INTERNATIONAL JOURNAL OF SCIENTIFIC PROGRESS AND RESEARCH (IJSPR) ISSN: 2349-4689

Early Detection of Human Diseases using IoT

[1] Ms. Divya S, [2] Ms. Deeksha K, [3] Ms. Harshitha C P,[4]Mr. Nithin Kumar

[1]*UG Scholar , Dept. of CSE, BGS Institute of Technology, Mandya Karnataka, India*
[2] *UG Scholar , Dept. of CSE, BGS Institute of Technology, Mandya Karnataka, India*
[3]*UG Scholar , Dept. of CSE, BGS Institute of Technology, Mandya Karnataka, India*
[4]*Assistant Professor, Dept. of CSE, BGS Institute of Technology, Mandya, Karnataka, India*

Abstract:-Health monitoring is process of monitoring and predicting the abnormalities in human beings from remote areas. Nowadays the advancement of sensors to measure different physical qualities and internet of things have gained popularity in field of health monitoring and remote environment monitoring, etc. In this research work we are proposing a novel technique for human health monitoring from remote area using sensors such as body temperature sensor, pulse rate sensor, blood pressure sensor etc. In this proposed work the sensors are deployed into human body to observe any abnormalities. For every interval of time saved values are transmitted from sensors, the values are processed and stored in a server. Upon the stored data, the analysis performed and visualization report is transmitted to doctor.
Keywords: Health Monitoring, IoT, Sensors, Data Analysis.

I. INTRODUCTION

IoT (Internet of Things) is a currently advanced concept of ICT (information communication technology), in which all devices and services are collaborating while reducing human intervention for better human life. The Gartner which is one of market research firms expected that IoT has been ranked in the top future promising technology. In addition, healthcare service is making the application and development of the currently most active IoT technologies. Capturing and sharing of vital data of the network connected devices through secure service layer is what defines IOT. In simple terms, Internet of Things (IOT) can be defined as the wireless network of devices which are connected to each other to share information and data in order to communicate and produce new information so as to record and analyse it for future use. These interconnected IoT devices produce large amounts of information and data that should be dealt efficiently by the providers and so is a big challenge. To overcome this challenge of storing and analysing large data, the technique of Internet of Things Analytics (IoTA) is implemented.

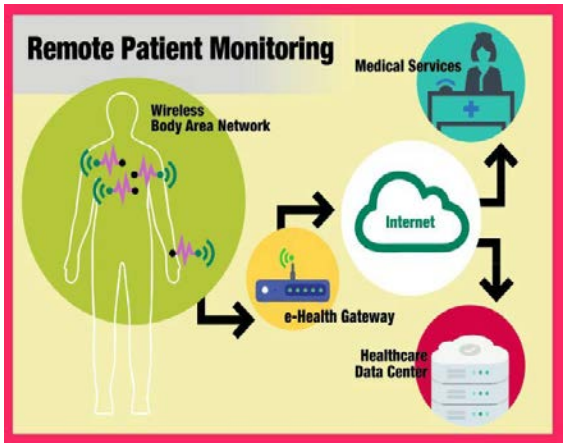

Fig 1: Remote health monitoring

Internet of Things gains its full potential by utilizing the key role playing objects i.e. “Smart” objects which use various sensors and actuators that are able to perceive their context, and via built in networking capabilities they could communicate to each other, access the open source Internet services and interact with the human world. This not only makes the world connected but also robust and comfortable. The Internet of things in the field of healthcare also plays a major role in providing ease to patients and doctors. It consists of a system that communicates between network connected systems, apps and devices that can help patients and doctors to monitor, track and record patients’ vital data and medical information. Some of the devices include smart meters, wearable health bands, fitness shoes, RFID based smart watches and smart video cameras. Also, apps for smart phones also help in keeping a medical record with real time alert and emergency services. Mobile healthcare service is currently more popular since healthcare service with computer was started using everywhere. Current research of IoT technology, as shown by the case, such as Google Fit, is focused

on the open IoT platform and its embedded device including sensors. However, critical success factor of IoT is an explosion of demand for services. Therefore, it is very important to develop a health service that provides a number of customized services to users on the open IoTplatform [4].

