A Review on Health Monitoring System using IoT

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***Abstract*—Now-a-days health care has become technology ori- ented. Humans are facing a problem of unexpected death due to lack of medical care at right time. Therefore, there is a need to develop body health monitoring system. In the proposed system, a patient will be carrying hardware having sensors and android phone application. The sensors will sense the body temperature and heart rate of patient and these data are transferred to android smart phone via Bluetooth/Wi-Fi. System has the cloud database which stores all information about patients health and the doctors diagnose the symptoms based on this data and will prescribe medicine. The proposed system is flexible since it allows patient to move freely and yet be monitored continuously. Monitoring of patient's health is a combination of web as well as android application where reliable, energy efficient patient monitoring system is proposed in this work. In the current proposed system the patient health is continuously monitored using a different sensor which is connected to the Ardiuno board and the acquired data is send to the server using Ethernet shield attached to the Ardiuno board. If any of the parameter values goes beyond the threshold value an alert is given to the doctor using an Android application installed in the doctors smart phone. The IoT allows to integrate multiple devices capable of connecting to the internet and providing information on the state of health of patients and providing information in real time to doctors who assist.**

I. INTRODUCTION

The health care is vast area requiring continuous monitor- ing. Continuous measurement of patient parameters such as heart rate and rhythm, respiratory rate, blood pressure, blood- oxygen saturation and, many other parameters have become a common feature utilized in major health care systems. When accurate and immediate decision-making are crucial, electronic monitors have be extensively used to collect and display physiological data. Also there are scenarios where patient are not ready to wait in the queue and appointments for the check- up and also constant monitoring of their health. Usually patient monitoring system detects for and also warns against serious or life-threatening events in patients or critically ill. Patient monitoring system can be rigorously defined as repeated or continuous observations of the patients physiological function, and the function of life support equipment, for the purpose of guiding management decisions. This also includes when to make therapeutic interventions and assessment of those inter- ventions [GardnerR.M, 2006]. A patient monitoring system may not only alert caregivers to potentially life-threatening events; many also provide physiologic input data used to control directly connected life-support devices. In real case scenario, manual intervention is required for registration, for eg., when a patient is in critical condition there are chances that no alerts are generated which may sometimes cause loss of life. Also, in absence of doctors they do not have a provision of remotely monitoring the patient. In the initial years Near Field Communication (NFC), the similar device used was Radio Fre- quency Identification (RFID). With RFID the cost was high as there was a requirement of RFID reader. In the existing system the transmission of data received from sensors is intermittent. If any critical parameter is recorded it sends an alert message through Global System for Mobile(GSM) technology to the registered caretaker. The drawback in the existing system is that the continuous monitoring of patient health is not possible. Even though the patient is taken to the hospital in time the doctor may not come to a conclusion with which critical health condition the patient has comeback without further testing the patient. This may cause delays in providing treatment. The proposed work aims in developing a health monitoring system that integrates IoT and cloud computing. The Internet of Things (IoT) is the inter-networking of physical devices, vehicle, buildings and other items embedded with electronics, software, sensors and network connectivity which enable these objects to collect and exchange data [Andrejs, 2015]. Also the processing of data on web-connected servers in large data centers through cloud, has also contributed greatly to the ability of everyday gadgets to become part of the IoT. These devices may connect to the internet by sending data to your phone or some other dedicated hardware in your home that acts as a hub over a local communication method. The other applications of IoT can be seen in smart surveil- lance, automated transportation, smarter energy management systems, water distribution, urban security and environmental monitoring. For a health monitoring system, wearables become a major aspect. Wearable devices are installed with sensors and softwares which collect data and information about the users. These devices broadly cover fitness, health and entertainment requirements. Patient health monitoring system using mobile phone is used to monitor the different parameters of patients remotely and simultaneously. In this system the doctor can monitor

different parameters of patients sitting in his room and even when he is away from the patient. In this work an attempt is made to collect the parameters such as body temperature, heart beat rate, sugar level etc., and recommend a course of action based on these data. Doctor can obtain the results in their mobile phone so that immediately the doctor can attend the patient for the further treatment if necessary. In this paper, detail survey of various approaches for Health Monitoring System is done. The paper also concludes with future conclusion.

