reported an alzheimer patient monitoring system which operated using wireless senor network specially designed for ambient assisted living and also for alerting the caretakers of the patients during emergency situations. Most of the works that were published earlier were based on employment of a 2G/2.5G wireless communication module and most of the standards for monitoring the patients were forcussed on the usage of wireless sensor networks and nodes.

Different methods were proposed by various authors in order to ensure the security in patient monitoring systems. Confidentiality is one among the issues that is being faced during the process of storing patient related data. In Luan Ibraimi et al proposed a method using Cipher text Policy Attribute Based Encryption (CP-ABE) .The operation of this method as such that, after encrypting the data it can be stored in a server. This makes it possible to download a copy of the data which wouls be useful for the care taker, but the access policy that has to be used by the care taker can actually

decrypt it which resulted as a drawback. Here different algorithms were used to generate the various keys that were used, to encrypt the data and also to decrypt the data.

Two security issues were considered by M. Li and W. Lou, which led to the arisal of this method. Dependable distributed data storage and fine-grained data access control was being able to be achieved by this method. Integrity and dependability are considered to be the two the major aspects which are generally required for data storage. Confidentiality was achieved in this method by usage of public key encryption and integrity was achieved by MAC which can be expanded as Message Authentication Code schemes also dependability was achieved by the implementation of error correction.

SKC (Symmetric Key Cryptography) and PKC (Public Key Cryptography) was used to gain access control and Qian Wang and Kui Ren Wenjing Lou Yanchao Zhang, proposed a data storage scheme in which dynamic integrity assurance which was based on secret sharing and erasure coding was implemented. The data integrity schemes used were mostly based on the principle of algebraic signs. Here the verification of data was able be done without the need for original data. This scheme proved to be secure and efficient against different types of attacks that were usually encountered. Verification also was done without the requirement of the original data.

III. EXISTING SYSTEM

- In existing system, blue-term android app is used to find the lost patients in hospitals/outdoor or indoor situation using Bluetooth device along with GPS, which could cover a distance of about 10m.
- In the existing system there is manual searching is followed the missed patients and TV announcement other way to find the patients. And also file a police compliant to search the patient. No automatic smart technology used to find the lost persons.

A. Disadvantages

- Shortest range of about 10m.

IV. PROPOSED SYSTEM

- In PROPOSED SYSTEM, The main aim of the Project is to find users when they are missed.
- The proposed system has three modules, patient module, guardian module and server section.
- The user/patient module is a wearable device. It is provided for DEMANTIA persons.
- Zigbee and GPS enable hardware is mainly fixed into patients, similar to the wearable model.
- The Android based APP is developed.
- The patient module is always paired with the guardian module, which contains when the patient gone out the Range, our application automatically can send of user to all social websites (example facebook).
- Automatic alert is generated in case of Out of Range of Dementia patient.
- Those who are getting information from social website immediately can search the through mobile app.
- We implement Cloud Computing in this project. If the patient is in outdoor, enabled GPS module is sending the location information of the patient in a regular interval to the server.
- If the guardian want to trace the location of the patient, possible to connect with the server and get the location information.

1) Advantage

- Distance upto 50m.
- Wearable device
- Waterproof

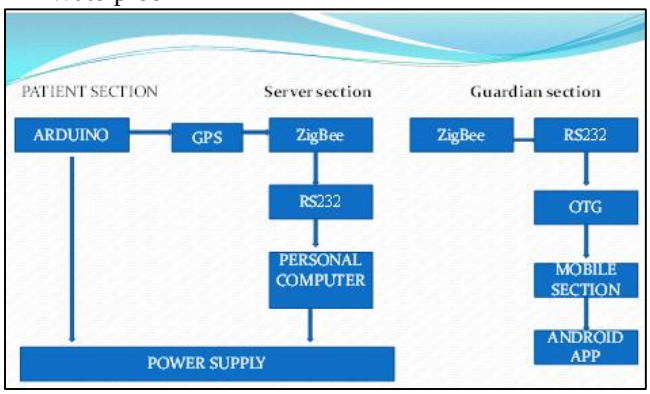

Fig. 1: shows the block diagram of the proposed method

V. RESULTS AND DISCUSSIONS

By using this prototype circuit containing ARDUINO 167, GSM Modem, LCD and other sensors hardware circuit so that the messages can be transferred at fixed time intervals to the corresponding medical expert to give necessary precautions to take care about the patient. With the view of manufacturing a compact and portable device which can provide all the analysis and calculation of the basic physical parameters required by an individual, the following system has been provided with the following features:

- ARDUINO consumes low power with suitable devices for interconnection.
- Continuous monitoring of patients is done by using GSM network.
- The device is designed to provide a continuous access to a person's heart rate and temperature monitoring & inform through wireless communication.
- The heart beat sensor which detects heart beat is interfaced to microcontroller along with LCD, which display the heart beat rate.
- Monitoring of glucose level from sweat can relief the patient from piercing and taking blood from their body.

The objective of the project is to reduce the hospital charge for providing basic assistance to the patient and to provide help and attention within the adequate time. Health monitoring application is mainly proposed to provide alerts for medical health monitoring staff for the patients when needed, so that the patient gets the medical facilities as soon as he/she requires.

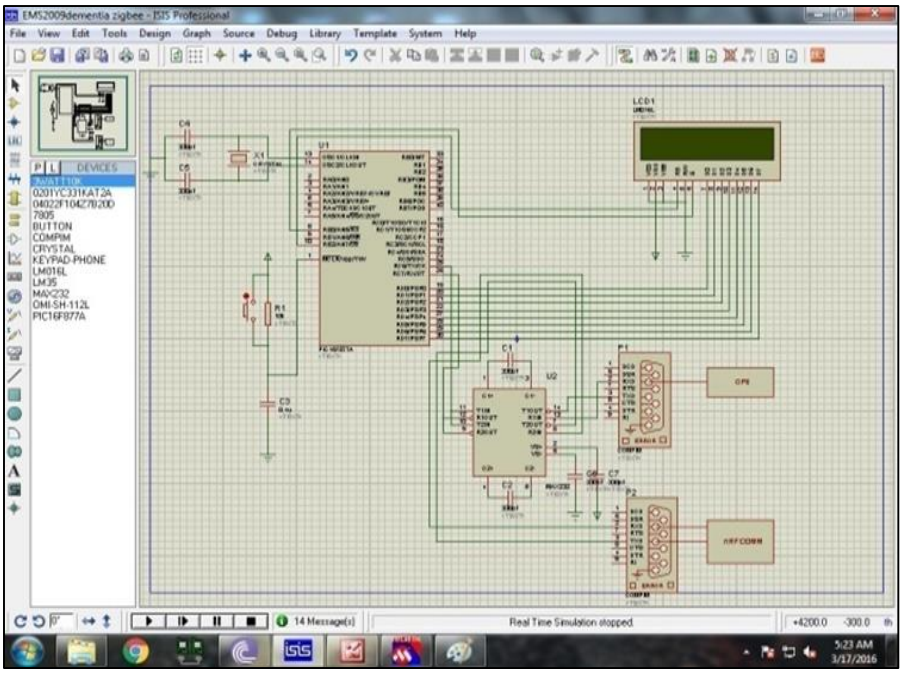

Fig. 2: Shows the proteus connection of the tracking system

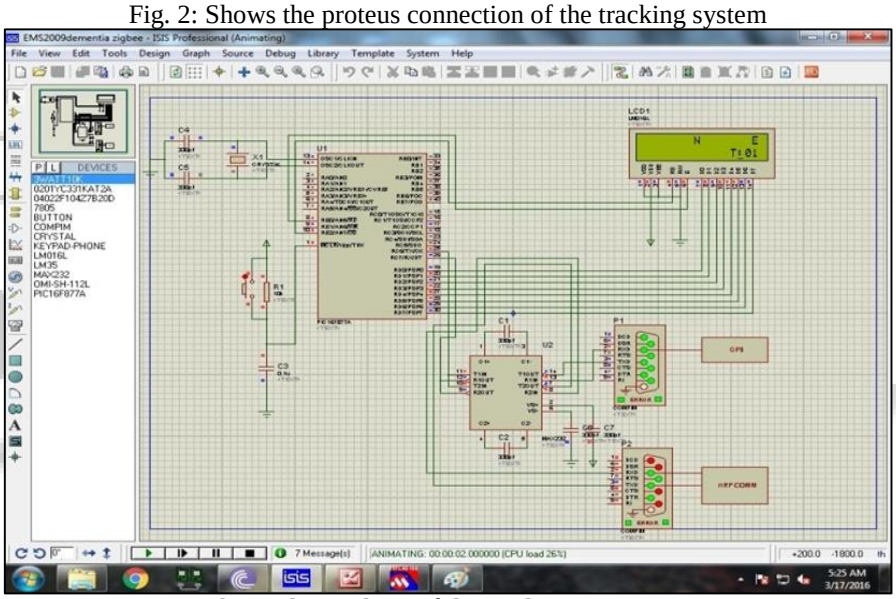

Fig. 3: Shows the working of the tracking system in proteus

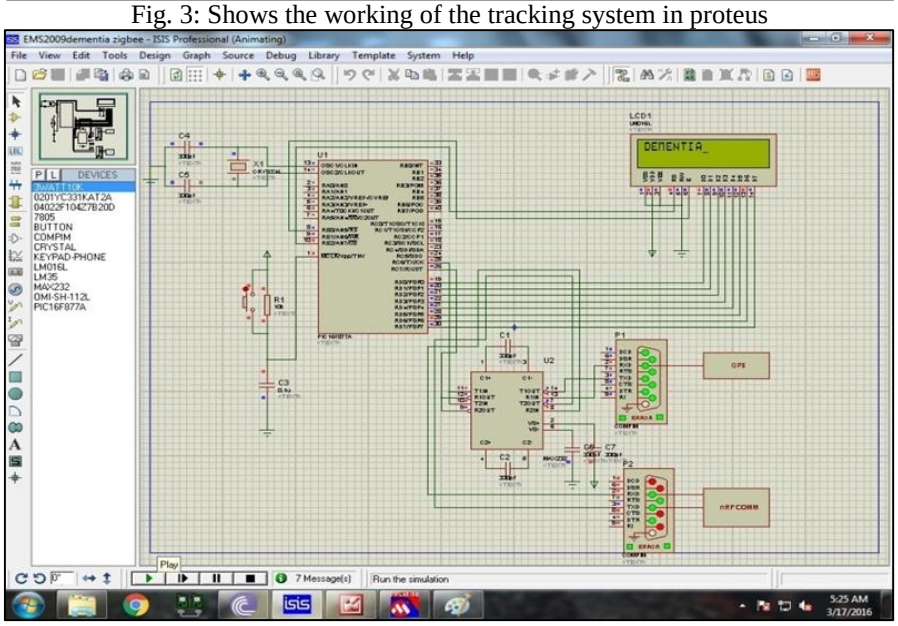

Fig. 4: Shows the proteus output of the tracking system

	ZigBee	802.11 (Wi-Fi)	Bluetooth	IR Wireless
Data Rate	20, 40, and 250 Kbits/s	11 & 54 Mbits/sec	1 Mbits/s	20-40 Kbits/s115 Kbits/s4 & 16 Mbits/s
Range	10-100 meters	50-100 meters	10 meters	<10 meters (line of sight)
Networking Topology	Ad-hoc, peer to peer, star, or mesh	Point to hub	Ad-hoc, very small networks	Point to point
Operating Frequency	868 MHz (Europe) 900-928 MHz (NA), 2.4 GHz (worldwide)	2.4 and 5 GHz	2.4 GHz	800-900 nm
Complexity (Device and application impact)	Low	High	High	Low
Power Consumption (Battery option and life)	Very low (low power is a design goal)	High	Medium	Low
Other Information	Devices can join an existing network in under 30ms	Device connection requires 3-5 seconds	Device connection requires up to 10 seconds	-
Typical Applications	Industrial control and monitoring, sensor networks, building automation, home control and automation, toys, games	Wireless LAN connectivity, broadband Internet access	Wireless connectivity between devices such as phones, PDA, laptops, headsets	Remote controls, PC, PDA, phone, laptop links

Table 1: Comparison Chart

VI. CONCLUSION

This review work describes research related to the design of an intelligent, self-adaptive and interactive wearable system for health monitoring of people at risk available in India as well as foreign countries. To provide deeper knowledge about sensors some commercial systems are also introduced in this project. This also helped us identify the shortcomings of the current technology, and also define new capabilities that could be integrated in wearable sensors to improve their overall functionality and also the quality of life. Focus is also given on various types of sensors and their application in patient monitoring system. The developed interfaces on both the smart-phone and the remote workstation allow the user of the wearable health monitoring system and the person supervising the patient to have a complete picture of the user's health and to have instant access to real-time and past physiological data.