In addition, Medical sensor devices such as glucose meter, body temperature sensor, respiration sensor, heart beat sensor and virtual medical sensor such as diabetes meter should be provided to users on the same platform. Most proposed frameworks for health monitoring have used a three tier architecture: A Wireless Body Area Network (WBAN) consisting of wearable sensors as the data acquisition unit, communication and networking and the service layer. For instance, proposes a system that recruits wearable sensors to measure various physiological parameters such as blood pressure, pulse rate,respiration sensor, glucose meter and body temperature. Sensors deployed transmit the gathered information by sensing to a smart application through a Bluetooth connection. The smart application turns the data into an Analysis and later visualization report is generated and stores it on a server for later retrieval by doctor through the Internet. Utilizing a similar IoT based medical data storage,a health monitoring system is presented in which medical staff can access the stored data online [3][4]. The organisation of this research work deals with as follows:

Section 1 deals with introduction, section 2 deals with methods and materials, section 3 deals with related work, section 4 deals with remote health monitoring and section 5 deals with conclusion and references.

II. METHODS AND MATERIALS

The power of IOT for health and medical services are harnessed by smart sensors (sensor and a microcontroller) which accurately measures, monitors analysea variety of health status indicators. These can include basic vital health signs such as pulse rate and blood pressure, oxygen and glucose level in blood and heart rate. Smart sensor can be incorporated into medicines and pill bottles that are connected to a network and can generate alerts about whether the patient has taken a scheduled dose of medication. We are currently witnessing a growing interest in the area of wireless body area networking(WBAN) accompanied by the strong demand of the medical and the healthcare society as well as by advances in lower micro and nano electronics and wireless networking. Consumers and doctors to imagine an era where phone health monitoring systems will work seamlessly, symptoms and diagnosis. The aim of this special issue is to collect the recent advances on IoT for healthcare applications [3].

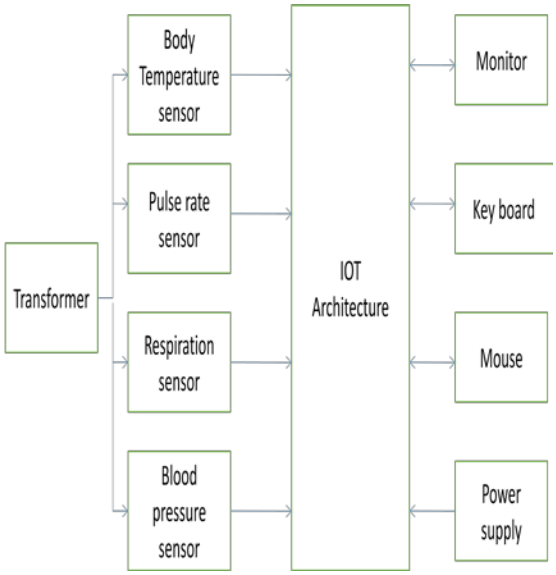

Fig 2: IoT Architecture

- SENSORS

The Body temperature sensor accurately measures temperature and provide an over temperature alarm. This device converts the temperature measurements to digital form using a high resolution, sigma-delta, analogue-to-digital converter. Pulse rate sensor is connected through finger. Normal heart rate for human being is 60 to 100 bmp. Heart beat can be measured based on optical power variation as light scattered or observed during its path through a blood as the heart beat changes. Respiration is number of breaths per minute. In human being respiration rate is varied. Normal respiration rate for all human beings are 12 to 18 breaths per minute for above 10 years. Respiration sensor is a sensitive protector sensor. It detects chest or abdominal expansion and outputs the respiration wave form. Blood Pressure sensors are used to measure the amount blood pumped by the heart. They operate based on

oscillometric principle. The Blood pressure sensor is a non-invasive sensor designed to measure human blood pressure.

