A IOT-based Modern Healthcare System Using Body Sensor Network (BSN)

Deshpande Niranjan R[1], Vadane Pandurang M[2], Sangle Sagar D[3], Prof. Dighe M. S.[4]

B.E. Student, Dept. of Computer, SCSCOE, Rahuri Factory, Maharashtra, India[1,2,3]

Asst. Professor, Dept. of Computer, SCSCOE, Rahuri Factory, Maharashtra, India[4]

ABSTRACT: In now a days increasing diseases and people are becoming health conscious. And proper diagnosis of diseases and time to time normal or abnormal biological changes detection leads to avoid critical situations. Hence the system designed for that purpose that periodically monitoring of patient and sensor nodes for detecting biological changes should be done and under observation of all patients at the same time can be easy by the body sensor network. IOT based technology used in system

KEYWORDS:IOT, BSN, ECG, EMG, EEG, BP, LPU, PDA

I. INTRODUCTION

Now a day's people are becoming health conscious and increasing and suffering from chronic diseases. And difficult occurs in taking care of that patients. In hospital, also many patients are admitted and doctor and their colleagues should have to maintain the treatment of them. For that all patient are should remain continuously under observation. Hence, IOT (internet of Concept) concept used and sensor are connected to human body with well managed wireless network. For measurement heart bit rate, blood pressure, Insulin etc. Can be measured by sensors and particular sensor are required to gather specific information. BSN care server also maintained to store data collects data from sensor and it processes in LPU that is local processing unit and send it to database server.And Internet and power supply continuous required to work proper functioning and periodically to work proper functioning of health. Because sensor is collecting information after every 10 secs and sends it to database server. As it also includes data gathering from wearable sensors and stores on database server. It also requires security is measure concern for privacy and prevention of attacks. For data security encryption algorithm also used for convert data into other format so that human cannot read easily that data. And only machine identifies because maintains symbol tables and predefined data format, while sensor is collecting information and after that encryption process done that data and then it goes to storing on database. Internet connection is required for message alert because condition checking and whether it is true or false on that basis result will be generated through internet. So, Ethernet connection is necessary for that. Heart bit sensor, temperature sensor, BP sensor are also used in project. Temperature sensor are RTD Resistance Temperature Detector. Sensor are RTD i.e. Resistance temperature Detector sensor is made up of semiconductor material and exhibit highly nonlinear vs temperature curve. In database management section, SVM (Support Vector Machine) is also used for mining data from database. Data mining management is also necessary for storing data retrieving actually related data from. MySQL database. Naive Bayes algorithm is also used to identify spam e-mail and it is having embedded facility.

II. RELATED WORK

[1].BODY SENSOR NETWORK – A WIRELESS SENSOR PLATFORM FOR PERVASIVE HEALTHCARE MONITORING [Benny P.L. Lo, SurapaThiemjarus, Rachel King and Guang-ZhongYang]
Contribution: Recently advancement in the wireless sensor network (WSN) and embedded computing technologies, in that health monitoring devices have feasible. In which it provides the continuous monitoring and analysis of the physiological parameter of the body. And recently proposed Body Sensor Network (BSN) sensing the patient's physiological part. The important aim of proposed system to control and quickly analysis of the patient's disease. Cardiovascular is the disease that cause the death in UK and from this disease 38% of all death in the each year. Some patient has heart attack, up to 29% people of them died before reaching to the hospital. This heart attack will happen without any indication. Currently, ECG (Electrocardiogram) Holter monitoring is mostly used technique for providing

ambulatory cardiac monitoring for capturing disturbances in the body. This Holter monitor can record up to 24 hours of ECG signals, and the recorded data is subsequently retrieved and analyzed by a clinician. They can also detect and signal a warning in real-time if any abnormal changes in the body is captured. Recent research has also focused on the development of wireless sensor networks (WSN) and monitoring systems for cardiac patients. For example, number of wearable systems have been proposed with integrated wireless transmission, GPS (Global Positioning System) sensor, and local processing. For example, the proposed cardionet provides a remote heart monitoring system and ECG signals are send to a PDA (Personal Digital Assistant) and then routed to the central server by using the cellular network. Recently Pentland presented the proposed wearable mithril system in which ECG data, GPS position, skin temperature and galvanic skin response can be captured by using PDA. With the proposed BSN architecture, a number of wireless biosensors including with 3-lead ECG, 2-lead ECG strip, and spo2 sensors have been developed. This sensor includes accelerometers, temperature and humidity sensors are also integrated to the BSN node. For that, a compact flash BSN card is developed for pdas, in which sensor signals can be collected, displayed and analyzed by the PDA, This PDA can also act as the router between the BSN nodes and the central server, where all sensor data collected will be transmitted through a Wi-Fi / GRPS network for long-term storage and analysis.