REFERENCES

[1] KarandeepMalhi, Subhas Chandra Mukhopadhyay, Fellow, IEEE, Julia Schnepper, Mathias Haefke, and Hartmut Ewald "A Zigbee-Based Wearable Physiological Parameters Monitoring System" IEEE sensors journal, vol. 12, no. 3, march 2012.

[2] Reza S. Dilmaghani, Hossein Bobarshad, M Ghavami, SabriehChoobkar, and Charles Wolfe "Wireless Sensor Networks for Monitoring Physiological Signals of Multiple Patients" IEEE transactions on biomedical circuits and systems, vol. 5, no. 4, august 2011.

[3] Shyr-kuenchen, tsairkao, chia-tai chan, chih-ninghuang, chih-yen chiang, chin-yulai, tse-huatung, and pichungwang "A reliable transmission protocol for zigbee-based wireless patient monitoring" IEEE transactions on information technology in biomedicine, vol. 16, no. 1, January 2012.

[4] Y.Gu, A. Lo, and I. G. Niemegeers, "A survey of indoor positioning systems for wireless personal networks," IEEE Commun. Surv. Tutorials, vol. 11, no. 1, pp. 13–32, First Quarter 2009.

[5] Jianwei DONG Shi ZHANG, Xiaonan JIA,"A Portable Intelligent ECG Monitor Based on Wireless Internet and Embedded System Technology", IEEE transactions on information technology in bio medical Engineering and Informatics in 2008.

[6] Tony HaoWU, Enid Wai-Yung KWONG, Grantham Kwok-Hung PANG, "Bio-medical Application on Predicting Systolic Blood Pressure Using Neural Networks", in 2015.

[7] Xiao Liu, Chen, "Identifying Adverse Drug Events from Patient Social Media: A Case Study for Diabetes", IEEE sensors journal, March 2013.

[8] P.H.N. de Witha, L. Vervenneb, W. Goossenb, S. Zinger, "On a Patient-based leT Architecture for Telehealth Applications for increasing Human Empowerment", IEEE International Conference on Consumer Electronics (ICCE) in 2015.

[9] F. Shawki, M. El-Shahat. Dessouki, A. I. Elbasiouny, A.N. Almazroui, F. M. R. Albeladi, "Microcontroller Based Smart Home with Security using Gsm Technology", IEEE journal, March 2014.

[10] SudipMisra, Subhadeep Sarkar, "Priority-Based Time-Slot Allocation in Wireless Body Area Networks During Medical Emergency Situations: An Evolutionary Game Theoretic Perspective", IEEE journal ofBio medical and Informatics in 2012.

[11] J. West, J. Hippisley-Cox, C.A.C. Coupland, G.M. Price, L.M. Groom, D. Kendrick, E. Webber, "Do rates of hospital admission for falls and hip fracture in elderly people vary by socioeconomic status?,"Public Health, Vol. 118, pp. 576-581, Dec. 2004.
[12] Melzer, N. Benjuya, J. Kaplanski, "Postural stability in the elderly: a comparison between fallers and non-fallers,"Age and Ageing, Vol. 33, pp. 602-607, Nov. 2004.
[13] Asada HH, Shaltis P, Reisner A, Rhee S, Hutchinson RC, "Mobile monitoring with wearable photo plethysmo graphic biosensors," IEEE Eng Med Biol Mag 2003,vol 22,p.28-40.
[14] Brand O,"Micro sensor integration into systems-on-chip," Proceedings of the IEEE 2006,vol 94,p.1160-1176.
[15] Ahn CH, Jin-Woo C, Beaucage G, Nevin JH, Jeong-Bong L, Puntambekar A, Lee JY,"Disposable smart lab on a chip for point-of-care clinical diagnostics," Proceedings of the IEEE 2004,vol 92,p.154-173.