III. RELATED WORK

A. Raspberry Pi using health monitoring:

In the recent development of, Internet of Things (IoT) makes all objects interconnected and it has been recognized as the next technical revolution. Some of the applications of Internet of Things are smart parking, smart home, smart city, smart environment, industrial places, agriculture fields and health monitoring process. One such application is in healthcare to monitor the patient health status Internet of Things makes medical equipment more efficient by allowing real time monitoring of patient health, in which sensor acquire data of patient's and reduces the human error. In Internet of Things patient's parameters get transmitted through medical devices via a gateway, where it is stored and analysed. The significant challenge in the implementation of Internet of Things for healthcare applications is monitoring all patients from various places. Thus Internet of Things in the medical field brings out the solution for effective patient monitoring at reduced cost and also reduces the trade-off between patient outcome and disease management. In this research work discuss about, monitoring patient's body temperature, respiration rate, heart beat and body movement using Raspberry Pi board [1].

B. Smart Health Monitoring and Alert System:

This work presents a reconfigurable sensor network for structural health monitoring. Real-time and periodic structural health monitoring can reduce the probability of collapse and the consequences of potential life-threatening conditions. Computer communication systems and Internet plays an important role. NFC technology to fetch patient complete information automatically when doctor approaches patient. Biosensors interfaced with the microcontroller will monitor patient’s vital health. If any of the sensor’s preset threshold value is exceeded beneath, an SMS will be sent to doctor and the patient’s caretaker. The monitoring system comprise of web server part: The sensor network in which the sensor nodes are equipped with different biometric sensors, sensor data will be regularly transferred to hospital database from which it is uploaded to hospital’s web server continuously. Doctor can monitor the patient condition from any place [2].

C. Health Monitoring using Cloud Based Processing:

Among the panoply of applications enabled by the Internet of Things (IoT), smart and connected health care is a particularly important one. Networked sensors, either worn on the body or embedded in our living environments, make possible the gathering of rich information indicative of our physical and mental health. Captured on a continual basis, aggregated, and effectively mined, such information can bring about a positive transformative change in the health care landscape. In particular, the availability of data at hitherto unimagined scales and temporal longitudes coupled with a new generation of intelligent processing algorithms can: (a) facilitate an evolution in the practice of medicine, from the current post facto diagnose-and treat reactive paradigm, to a proactive framework for prognosis of diseases at an incipient stage, coupled with prevention, cure, and overall management of health instead of disease, (b) enable personalization of treatment and management options targeted particularly to the specific circumstances and needs of the individual, and (c) help reduce the cost of health care while simultaneously improving outcomes. In this research work, we highlight the opportunities and challenges for IoT in realizing this vision of the future of health care [3].

D. Smart HealthCare Kit:

This work presents the design and implementation of an IOT-based health monitoring system for emergency medical services which can demonstrate collection, integration, and interoperation of IoT data flexibly which can provide support to emergency medical services like Intensive Care Units(ICU), using an INTEL GALILEO 2ND generation development board. The proposed model enables users to improve health related risks and reduce healthcare costs by collecting, recording, analyzing and sharing large data streams in real time and efficiently. The idea of this project came so to reduce the headache of patient to visit to doctor every time he need to check his blood

pressure, heart beat rate, temperature etc. With the help of this proposal the time of both patients and doctors are saved and doctors can also help in emergency scenario as much as possible. The proposed outcome of the project is to give proper and efficient medical services to patients by connecting and collecting data information through health status monitors which would include patient's heart rate, blood pressure and ECG and sends an emergency alert to patient's doctor with his current status and full medical information [4].

IV. REMOTE HEALTH MONITORING

We have proposed a robust health monitoring system that is intelligent enough to monitor the patient automatically using IOT that collects the status information through these systems which would include patient's pulse rate, blood pressure, respiration and temperature and sends an emergency alert to patient's doctor with his current status and full medical information. This would help the doctor to monitor his patient from anywhere and also to the patient to send his health status directly without visiting to the hospital. Our model can be deployed at various hospitals and medical institutes. The system uses smart sensors that generates raw data information collected from each sensor and send it to a database server where the data can be further analyzed and statistically maintained to be used by the medical experts. Maintaining a database server is a must so that there is even track of previous medical record of the patient providing a better and improved examining [4].

