Patient Rescue and Condition Monitoring System Using IOT

Dr. S.Ponlatha[1], M.Gowthaman[2], K.Jayabalaji[3], A.Karthick[4], V.G.Karthikeyan[5]

[1]*Associate Professor, Department of ECE, Mahendra Engineering College (Autonomous)*

[2,3,4,5]*Mahendra Engineering College (Autonomous)*

Abstract- The Internet of Things (IoT) concepts have been widely used to interconnect the available medical resources and offer smart, reliable, and effective healthcare service to the patients. Health monitoring for active and assisted living is one of the paradigms that can use the IoT advantages to improve the patient's lifestyle. In this project, I have presented an IoT architecture customized for healthcare applications. The aim of the project was to come up with a Remote Health Monitoring System that can be made with locally available sensors with a view to making it affordable if it were to be mass produced. Hence the proposed architecture collects the sensor data through Arduino microcontroller and relays it to the cloud where it is processed and analyzed for remote viewing. Feedback actions based on the analyzed data can be sent back to the doctor or guardian through Email and/or SMS alerts in case of any emergencies.

INTRODUCTION

A Remote health monitoring system is an extension of a hospital medical system where a patient's vital body state can be monitored remotely. Traditionally the detection systems were only found in hospitals and were characterized by huge and complex circuitry which required high power consumption. Continuous advances in the semiconductor technology industry have led to sensors and microcontrollers that are smaller in size, faster in operation, low in power consumption and affordable in cost.

This has further seen development in the remote monitoring of vital life signs of patients especially the elderly. The remote health monitoring system can be applied in the following scenarios:

1. A patient is known to have a medical condition with unstable regulatory body system. This is in cases where a new drug is being introduced to a patient.

2. A patient is prone to heart attacks or may have suffered one before. The vitals may be monitored to predict and alert in advance any indication of the body status.

3. Critical body organ situation

4. The situation leading to the development of a risky life-threatening condition. This is for people at an advanced age and maybe having failing health conditions.

5. Athletes during training.

To know which training regimes will produce better results. In recent times, several systems have come up to address the issue of remote health monitoring. The systems have a wireless detection system that sends the sensor information wirelessly to a remote server. Some even adopted a service model that requires one to pay a subscription fee. In developing countries, this is a hindrance as some people cannot use them due to cost issue involved. There is also the issue of internet connectivity where some systems to operate, good quality internet for a real-time remote connection is required. Internet penetration is still a problem in developing countries. Many of the systems were introduced in the developed countries where the infrastructure is working perfectly. In most cases, the systems are adapted to work in developing countries. To reduce some of these problems there is need to approach the remote detection from a ground-up approach to suit the basic minimal conditions presently available in developing countries.

Remote health monitoring can provide useful physiological information in the home. This monitoring is useful for elderly or chronically ill patients who would like to avoid a long hospital stay. Wireless sensors are used to collect and transmit signals of interest and a processor is programmed to receive and automatically analyze the sensor signals. In this project, you are to choose appropriate sensors according to what you would like to detect and design

algorithms to realize your detection. Examples are the detection of a fall, monitoring cardiac signals.

Here the main objective is to design a Remote Patient Health Monitoring System to diagnose the health condition of the patients. Giving care and health assistance to the bedridden patients at critical stages with advanced medical facilities have become one of the major problems in the modern hectic world. In hospitals where many patients whose physical conditions must be monitored frequently as a part of a diagnostic procedure, the need for a cost-effective and fast responding alert mechanism is inevitable. Proper implementation of such systems can provide timely warnings to the medical staffs and doctors and their service can be activated in case of medical emergencies. Present-day systems use sensors that are hardwired to a PC next to the bed.