II. Literature Survey

Tao et. al(2009) developed a wearable sensor system to monitor the movements of the patients. The system was calibrated to a threshold level less than 5percent with the aim of minimizing the error rate of the captured data. Stefano et. al(2012)proposed a detection system to monitor the move- ments of patients which recognizes a drop and automatically sends a request for help to the care takers. Gennaro et. al(2012) developed a personal health diagnosis based on the symptoms of the patient. A huge amount of collected data is used to analyze the disease and risk of the patients. Franca et. al (2012) has discussed that the innovations of the new gener- ation systems are the development of continuous monitoring features for the patient and the improvement of workflows and productivity of medical personal. There has been emphasize on the various wireless technologies and the advantages of using those technologies for faster communication. eHealth Service Support In IPv6 Vehicular Networks by Imadali S et al(2012) This paper provides an IPv6 vehicular platform which integrates e-Health devices and allows sending captured health-related data to a Personal Health Record (PHR) appli- cation server in the IPv6 Internet. Security is a key concern in the IoT devices management. The four identified security requirements are (i) Secure authentication and authorization, (ii)Secure bootstrapping of objects and transmission of data, (iii)Security of IoT data, (iv)Secure access to data by au- thorized persons. According to Mohammed (2015) the key distribution is required to secure the e-health applications. A protocol for key management which allows the captured data to be transferred in a secured channel was proposed. An IoT deployment in healthcare needs more security because the data of any patients is more sensible and it should not be misused by any bad elements in the society. Rohan Tabish et al (2014) Application save readings from the sensors into a file that can be downloaded by a remote server using a free Cloud service such as Ubuntu. Debiao and Sherali(2016) discussed the security requirements and authentication schemes for RFID based on elliptic Curve Cryptography (ECC). Jieranet. al(2012) developed a RFID technology and intelligent systems, which detects the disinfected articles and alerts the medical staff to wash the hands after the contact with the disinfectant articles. IoT techniques can be used to promote healthcare in a better way. The health related information could be interacted with doctors who are in emergency. Even in the absence of the doctor near the patient or in the hospital, the doctor can know the patients' status so that the doctor's advice is given in critical cases. Cristina et. al(2013) developed an approach to maintain health care data of a patient collected in different geographic locations. The data is available to doctors, hospitals, laboratories etc., to check the medical history of the patients. Boyiet et.al(2014) presented IoT based system for providing support to emergency medical services by demonstrating how IoT data can be collected and integrated for interoperability. Farid Touati et al (2014) Low power de- vices, to mitigate the interoperability problem efficient header compression, network auto-configuration using neighbourhood discovery unicast/multicast and broadcast support, fragmen- tation, support for IP routing (using RPL) and support for link layer mesh. Long et. al(2015) discussed the necessary and requirements details of the software for healthcare and proposed an architecture for healthcare and IoT. Also taken the parameters like ECG, blood oxygen, respiration, temperature. Kaleem Ullah,MunamAli Shah et.at(2015) this presents the model named as k-Healthcare makes use of four layers, sensor layer, network layer, internet layer and service layer. Suman Sankar Bhunia et al (2014) Fuzzy logic resembles human thought hence is much more intuitive and easy to use due to event driven data acquisition, unnecessary consumption of energy. Manat et al (2014) the context aware decision approach helps in optimal prioritization of medical resources without human labour. Brian Blake (2015) commented that the human users could be alerted proactively based on their fitness and historical medical or genetics history. Data sensed and transmitted through the wireless devices are received in the local system that needs to support accessing of data in heterogeneous formats, can be useful in building real time applications and to be updated in the mobile application of the doctor as well as the user. Yaoliang Chen et al (2015) Required data can be accessed at the subscribers end by manipulating data at the subscribers end we can directly access the data on so an so time exactly by using COSS. Other systems such as those proposed earlier are based on the IoT technology bring advantages in terms of perception, transmission and application of information in the field perspectives of health and medical care. Enabling smart, an accessible and communi- cation system based on IoT hosting segments such as: medical equipment, information management control medication of patients, telemedicine, mobile medical care, and personal health management, among others. With the increasing health related problems and lack of proper solution in healthcare to monitor the patients in the absence of doctor, the patients face serious problems and lost life in critical conditions, Hence to overcome these problems the new Patient Health Monitoring System (PHMS) was proposed

to monitor(P Kakria) and evaluate the status of each patient by the doctor even in their absence in hospital or near the patient.

A. Gaps in the existing system

(i) IoT technology can be integrated to accommodate various device which is not seen in most of existing system. (ii)Data which is stored may not be secured. (iii)Complex systems involve many gaps between people, stages, and processes. (iv)Analysis of accidents usually reveals the presence of many gaps, yet only rarely do gaps produce accidents. (v)Safety is increased by understanding and reinforcing practitioners' nor- mal ability to bridge gaps. (vi)This view contradicts the normal view that systems need to be isolated from the unreliable human element. (vii)We know little about how practitioners identify and bridge new gaps that occur when systems change.

III. CONCLUSION AND FUTURE WORK

Biomedical engineering is the application of engineering principles and techniques to the medical field. It combines design and problem solving skills of engineering with medical and biological sciences to improve patients health care and the quality of life of individuals. A medical device is intended for use in the diagnosis, or in the cure, treatment, or prevention of diseases. This work proposes and focuses on the heart beat rate and body temperature monitoring system that is able to monitor the condition of the patient. The system determines the pulse rate and body temperature per minute or as per the time specified and then sends it to an android application. The data is also stored in the database. Thus, the doctors can monitor and diagnose the patients condition continuously and could suggest earlier precaution for the patients themselves. This system is cost effective and user friendly and thus its usage is not restricted or limited to any class of users. It is a very efficient system and very easy to handle and thus provides great flexibility and serves as a great improvement over other conventional monitoring systems. In future: By using capacitive touch screen the system can be implemented in hospitals to maintain patients data. Voice alerts can be used to initiate the various controlling of devices and their status of operation. Apart from the brilliant Soldier Navigation and Health Monitoring usage, this system can be utilised by pro trekkers who trek extensively in remote areas and have no means of communication. By using this system the trekkers can be monitored and in case of crisis help can be sent to them as soon as possible. Also, for professionals like wild life photographers and vet doctors who have to go deep into the jungle can make use of this system. This system is useful for the miners too as they work in deep caves and might face health issues.

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