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Wireless Sensor Network Based Healthcare Monitoring: A Review

Swati Gawand Prof. Santosh Kumar

Abstract — **Development in healthcare monitoring systems which allow a continuous remote patient monitoring and diagnostics by doctors. The wireless nature of network and use of sensors gives new approach to healthcare system. There is no manual operation is required, all the things are get automated by the use of wireless sensor nodes. By staying at remote place doctor can operate patient easily with the help of technology use in wireless network. In this paper we present an idea for better improvement in healthcare system in india with the help of information technology by using wearable on body sensor and in body sensors for patient continuous monitoring. This sensors are take the reading of patient and send it to doctor can help the patient for improving health. In this paper we discuss various techniques and innovation new trends in wireless sensor network for continuous health monitoring. The main aim of this proposed system is critical patient can be operate by doctor as soon as early. So to save the life of critical patient wireless sensor network plays an important role.**

Key Words —**Cluster Head, Sensors, Wireless body area network, Wireless sensor network.**

I. INTRODUCTION

Wireless sensor network is a system which can continuously monitor the health of patient to prevent and early detection by of disease. A Wireless Body Area Network (WBAN) is a special purpose sensor network designed to operate autonomously to connect various medical sensors and appliances, located inside and outside of a human body. A WBAN system can offer two significant advantages compared to current to electronic patient monitoring system .the first advantage is the mobility of patients due to use of portable monitoring devices. Second advantage is the location independent monitoring facility. A WBAN node being an autonomous device can search and find a suitable communication network to transmit data to remote database server for storage. It is also possible that a WBAN will connect itself to the internet to transmit the data in a non-invasive manner. The health care sector is increasingly looking for advanced ICT (Information & Communication Technology) systems to efficiency administer the healthcare delivery for a range of services. Advanced ICT systems will be able to deliver healthcare not only to patient in hospital and medical centers; but also in their home and workplaces thus offering cost savings, and improving the quality of life of patients. Health care is always a big area, since it involves the life a given individual can have[1][3]. The aging population of developed countries present a growing slice of governments budget, and presents new challenges to health care systems, namely with elderly people living on independent senior housing. As body sensor network systems are capable of continuously monitoring a person's physiological and physical state , they can provide patients with the required information and motivation[4][6]. Combined with the additional information of the user's surroundings via ambient sensors, full-fledged Body and Ambient Sensor Network (BASN) health monitoring solutions can be built to face these upcoming challenges in health care systems. Patient by staying at remote place can get operated by doctor with the help of wireless network. In health care monitoring the patient ECG(Electrocardiogram),blood pressure, pulse rate etc and send this record of patient to central unit. In this sensor nodes send records of patient to the central unit unit. In central unit records are maintained in queue then one by one record is send to the doctors computer and mobile

In previous system all records are kept in queue in central unit, suppose any patient blood pressure is get increase above the normal range so this record has reach to doctor as early as possible. But in previous system there is no such arrangement to send critical reading to doctor immediately. There is one more drawback is each sensor nodes broadcast there data to other nodes. So because of this congestion occur in the network, also time delay is get increased [11][12]. Because of this sensor nodes efficiency get decreased. To remove this drawback proposed system is used to remove congestion, time delay and improve energy efficiency of sensor nodes by using a mobility aware and energy efficient medium access protocol (MEMAC) for mobile wireless sensor networks[17].For critical patient record we add priority field to identify critical record that should be send immediately to doctor. To remove channel traffic we use the concept of clustering in this system [19]. Some sensor nodes are far away from central unit, this nodes send their data to intermediate nodes that will send their data to central unit. But in this sensor nodes having limited battery life for transmitting data like this sensor nodes loss their energy and congestion also occur. To remove this the concept of clustering is used..