LITERATURE STUDY

Development and Clinical Evaluation of a Home Healthcare System Measuring in Toilet, Bathtub and Bed without Attachment of Any Biological Sensors: Daily monitoring of health condition at home is important for an effective scheme for early diagnosis, treatment, and prevention of lifestyle-related diseases such as adiposis, diabetes and cardiovascular diseases. While many commercially available devices for home health care monitoring are widely used, those are cumbersome in terms of self-attachment of biological sensors and self-operation of them. From this viewpoint, we have been developing a non-conscious physiological monitoring system without attachment of any sensors to the human body as well as any operations for the measurement. We developed some devices installed in a toilet, a bath, and a bed and showed their high measurement precision by comparison with simultaneous recordings of ordinary biological sensors directly attached to the body. To investigate that applicability to the health condition monitoring, we developed a monitoring system in combination with all the monitoring devices at hospital rooms and previously carried out the measurements of patients' health condition. Further, in this study, the health conditions were measured in 10 patients with cardiovascular disease or sleep disorder. From these results, the patients' health conditions such as the body and excretion weight in the toilet, the ECG during taking the bath and the pulse and respiration rate during sleeping were successfully monitored in the hospital room, demonstrating its usefulness for monitoring the health condition of the subjects with cardiovascular disease or sleep disorder.

Intelligent wireless mobile patient monitoring system: Nowadays, Heart-related diseases are on the rise. Cardiac arrest is quoted as the major contributor to the sudden and unexpected death rate in the modern stress filled lifestyle around the globe. A system that warns the person about the onset of the disease earlier automatically will be a boon to the society. This is achievable by deploying advances in wireless technology to the existing patient monitoring system. This paper proposes the development of a module that provides mobility to the doctor and the patient, by adopting a simple and popular technique, detecting the abnormalities in the bio signal of the patient in advance and sending an SMS alert to the doctor through Global System for Mobile(GSM) thereby taking suitable precautionary measures thus reducing the critical level of the patient. Worldwide surveys conducted by World Health Organization (WHO) have confirmed that the heart-related diseases are on the rise. Many of the cardiac-related problems are attributed to the modern lifestyles, food habits, obesity, smoking, tobacco chewing and lack of physical exercises etc. The post-operative patients can develop complications once they are discharged from the hospital. In some patients, the cardiac problems may reoccur, when they start doing their routine work. Hence the ECG of such patients needs to be monitored for some time after their treatment. This helps in diagnosing the improper functioning of the heart and take precautions. Some of these lives can often be saved if acute care and cardiac surgery is provided within the so-called golden hour. So, the need for advice on first-hand medical attention and promotion of good health by patient monitoring and follow-up becomes inevitable. Hence, patients who are at risk require that their cardiac health to be monitored frequently whether they are indoors or outdoors so that emergency treatment is possible. Telemedicine is widely considered to be part of the inevitable future of the modern practice of medicine.

The real-time monitoring system for in-patient based on ZigBee: The system is made up of two sub-systems: patient physical states data acquisition and

communication system based on ZigBee technology, and hospital monitoring and control center. The patient physical states data acquisition and communication system monitors the main physical parameters and movement status continuously. The information from data acquisition system is sent to hospital monitoring center by ZigBee wireless communication module. The monitoring center receives the information from each patient and save them to the database, and then judges the states of the patient by fuzzy reasoning. The data from the patient can be displayed as a graph or numeric on the monitor if it is necessary, and then the doctor can diagnose the patient according to the recorded continuous data. Wireless sensor network is made up of a lot of wireless sensors based on ZigBee technology. The ZigBee technology provides a resolution for transmitting sensors' data by wireless communication. ZigBee technology can transmit data with a rate of 250kbps, and then it is enough for the physical parameters of the patient. The communication distance of ZigBee node can be over 200 meters and can be spread by add route node, and then ZigBee technology is suited to a short distance wireless sensors network. ZigBee technology owns many virtues, such as low power consumption, low cost, small size, free frequency, etc. To know the physical states of in-patient, the physical parameters need to be monitored real-time. The traditional medical test instrument is a large size and connected by wire often, and the patient is required to be quiet during the test. In most of the hospital, the medical instruments need to be read by doctor or nurse, and the physical parameters are tested and recorded one or two times each day, the real-time monitoring is expensive for most of the patients, and can be only acquirable for ICU by a nurse. For this reason, the worsening of patient can't be found in time, and then the patient can't be helped in time. For most of the patients can be monitored real-time in hospital, we should 10 find a new method. Consider that the movement of the patient is limited in hospital, we adopted the ZigBee and wireless sensors network to acquire the physical parameters of the patient.