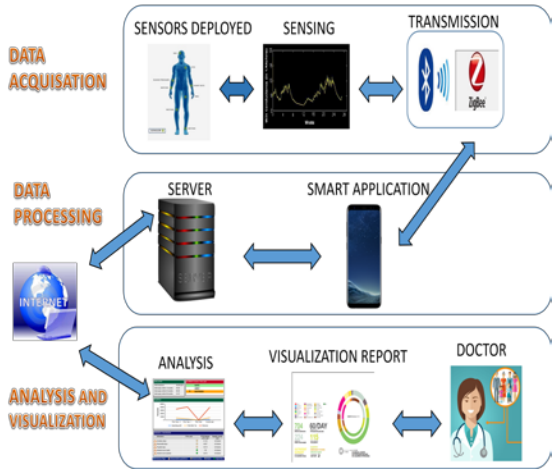

Fig 3: components of remote health monitoring system.

- DATA ACQUISITION AND SENSING

Physiological data is acquired by wearable devices that combine miniature sensors capable of measuring various physiological parameters, minor preprocessing hardware and a communications platform for transmitting the measured data. The Wearability requirement, poses physical limitations on the design of the sensors. The sensors must be light, small, and should not hinder a patient's movements and mobility. Also, because they need to operate on small batteries included in the wearable package, they need to be energy efficient. Though the battery may be rechargeable or replaceable, for convenience and to ensure that data is not lost during recharging or battery replacement periods, it is highly desirable that they provide extended durations of continuous operation without requiring charging or replacement [3]. The low energy operation requirement can also pose a challenge for the quality of the data captured in terms of the achievable signal to noise ratio. Recent designs [5][6][7], of flexible sensors that can be placed in contact with the skin in different body parts are particularly attractive for medical applications because, compared to alternatives, the close contact with the skin allows measurement of more physiological parameters and with greater accuracy. There have also been efforts to prolong the operational lifetime of wearable sensors by incorporating low power device and circuit level techniques. [8]

- DATA PROCESSING

Data aggregated by the concentrator needs to be transferred to the cloud for long term storage. Offloading data storage to the cloud offers benefits of scalability and accessibility on demand, both by patients and clinical institutions. Also, utilized with analytics and visualization (described in subsequent sections), cloud hosting and processing can reduce costs at HCOs and provide better diagnostic information. In this section, we outline such could architectures and discuss issues that impact long term medical data storage on the cloud.

Server: Server is a limited resource computing and storage platform that eliminates the need to outsource resource intensive tasks to the enterprise

server. Server computing has been introduced as a potential solution to deliver low latency to time critical tasks for health monitoring applications via body area networks. Communication between smart devices and server is realized through Wi-Fi interface [3].

Smart Devices: In IoT infrastructure as today's smart phones can use both LTE and Wi-Fi as the backhaul network. Data aggregation can be carried on either in server .Aggregated data, however,

Prevent unauthorized parties from accessing the information. Secure cloud storage frameworks have therefore been proposed for use with sensitive medical records [9]. Secure medical data processing on the cloud remains a challenge.

- ANALYTICS

Compared with the lab and office based measurements that are the workhorses of current clinical medical practice, wearable sensors can readily incorporate multiple physiological measurements and enable gathering of data with much finer temporal sampling over much longer longitudinal time scales. These rich datasets represent a tremendous opportunity for data analytics: machine learning algorithms can potentially recognize correlations between sensor observations and clinical diagnoses, and by using these datasets over longer durations of time and by pooling across a large user base, improve medical diagnostics. As in other big data applications, the use of analytics here can improve accuracy, allow earlier detection, enable personalization, and reduce cost by reducing expensive lab procedures that are unnecessary. Analytics on wearable sensor data can conceptually utilize a wide-range of pattern recognition and machine learning techniques that have matured significantly and are now commonly available as toolboxes in several software packages. Several challenges must, however, be overcome before analytics can be deployed on any meaningful scale. Some of these challenges are analogous to those in other big data problems where as others are unique to out setting. There are also, however, challenges unique to analytics with wearable sensor data and to the medical and clinical seeing that we're focused upon [3].

needs to be finally be stored in the cloud to allow distributed access and reliable storage.