[2]. Fuzzy Logic based Health Care System using Wireless Body Area Network [PrakashgoudPatil, SaminaMohsin, Karnataka, India]

Contribution: Wireless Sensor Networks (WSN) that provides the communication in healthcare systems. This sensor with advance Micro-Electro-Mechanical Systems (MEMS) technology, create a Body Sensor Network (BSN) that continuously monitors the abnormal changes in health of patients. This proposed system designed for measuring health parameters of patient body in which it consists of temperature and pulse sensor, this sensor is connected to Base Station through a microcontroller and that device have the ability to be control and monitored by remote computer. Wireless Sensor Network system continuously monitoring the pulse and temperature of patients at remote or in hospital. This wearable wireless sensor system is designed to continuously capture and send the bio-signals to the Doctor or Patient mobile phone. In that case of emergency alert will be transmitted to doctors, relatives, and ambulance in the form of Short Message Services (SMS). Doctor can also provide remote prescription for the patients this Data stored at database then after is passed to fuzzy logic controller to improve accuracy and this data is to be sent to the remote user. These data are read from sensor are imprecise / crisp here we design a Fuzzy logic controller (FLC), the FLC is one of the component in our healthcare monitoring system. The FLC system receives data from sensor as input and the fuzzification module converts input into fuzzy linguistic variable and its output is sent to Patient or Doctor. These systems have the main purpose: to provide or transmit the health information to the patient, to the medical staff or for both at the same time. This paper demonstrates the use of wearable Wireless Body Sensor Network and ambulatory health monitoring. If there is any change in the patient body that physiological parameter information is transferred through sensor, if there is any emergency then these message is transferred to doctor or relative or emergence unit. After receiving the information from patient doctor can controlled the patient via remote. This application main aim is to provide the quickly facility of hospital. This paper proves wireless sensor networks can be widely used in healthcare applications. Which could improve the quality of life.

[3]. A Unique Health Care Monitoring System Using Sensors and Zig Bee Technology [EktaMadhyan Mahesh Kadam, Department of Electronics & Telecommunications, Mumbai University, India]

Contribution: The purpose of the unique healthcare monitoring system using sensor and Zigbee Technology that remotely measuring and monitoring the patient's physiological parameter of the body. The author present in this paper measuring and monitoring system for Electrocardiogram (ECG), lung functioning (spirometer), heart rate and temperature signals. In this proposed system, the protocol for standard IEEE 802.15.4 zigbee system. The information collected from patient via radio frequency that data display on the displaying module such as PC or mobile devices. And collected information is sent via IP (GPRS or WI-FI) to a database server containing clinical data, and this stored information can be accessed on the small devices and this information can be shared with doctor at any time when they needed. The proposed system can monitor the different aspect of the human body such as Blood Pressure, Electrocardiogram (ECG), Electroenchaplogram (EEG), Temperature, glucose, respiratory (spirometer). The proposed system in which it gathered the information from patient through different aspect of body function and these information is transmitted to zigbee and from that zigbee it sends data from one zigbee to another zigbee, after receiving the information it display on the display module such as mobile of doctor or family or emergence unit. We can also say that intelligent healthcare and monitoring system that include body sensor network (BSN) and local sensor

network has been presented. The wireless bio-signal acquisition System–on–Chip for BSN application is applied to capture the real human body temperature, heart rate and ECG signal via IEEE 802.15.4 zigbee. According to the real measurement results, health care can be acquired by the proposed WBSA-soc.