METHODS

GSM/GPRS module is used to establish communication between a computer and a GSMGPRS system. Global System for Mobile communication (GSM) is an architecture used for mobile

communication in most of the countries. Global Packet Radio Service (GPRS) is an extension of GSM that enables higher data transmission rate. GSM/GPRS module consists of a GSM/GPRS modem assembled together with power supply circuit and communication interfaces (like RS-232, USB etc.) for a computer. GSM/GPRS MODEM is a class of wireless MODEM devices that are designed for communication of a computer with the GSM and GPRS network. It requires a SIM (Subscriber Identity Module) card just like mobile phones to activate communication with the network. Also, they have IMEI (International Mobile Equipment Identity) number similar to mobile phones for their identification. A GSM/GPRS MODEM can perform the following operations:
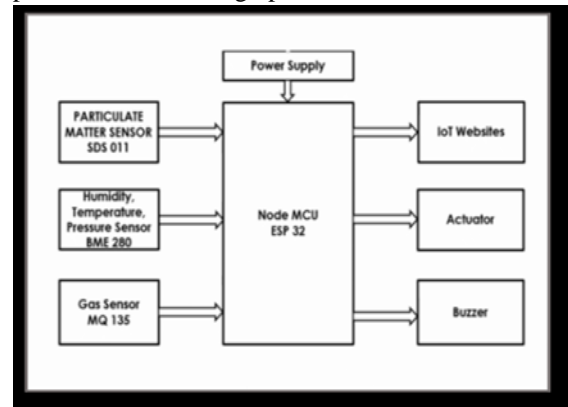

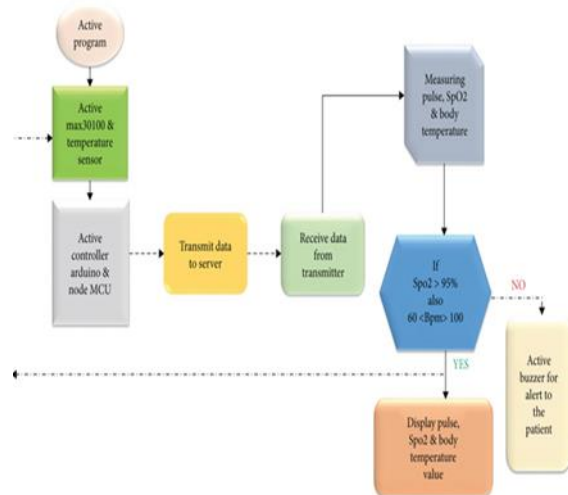Fig 1: Block Diagram of Proposed Method

Fig 2: Health monitoring

This study intends to combine the Internet of Things (IoT) technology with health monitoring to make it personalized and timely through allowing the interconnection between the devices. This work is aimed at exploring various wearable health monitoring

modules that people wear to monitor heart rate, blood pressure, pulse, body temperature, and physiological information. The information is acquired using the wireless sensor to create a health monitoring system. The data is integrated using the Internet of Things for processing, connecting, and computing to achieve real-time monitoring. The temperature of three people measured by the temperature thermometer is 36.4, 36.7, and 36.5 (°C), respectively, and the average acquired by the monitoring system of the three people is 36.5, 36.4, and 36.5 (°C), respectively, indicating that the system demonstrated relatively accurate and stable testability. The user's ECG is displayed clearly and conveniently using the ECG acquisition system. The pulse rate of the three people tested by the system is 78, 78, and 79 (times/min), respectively, similar to the medical pulse meter results. The physiological information acquired using the semantic recognition, matching system, and character matching system is relatively accurate. It concludes that the human health monitoring system based on the Internet of Things can provide people with daily health management, instrumental in heightening health service quality and level.