II. LITERATURE REVIEW

Ya-Li Zheng,Xiao-Rong Ding[1] study overview of four emerging unobtrusive and wearable technologies, which are essential to the realization of pervasive health information acquisition,followings are findings includes:unobtrusive

sensing methods, smart textile technology, flexible-stretchable-printable electronics, and sensor fusion, and then to identify some future directions of research.The methods used are in unobtrusive Sensing & Wearable Devices for health informatics[1]CapacitiveSensingMethod ,Sensing Method and Model-Based Cuffless BP MeasurementThe shorcomings are Issues such as user acceptance, reduction of motion artifact, low power design, on-node processing, and distributed interference in wireless networks still need to be addressed to enhance the usability and functions of these devices for practical use[1].

James Y. Xu,Hua-I. Chang,Chieh Chien, William J. Kaiser,Gregory J. Pottie[2]study theContext-driven, Prescription-Based Personal Activity Classification: Methodology,architecture and End-to-End Implementation[2].This paper presents a novel end-to-end system solution to some of these challenges. The system is built on the prescription-based context-driven activity\ classification methodology,To achieve the goal of enabling large-scale monitoring[2].The draw back of the paper is In the case of a large population deployment, efforts required to perform system training needs to be reduced by introducing default models that include population norms (thus, less individual training), and additional strong context data such as GPS can be introduced[2]. The mehod used in this paper is Context and Scenarios,Prescription Model and High-Level System Functionality[2].Amita Murthy, K. V. Padmaja[3] gives an approach on paper "Developing Trends in Cardiac Monitoring Systems".The paper provides a brief summary about the developments so far in three main factors of the device i.e. sensors used, the system design and the algorithm implemented in the design[3].Cadrdiac Monitors are used in this paperand the shortcomings are The studies developed until now reveal that there are cardiac ambulatory devices which record the ECG of the patients and classify them. But there is no means to correlate the patient"s activities (in day to day life) with the problems occurring in the ECG. This is being performed manually i.e. the patient is asked to note down the activities that he performs during the monitoring period. Hence it can be automated[3].

A Distributed Scheme to Manage The Dynamic Coexistence of IEEE 802.15.4-Based Health-Monitoring WBANs[4] gives findings that analytically study the effects of dynamic coexistence on the operation of IEEE 802.15.4-based health monitoring WBANs. The current IEEE 802.15.4 standard lacks mechanisms for effectively managing the coexistence of mobile WBANs[4].In this paper[4], the DCM mechanism as an extension to the IEEE 802.15.4 standard which enables the WBANs to independently manage the coexistence situation in a distributed manner.[4] The drawback of such a collaborative method is the complexity in maintaining synchronization after the super frame arrangement and the high overhead of the exchanged control messages[4].Abdelghani Benharref , Mohamed Adel Serhani gives proof for Novel Cloud and SOA-Based Framework for E-Health Monitoring Using Wireless Biosensors[5].In this paper[5], we propose a framework to collect patients' data in real time, perform appropriate non intrusive monitoring, and propose medical and/or life style engagements, whenever needed and appropriate. The framework, which relies on service-oriented architecture (SOA) and the Cloud, allows a seamless integration of different technologies, applications, and services,in this "socbes" framework is uesd[5].Xiaoliang Wang, Qiong Gui, Bingwei Liu, Zhanpeng Jin,Yu Chen[6]In this study, they propose a new hybrid mobile-cloud computational solution to enable more effective personalized medical monitoring. In this Mobile-cloud-based ecg monitoring and analysis is used.In future study, precisely profile and characterize the power consumption caused by various data communications and, thus, explore alternative ways to extend the battery life (e.g., optimize the training dataset to be transmitted), while maintaining the desired performance and accuracy[6].