[4]. Discovering Multidimensional Motifs in Physiological Signals for Personalized Healthcare. [ArvindBal Subramanian, Jun Wang, and RamakrishnanPrabhakaran]
Contribution: Nowadays patient can be monitored with the help of sensor that are wear on the patient body. These sensors can be monitored personalized diagnosis and the therapy of the patient. Suppose that the patient having any abnormal changes in the body then these wear sensor sense and collect the information and transfer and informs the any emergency to the family or doctor. In these paper, we have to observe that the there is proposed Multidimensional Motif (MDM) discovery. These MDM is used for the capturing the patient's physiological parameter. In previously proposed system the MDM have the Capability   simultaneous processing and multiple dimension. The author proposed in this system an efficient and real time approach for MDM discovery in the body sensor. There MDM monitoring the performance of the patient during the therapy. These proposed system enables the recording of patient performance and speedy update and retrieve the data that are collect from the sensor. The wearable sensor widely used that can be that can be continuous monitored the patient performance at the time of therapy from the accurate analysis from the sensor. The doctor and medical care can be alert and provide efficiently treatment to patient. The wearable sensor sense the recording of the unidirectional and multidimensional data. The context aware approach is used for the analyze the patient activity in semi supervised or in unsupervised manner for identifying patterns. In this paper the author uses the MBM O Algorithm. The proposed system has the scalability and efficiently of the approach that collects the online analysis and monitored the patient in healthcare application.

[5]. Coexistence of zigbee-based WBAN and wifi for Health Telemonitoring Systems [Yena Kim, Student Member, seungseob Lee, Student Member, and sukyoung Lee, Member]
 Contribution: The telemonitoring concept can be used concept can be used via Wireless Body Area Network (WBAN) that provide the home based mobile health monitoring. A wireless Body Area network (WBAN) in which having small sensor, this medical sensor is very intelligent that is collect the physiological parameter i.e. EKG (electrocardiogram), EEG (electroencephalography and the last one blood pressure can be monitored in this healthcare application. These sensors are wearable on the patient body that sensor collects the patient body that sensor collect the physiological parameter from patient and send to the coordinator is small mobile devices after that the coordinator sends this data through wireless network this can be send to the doctor clinic. For transferring this physiological parameter through wireless technology in WBAN is zigbee. This zigbee channel are overlap with WIFI channel and that have the ability to guaranteed deliver the physiological parameter such as zigbee channel are overlapped with WIFI channel to solve this problem the author developed the algorithm for controlling or reducing the load in the WIFI network then it guaranteed transfer the physiological parameter or signal. In this paper the author proposed the algorithm for control the load the network in zigbee based WBAN / WIFI co-existence environments. These sensor collects the data for Blood pressure and Blood temperature and sending this physiological parameter signal to coordinator and then transmitted to Health Telemonitoring System. These sensors are continuously monitoring the physiological parameter and doctor doesn't have need to visit them in hospital. The physiological signal is two type first regularly collects the information and emergency signal are immediate transfer. In this paper signal traffic is reduced and continuous send the data to Health Monitoring System.

[6]. Automated Patient Handling Activity Recognition for At-Risk Caregivers Using an Unobtrusive Wearable Sensor. [Feng Lin, XiaoweiXu, Aosen Wang, Lora Cavuoto, and WenyaoXu]
Contribution: In this proposed system it monitors complex patient handling activities. The patient having multiple IMU sensors on the body and this sensor are located at different location on the body. In this paper, the authors propose system in which automatically patient handling activity (PHA) recognition. The mostly important device used in this proposed system name as smart insole 2.0. This device wear on the patient body with rich number of sensor and all this sensor are capture the information of Patient Handling activity (PHA). The device Smart Insole 2.0, it utilizes an advanced electronic textile (etextile). This   sensor technique providing accurate measurement in ambulatory and static status.
This proposed system for the PHA recognition, it consists of two modules which includes the device such as Smart Insole 2.0 and the STW framework. A developed device such as Smart Insole 2.0 working like as a sensor. And this

sensor collect plantar pressure during various phas unobtrusively. The STW framework contains an STW (Spatio Temporal Warping) signal processing part. The computing of the STW framework is implemented in the smartphone. In this paper, we have to observe that the accurately recognize the PHA, for that purpose, the researchers first developed small and intelligent device name as the Smart Insole 2.0 it is to capture the plantar pressure change information caused by the PHA. An STW is a framework its main purpose to analyze the pressure data for classification. The researchers study showed the results of our framework can achieve 98%, 92%, and 92.5% recognition accuracy with qualitative profile, PHA recognition, and load estimation, respectively.