RESULT ANALYSIS

Solutions aimed at protecting individuals' privacy should give people the power to choose who can lawfully view and make changes to their data. Users of the IoT need to trust that their personal information will be handled securely and responsibly. Multiple laws and policies, such as HIPAA and the EU's General Data Protection Regulation, have already addressed privacy concerns when creating IoT applications (GDPR). There is, nevertheless, a requirement to think about the secondary use of the data gathered via home IoT remote monitoring. Patients using these systems may provide their permission for their information to be used just for the home health-monitoring system [11,94]. Indeed, securing data and assuring privacy remains a key challenge to the health IoT. Data that are transmitted to the data-processing unit could be spied upon, or the data could be manipulated, leading to a flawed analysis of Big Data. Therefore, ensuring the data are transmitted securely from the nodes to the processing unit is critical. Furthermore, during data processing, the identity of the individual yielding the data must be

protected. By adopting cryptographic methods, the algorithms that process the data do not need to map the data to the user.

CONCLUSION

The main objective of the experiment was successfully achieved. All the individual modules like Heartbeat detection module, fall detection module etc. and remote viewing module gave out the intended results. 55 The designed system modules can further be optimized and produced to a final single circuit. More important fact that came up during project design is that all the circuit components used in the remote health detection system are available easily. With the development in the integrated circuit industry, Micro Electro Mechanical Systems (MEMs) and microcontrollers have become affordable, have increased processing speeds, miniaturized and power efficient. This has led to increased development of embedded systems that the healthcare specialists are adopting. These embedded systems have also been adopted in the Smartphone technology. And with increased internet penetration in most developing countries through mobile phones, and with use of Internet of things (IoT) will become adopted at a faster rate. The Remote Health Care system utilizes these concepts to come up with a system for better quality of life for people in society.

FEATURE WORK

From an engineering perspective, the project has seen concepts acquired through the computer science and embedded study period being practically applied. The Electric circuit analysis knowledge was used during design and fabrication of the individual modules. Electromagnetic fields analysis used in the wireless transmission between microcontrollers and Software programming used during programming of the microcontrollers to come up with a final finished circuit system.

REFERENCE

[1] S.Ponlatha, P.Umashankar, P.Balashanmuga Vadivu, D.Chitra, " AN IoT based efficient energy management in smart grid using SMACA technique", Wiley- International Transaction on

Electrical Energy System, Vol.31,No.125, pp.1-22, Dec 2021.

[2] Alekya, R.; Boddeti, N.D.; Monica, K.S.; Prabha, R.; Venkatesh, V. IoT based smart healthcare monitoring systems: A literature review. Eur. J. Mol. Clin. Med. 2021, 7, 2020.

[3] Naveen; Sharma, R.K.; Nair, A.R. IoT-based Secure Healthcare Monitoring System. In Proceedings of the 2019 IEEE International Conference on Electrical, Computer and Communication Technologies (ICECCT), Coimbatore, India, 20–22 February 2019; pp. 1–6.

[4] Rathi, V.K.; Rajput, N.K.; Mishra, S.; Grover, B.A.; Tiwari, P.; Jaiswal, A.K.; Hossain, M.S. An edge AI-enabled IoT healthcare monitoring system for smart cities. Comput. Electr. Eng. 2021, 96, 107524. [CrossRef]

[5] Alshamrani, M. IoT and artificial intelligence implementations for remote healthcare monitoring systems: A survey. J. King Saud Univ. Comput. Inf. Sci. 2022, 34, 4687–4701. [CrossRef]

[6] Gera, S.; Mridul, M.; Sharma, S. IoT based Automated Health Care Monitoring System for Smart City. In Proceedings of the 2021 5th International Conference on Computing Methodologies and Communication (ICCMC), Erode, India, 8–10 April 2021; pp. 364–368.