Jin Wang,Zhongqi Zhang,Bin Li, Sungyoung Lee, and R. Simon Sherratt[[7] gives an approach for An Enhanced Fall Detection System for Elderly Person Monitoring using Consumer Home Networks[7].In this paper, an enhanced fall detection system is proposed for elderly person monitoring that is based on smart sensors worn on the body and operating through consumer home networks. With treble thresholds, accidental falls can be detected in the home healthcare environment and sytem sensors are used in this[7] .The draw back is Video based methods are usually more accurate than wearable based and ambient based methods. However, these systems often suffer from high risk of privacy and the prohibitive cost implementing the cameras[7].Android based Body Area Network for the evaluation of medical parameters[8] in this paper The wireless BAN combined with an Android based smart phone offers a large functionality. Different medical parameters can be analyzed, store and visualized using the graphical user interface of an android smartphone designed for the end user. The Bluetooth based sensor nodes acquire physiological parameters of patients then perform signal processing and data analysis and send results to the coordinator node[8]and Atmel Board is used.The drawback is In this bluetooth is used for transfering data so range of transmission is less[8].GuoChen Peng,Mark F. Bocko[9]suggested Non-Contact ECG Sensing Employing Gradiometer Electrodes[9].In this paper Noncontact, capacitive electrocardiogram (ECG) measurements are complicated by motion artifacts from the relative movement between the ECG electrodes and the subject. To compensate for such motion we propose to employ first and second order gradiometer electrode designs[9].Following methods are usedGradiometer Electrode Designs and Common Mode Noise (CMRR Sensitivity)The drawback is Changes in source capacitance due to the relative motion of the electrodes and the subject leads to modulation of both the signals of interest

as well as the aforementioned sources of interference and noise, which in turn may generate interference within the signal band of interest. This effect may be large enough in pra Christian Seeger, Kristof Van Laerhoven, and Alejandro Buchmann[10] gives an overview for MyHealthAssistant: An Event-driven Middleware for Multiple Medical Applications on a Smartphone-mediated Body Sensor Network[10].This paper presents a middleware targeted for medical applications on smartphone-like platforms that relies on an event-based design to enable flexible coupling with changing sets of wireless sensor units, while posing only a minor overhead on the resources and battery capacity of the interconnected devices[10].Followings are the methods are used

1.Event-driven Architecture

2.Broadcast Channels

and drawbacks are as follows

1. Battery life of all sensors is very less
2. Data is stored in server in form of queue [10].

Remote Health Monitoring using Wireless Body Area Network [11] in this paper aim of wireless body area network is to facilitate continuously recording and monitoring of a person's health condition and transfer it over a long distance communication network. sensing system is to be worn by the individual for a long duration.[11].Another area of application can be found in the domain of public safety where the WBAN can be used by firefighters, policemen or in a military environment [11].Ebrahim Nemati, M. Jamal Deen, and Tapas Mondal[12]finds that this sensor system combined an appropriate wireless protocol for data communication with capacitive ECG signal sensing and processing.The ANT protocol was used as a low-data-rate wireless module to reduce the power consumption and size of the sensor[12].Future improvements can include making the capacitive electrodes even more convenient by employing flexible electrode PCBs or removing the battery and providing power wireless to further decrease the size of the sensor[12].A Novel Middle ware Solution to Improve Ubiquitous Healthcare Systems Aided by Affective Information[13]this paper proposes the Pervasive Environment for Affective Healthcare (PEACH) framework, a middle ware level support for affective healthcare that incarnates these ideas and describes its effective functions in a drug addiction treatment application scenario[13].Peach Framework is used in this paper.In future, expect to develop PEACH to transparently handle more complex scenarios, intricate symptoms and gestures, and process huge volumes of context information[13].Photoplethysmogram Measurement Without Direct Skin-to-Sensor Contact Using an Adaptive Light Source Intensity Control[14] this paper developed a chair-attached, non intrusive photoplethysmogram (PPG)measuring system for everyday life,unconstrained monitoring using non skin-contacting sensor-amplifier circuits capable of emitting suitable light intensity adaptable to clothing characteristics[14].Possible transmission at maximum light intensity through clothing may have limits in terms of optical path length and absorption coefficients. However, it may be possible to detect PPG signals through thicker clothing if a PPG sensor with more LEDs or more photodiodes is used, or if an LED that can tolerate much higher forward current is developed and applied to system[14].myHealthAssistant: A Phone-based Body Sensor Network that Captures the Wearer's Exercises throughout the Day[15] this paper presents a novel witness and preventive health care system with a flexible and easy to deploy platform. It's architecture contains android platform,sensors and layered architecture.The future work contains the gym exercise detection for extended use by expert users. We also plan to integrate uploading of the completed workout to a social platform in order to increase the user's motivation[15].wireless biomedical sensor network for home based ECG monitoring[15]This paper focuses at the development of a mote platform for Wireless Biomedical Sensor Network (WBSN), named Telecoms Research Group (TRG) mote that complies with IEEE802.15.4 standard and operates in 2.4 GHz ISM band. Since energy consumption is a major concern for any wireless sensor network, the mote design utilizes a low power 8-bit PIC18F452 microcontroller and XBee wireless transceiver module[15].TRG mote. Sink Mote technique is used in this paper.Body Sensor Network – A Wireless Sensor Platform For Pervasive Healthcare Monitoring[15]in this paper to facilitate research and development in BSN and multi-sensor data fusion, a BSN hardware development platform is presented. With its low power, flexible and compact design, the BSN nodes provide a versatile environment for wireless sensing research and development[16].IEEE 802.15.4 standards is used in this paper[16].The drawback is STSOM and Bayesian context detection framework for outlining the strength and research challenges of context aware sensing[16].A New Architecture Of A Ubiquitous Health Monitoring System [17]In this paper we propose a prototype of cloud mobile health monitoring system. The system uses WBASN and Smartphone application that uses cloud computing, location data and a neural network to determine the state of patients[18].Gprs And Cloud method is used in this paper.The drawback is Some times data get lost because network congestion[18].Jana puchyova michal kochln,mical hodan study development of special smartphone based body area network energy requirements[19].In thi paper author covers all energy requirement for smart phone for medical application.Android bases smartphone is employed as the main control unit of the sensor network built on the star architecture.R.Aravind,syed Mushathak Ahemd[20] gives an approach for different types of technology such as GPRS,Zigbee technology,GSM,RF communication,sms.Prof.pravin R. Lakhe [21]study zigbee is a typical wireless technology, high level communication protocol. Uses low rate ,low-power digital radios based on an IEEE802 standard for personal area networks. Less expensive than other wireless personal area network such as Bluetooth.