[7]. Effective Ways to Use Internet of Things in the Field of Medical and   Smart Health Care. [KaleemUllah, Munam Ali Shah, Sijing Zhang, Department of Computer Science, University of Bedfordshire, Luton, UK]

Contribution: Nowadays there is lots of advancements in the technology and there is everywhere easily availability of the internet access that makes possible to connect various devices. This device can communicate with each other via wireless or wired technology. The Internet of Things (iot) is a new and important concept. Its main purpose is the to allows users to connect various sensors and smart devices to collect real-time data from the environment. E-Health and m-Health architectures are use smartphone sensors to sense the data from the patient and transmit important data related to a patient's health is to transmit to the doctor. Then doctor take appropriate decision on tn the basis of sensor report. This sensor is continuous monitoring the patient hence there is no need to doctor visit them. At a time doctor can be handle the number the of patient.   In this paper the contribution of the authors is firstly effectively deploy the iot in the field of medical and smart health care. Secondly, we propose a new semantic model for patients' e-Health. The Proposed system has named as 'k-Healthcare' that uses 4 layers, these layers namely are sensor layer, network layer, Internet layer and services layer. All this layer effectively and efficiently is co-operate to each other that are responsible for the collecting information from the patient using the smart phone. There are many people in the world that are suffers from the at least one chronic diseases but they do not get proper access to hospitals and or due to some problems such as patient in traffic, they do not get the treatment at emergency time for that purpose this health care monitoring system is developed. But nowadays the latest technology, small wireless devices which are connected to iot and monitor the patient remotely instead of visiting the physical hospital. Sensors are attached to the body of the patient, and these sensors are collecting the data related to the physiological parameter to get health data securely, and the collected data can be analyzed and sent to the server using different transmission media such as 3G/4G with base stations or Wi-Fi which is connected to the Internet. All the medical professionals can access and view the data, take decision accordingly to provide services remotely.

III. PROPOSED ALGORITHM

Body sensor network used in patient monitoring made easy to monitor patient from remotely body sensor network made possible monitor patient by tiny sensor with real time result which reduce risk, money, time. In body sensor network, tiny sensor placed on body It monitors biological change in body. It better than yearly manual patient monitoring. There are several body sensor networks proposed project developed until. Below described some of them

A. *CODE BLUE: -*
 It is popular healthcare research project based on body sensor network developed at Harvard sensor network lab in US in this project many sensors are attached patient body it senses biological change and send data wirelessly to end user like computer, notebook PDA for other analysis of data.
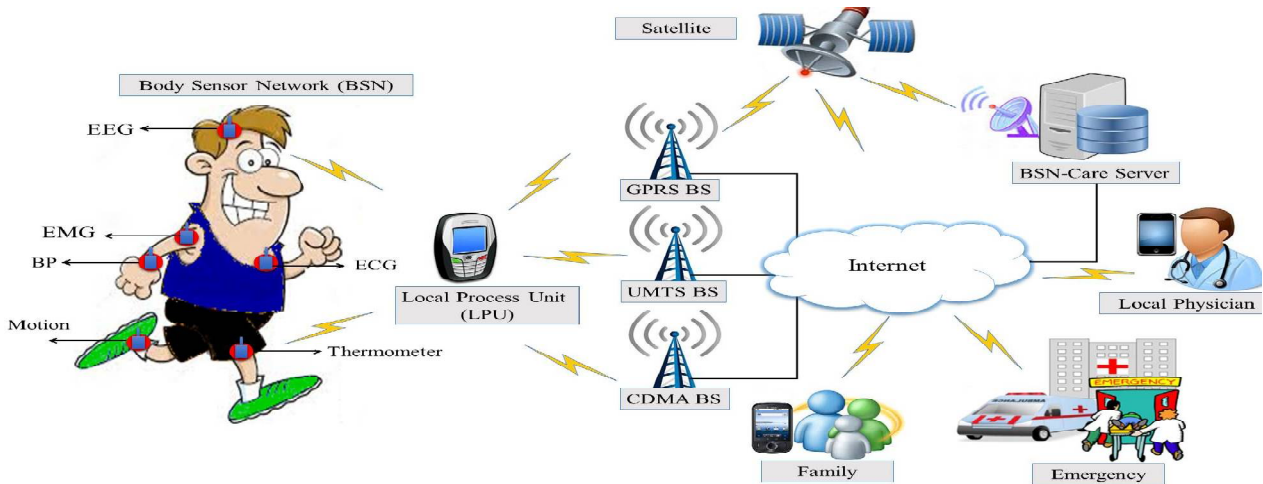
Fig. 1 IOT-based Modern Healthcare System Using BSN

B. ALARM-NET

Alarm-net was designed by university of virginia. In alarm-net on living and residential monitoring network used in pervasive adaptive health care.