[7] Bhatia, H.; Panda, S.N.; Nagpal, D. Internet of Things and its Applications in Healthcare—A Survey. In Proceedings of the 2020 8th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO), Noida, India, 4–5 June 2020; pp. 305–310.

[8] Jain, U.; Gumber, A.; Ajitha, D.; Rajini, G.; Subramanian, B. A Review on a Secure IoT-Based Healthcare System. In Proceedings of the Advances in Automation, Signal Processing, Instrumentation, and Control: Select Proceedings of i-CASIC, India, 27–28 February 2020; pp. 3005–3016.

[9] Kumar, R.; Rajasekaran, M.P. An IoT based patient monitoring system using raspberry Pi. In Proceedings of the 2016 International Conference on Computing Technologies and Intelligent Data Engineering (ICCTIDE'16), Kovilpatti, India, 7–9 January 2016; pp. 1–4.

[10] Meliá, S.; Nasabeh, S.; Luján-Mora, S.; Cachero, C. MoSIoT: Modeling and Simulating IoT Healthcare-Monitoring Systems for People with Disabilities. Int. J. Environ. Res. Public Health 2021, 18, 6357. [CrossRef]

[11] Philip, N.Y.; Rodrigues, J.J.P.C.; Wang, H.; Fong, S.J.; Chen, J. Internet of Things for In-Home Health Monitoring Systems: Current Advances, Challenges and Future Directions. IEEE J. Sel. Areas Commun. 2021, 39, 300–310. [CrossRef]

[12] Bhardwaj, R.; Gupta, S.N.; Gupta, M.; Tiwari, P. IoT based Healthware and Healthcare Monitoring System in India. In Proceedings of the 2021 International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE), Greater Noida, India, 4–5 March 2021; pp. 406–408.

[13] Patel, W.D.; Patel, C.; Valderrama, C. IoMT based Efficient Vital Signs Monitoring System for Elderly Healthcare Using Neural Network. Int. J. Res. 2019, VIII, 239.

[14] Li, C.; Hu, X.; Zhang, L. The IoT-based heart disease monitoring system for pervasive healthcare service. Procedia Comput. Sci. 2017, 112, 2328–2334. [CrossRef]

[15] Cao, H.-R.; Zhan, C. A Novel Emergency Healthcare System for Elderly Community in Outdoor Environment. Wirel. Commun. Mob. Comput. 2018, 2018, 7841026. [CrossRef]

[16] Wu, T.; Wu, F.; Qiu, C.; Redouté, J.M.; Yuce, M.R. A Rigid-Flex Wearable Health Monitoring Sensor Patch for IoT-Connected Healthcare Applications. IEEE Internet Things J. 2020, 7, 6932–6945. [CrossRef]

[17] Islam, M.M.; Rahaman, A.; Islam, M.R. Development of smart healthcare monitoring system in IoT environment. SN Comput. Sci. 2020, 1, 1–11. [CrossRef] [PubMed]

[18] Al-Sheikh, M.A.; Ameen, I.A. Design of mobile healthcare monitoring system using IoT technology and cloud computing. In Proceedings of the IOP Conference Series: Materials Science and Engineering, Baghdad, Iraq, 15 April 2020; p. 012113.

[19] Hamim, M.; Paul, S.; Hoque, S.I.; Rahman, M.N.; Baqee, I. IoT Based Remote Health Monitoring System for Patients and Elderly People. In Proceedings of the 2019 International Conference

on Robotics, Electrical and Signal Processing Techniques (ICREST), Dhaka, Bangladesh, 10–12 January 2019; pp. 533–538.

[20] Swaroop, K.N.; Chandu, K.; Gorrepotu, R.; Deb, S. A health monitoring system for vital signs using IoT. Internet Things 2019, 5, 116–129. [CrossRef]