III. PROPOSED WORK

In proposed system wireless sensors are used for monitoring patient. For critical patient monitoring data has to reach to doctor quickly. So to provide immediate data to doctor proposed system use MEMAC protocol for communication.In proposed system threshold value is set for patient record if any patient record cross threshold value then immediately patient record is send to doctor,that record is not kept in queue in control unit. In Proposed system MEMAC protocol is used for avoiding congestion in network. For immediately sending critical patient data to doctor priority field is added to patient record[6].In proposed system the concept of clustering is used for reducing the number of data transmission[9].Cluster forms the group of sensor nodes from each group one node is select as cluster head. This cluster head will communicate with the central unit. Each sensor node will send data to only cluster head[25]. So by using concept of clustering number of data transmission are get reduced and also remove congestion in the network. Figure 1 shows the working of the proposed system

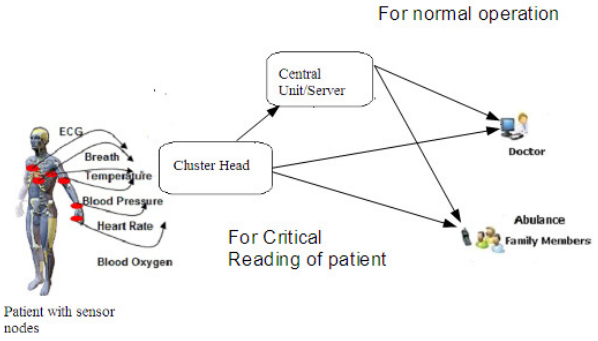

Figure 1 Proposed System for health monitoring

CONCLUSION

Wireless sensor network is growing field that will change the people's healthcare experiences in medical field. This paper reviewed the development on wireless sensor network in healthcare system and the technological requirements for this domain. In this several technologies are used for better improvement of wireless network for healthcare system.

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AUTHOR'S PROFILE

Swati Prakash Gawand
PG Student,Savitribai Phule University of Pune,
SITRC, Nashik
swatigawand@gmail.com .

Prof.Santosh Kumar
Assistant Professor,
ME Coordinator,
Computer Department,
SITRC, Nashik
Savitribai Phule Pune University,
Santosh.kumar@sitrc.org