Data Storage in the Cloud: Privacy is of tremendous importance when storing individual's electronic medical records on the cloud. According to the terms defined by Health Insurance Portability and Accountability Act (HIPAA), the confidential part of medical records has been protected from disclosure. When the medical records are outsourced to the cloud for storage, appropriate privacy preserving measures need to be taken

- VISUALIZATION

To be useful in clinical practice, the results from the Analytics Engine need to be presented to physicians in an intuitive format where they can readily comprehend the inter-relations between quantities and eventually start using the sensory data in their clinical practice. Visualization is recognized as an independent and important research area with a wide array of applications in both science and day to day life. Given that colour is a key discriminative attribute of our visual perception, it is unsurprising that colour plays a key role in information visualization [10].Colour distance and colour category have been shown to be effective in allowing rapid identification and comprehension of differences in visually presented data. The type ofcolour visualization that is most effective is dependent on the type of data.Data gathered or inferred from IoT sensors spans the complete spectrum of categories outlined in the previous paragraph and therefore an array of different visualization methodologies are required for effective use of the data. A distinct aspect of wearable sensor data, relative to data acquired at a laboratory or during a clinical visit, is that the data are gathered over a much longer longitudinal duration, with a finer temporal sampling, and simultaneously across multiple modalities. While the data represents a treasure trove for machine learning and inference, for the physician, it is problematic in the absence of tools to readily visualize and interact with the data. The time-varying and multi-dimensional aspects of the data pose a particular challenge because these have typically not been used in clinical practice even though the temporal variation and evolution of data

and analyses results are of particular interest for diagnosis [3].

V. CONCLUSION:

In this research work, we have presented a technique for health monitoring for patients situated in remote areas using different sensors and IoT Architecture. In future we are planning to provide security mechanism for the data stored and transmitted, because data related to health issue should be confidential.

REFRENCES

[1] R. Kumar, Dr. M. Pallikonda Rajasekaran "AnIoT based Patient monitoring system using raspberry pi".

[2] Thirumala settee Sivakanth, S.Kolangiammal" Design of Iot Based Smart Health Monitoring and Alert System".

[3] Moeen Hassan ali eragh, Alex Page, TolgSoyata, Gaurav Sharma, Mehmet Aktas, Gonzalo Mateos,BurakKantarci, SilvanaAndreescu" Health Monitoring and Management Using Internet-of-Things (IoT) Sensing with Cloud-based Processing: Opportunities and Challenges".

[4] Punit Gupta, Deepak Agrawal, Jasmeet Chhabra, Pulkit Kumar Dhir" IoT based smart healthcare kit".

[5] D. Son, J. Lee, S. Qiao, R. Ghaffari, J. Kim, J. E. Lee, C. Song, S. J. Kim, D. J. Lee, S. W. Jun, S. Yang, M. Park, J. Shin, K. Do, M. Lee, K. Kang,C. S. Hwang, N. Lu, T. Hyeon, and D.-H. Kim, "Multifunctionalwearable devices for diagnosis and therapy of movement disorders".

[6] S. Xu, Y. Zhang, L. Jia, K. E. Mathewson, K.-I. Jang, J. Kim, H. Fu, X. Huang, P. Chava, R. Wang, S. Bhole, L. Wang, Y. J. Na, Y. Guan,M. Flavin, Z. Han, Y. Huang, and J. A. Rogers, "Soft microfluidic assemblies of sensors, circuits, and radios for the skin

[7] D.-H. Kim, R. Ghaffari, N. Lu, and J. A. Rogers, "Flexible andstretchable electronics for biointegrated devices".

[8] T. Torfs, V. Leonov, C. Van Hoof, and B. Gyselinckx, "Body-heat powered autonomous pulse oximeter".

[9] M. Li, S. Yu, Y. Zheng, K. Ren, and W. Lou, "Scalable and securesharing of personal health records in cloud computing using attributebasedencryption".

[10] L. D. Bergman, B. E. Rogowitz, and L. A. Treinish, "A rule-based toolfor assisting colormap selection".