C. UBIMON: -

Ubimon project developed by department of computing imperial college of London. Main aim was this project address the issue related to use age of wearable sensor.

D. MOBICARE: -

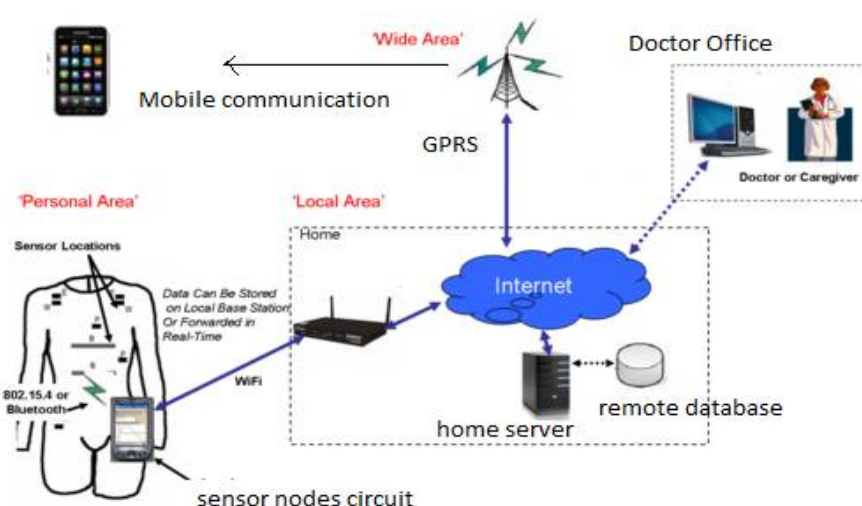Mobicare is use wide area mobile patient monitoring system with continuously and timely monitoring

Fig 2 system architecture

The body sensor network technology is one of core technology of IOT develop. In body sensor network patient, can be monitor by small sensor which low powered and light weight WSN. In this paper, we implement secure, real time monitoring system which has based on IOT healthcare system using body sensor network.

Following are main component in body sensor network: -

- Body sensor network care unit (body sensor network care)
- Local processing unit(LPU)
- Body sensor network server (body sensor network server)

1. Body sensor network care unit (body sensor network care): -
    Body sensor network Care shown in below fig 1. In BSN system, wearable sensor placed on body of patient. Each sensor checks biological change body by using biological sensor like ECG, blood pressure. Sensor sense physical body parameter all inform action is send to LPU.

2. Local processing unit(LPU): -
    Local Processing unit as like PDA, smart phone, personal computer or embedded Kit. It is router between BSN node and BSN sever. LPU act like router between BSN node and BSN server. It used Internet via Ethernet part, or GSM kit or Internet Dougal. It continuously checks patient physical parameter every 10 sec and store at BSN server side.

3. Body sensor network server (body sensor network server): -
    When BSN- server got data form LPU then stored at into database and analyzes that with standard physical data. It periodical update data to database if any abnormality found it compare with standard data then check another data based find patient Doctor friend and relative number send emergency message through internet.

Algorithm steps: -
> Step 1: Patient registration
> Step 2: Login
> Step 3: Insert normal data into data base for comparison

Step 4: Every 2 secs is gathered data from patient and stored
> Step 5: Collected data check with normal data
> Step 6: If any changes found in data then find patient doctor, relative, & friend number
> Step 7: send message patient doctor, relative, & friend number

IV. CONCLUSION

In this paper at first we have described the various filed healthcare applications using body sensor network (BSN) Subsequently, we found that even though most of the popular BSN based research projects acknowledge the issue Data dropout the and security. we create automated methods can be used to identify patient deterioration, fulfilling the aim of predictive monitoring, and automatically parse the large quantities of data acquired. In this paper, at first we have described the the alert to doctor when abnormalities occurred in patient and privacy issues in healthcare applications using body sensor network (BSN). Subsequently, It is basically a collection of low-power and lightweight wireless sensor nodes that are used to monitor the human body functions and surrounding environment. Since BSN nodes are used to collect sensitive (life-critical) information and may operate in hostile environments, accordingly, they require keep records of patient to keep track of patient monitoring and future use of data. And major advantage is that to alert doctor and their colleagues to take instant action in case of abnormalities.

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