International Journal of Research in Advent Technology, Vol.2, No.2, February 2014

E-ISSN: 2321-9637

E-Health Care Monitoring System

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***Abstract*—** Recently, the expeditious development of wireless networks has led to the emergency of a new type of e-healthcare system, providing expert-based medical treatment remotely on time. With the e-healthcare system, wearable sensors and portable wireless devices can automatically monitor individuals' health status and forward them to the hospitals, doctors and related people. The system offers great conveniences to both patients and health care providers. For the patients, the foremost advantage is to reduce the waiting time of diagnosis and medical treatment, since they can deliver the emergent accident information to their doctors even if they are far away from the hospital or they don't notice their health condition. In addition, e-health system causes little interruption to patients' daily activities. For the health care providers, after receiving the abnormal signals from the patients, appropriate treatment can be made, which saves medical resources. Furthermore, without direct contact with medical facilities, medical personnel or other patients, the patients are unlikely to be infected with other diseases.

***Index Terms*—Component, formatting, style, styling, insert.** *(key words)*

1. INTRODUCTION

The recent advances in Wireless Sensor Networks have given rise to many application areas in healthcare. It has produced new field of Wireless Body Area Networks. Using wearable and non-wearable sensor devices humans can be tracked and monitored. Monitoring from the healthcare perspective can be with or without the consent of the particular person. Even if it is with the consent of the person involved, certain social issues arise from this type of application scenario. The issues can be privacy, security, legal and other related issues. Healthcare sensor networks applications have a bright future and it is a must to take up these issues at the earliest. The issues should be carefully studied and understood or else they can pose serious problems. In this paper we try to raise and discuss these issues and find some answers to them.

We are developing network architecture for smart healthcare that will open up new opportunities for continuous monitoring of assisted and independent-living residents or comfortably moving around hospital. While preserving resident comfort and privacy, the network manages a continuous medical history. Unobtrusive area and environmental sensors combine with wearable interactive devices to evaluate the health of spaces and the people who inhabit them. Authorized care providers may monitor residents' health and life habits and watch for chronic pathologies. Multiple patients and their resident family members as well as visitors are differentiated for sensing tasks and access privileges.

High costs of installation and retrofit are avoided by using ad hoc, self-managing networks. Based on the fundamental elements of future medical applications (integration with existing medical practice and technology, real-time and long term monitoring, wearable sensors and assistance to chronic patients, elders or handicapped people), our wireless system will extend healthcare from the traditional clinical hospital setting to nursing and retirement homes, enabling telecare without the prohibitive costs of retrofitting existing structures. The architecture is multi-tiered, with heterogeneous devices ranging from lightweight sensors, to mobile components, and more powerful stationary devices.

2. LITERETURE REVIEW

a. Some Projects and Related Works

Much research time is being devoted to the area of wireless healthcare systems lately. A number of recent projects have focused on wearable health devices. These projects have been undertaken by government agencies and other private organizations. These projects cover many areas in healthcare viz. ECG monitoring, glucose level monitoring, stress monitoring, cancer detection, elderly people monitoring and so on. Some of the majorindoor/outdoor application projects that are going onaround the world are mentioned here.

b. Real Life Projects and Applications

HealthGear is a product of Microsoft Research. Itconsists of a set of physiological sensors connectedvia Bluetooth to a cell phone. It is basically a wearablereal-time health system for monitoring and analyzingphysiological signals.

MobiHealthis a mobile healthcare project funded by the European Commission. It allowspatients to be fully mobile while undergoingcontinuous health monitoring by utilizing UMTS andGPRS networks.

Ubimon is from the Department of Computing,Imperial College, London. The aim of this project is toaddress the issues related to using wearable andimplantable sensors for distributed mobile monitoring.Two areas under consideration are the management ofpatients with arrhythmic heart disease and the followupmonitoring of post-operative care in patients whohave had surgery.

CodeBlue is a research project at HarvardUniversity, US. It integrates sensor nodes and otherwireless devices into a disaster response setting. It isdesigned to work across various network densities anda wide range of wireless devices. From a tiny smallsensor mote to more powerful devices such as PDSs,PCs can be combined in CodeBlue.

eWatch is a wearable sensor and notificationplatform developed for context aware computingresearch. It fits into a wrist watch form making it highlyavailable, instantly viewable, and socially acceptable.eWatch provides tactile, audio and visual notificationwhile sensing and recording light, motion, sound andtemperature.

The Vital Jacket mobile device is an intelligentwearable garment that is able to continuously monitorelectrocardiogram (ECG) waves and Heart Rate fordifferent fitness, high performance sports, security andmedical applications. Here data can be sent viaBluetooth to a PDA and stored in a memory card at thesame time.

All these projects aim to provide affordablecontinuous monitoring of a person's health relatedissues. The major focus is on the cost effectiveness andpower consumption of these devices. Although thesedevices are for a novel cause, they have serious socialissues related to security, privacy and legal aspects. Forexample, some of these applications are heavily reliedon Bluetooth-like technologies. These technologies canpose security threats like eavesdropping and denial ofservices. They also have to meet the concerns of healthhazards for the implanted devices. As our discussion isof the social impacts of these applications, we willpresent the major issues related to them in the nextsections.

c. Related Works

There are some works authored by people that addressthe issues related to sensor networks. But social issuesas a whole for application scenarios such as wirelessbody area networks or in healthcare perspective havenot yet been covered extensively. Many authors havesuggested these issues as important. But we have foundthat most of these works are for either some stand-alone applications or the issues are not covered as a whole. One of the papers discussed these issues in the e-Health monitoring applications. Authors in alsohave discussed some of these issues for personal healthmonitoring. We have found that most published worksaddress the security issues for sensor networksapplications.

3. OBJECTIVE

1. *Portability and unobtrusiveness*. Small devices collect data and communicate wirelessly, operating with minimal patient input. They may be carried on the body or deeply embedded in the environment. Unobtrusiveness helps with patient acceptance and minimizes confounding measurement effects. Since monitoring is done in the living space, the patient travels less often; this is safer and more convenient.

2. *Ease of deployment and scalability***.** Devices can be deployed in potentially large quantities with dramatically less complexity and cost compared to wired networks. Existing structures, particularly dilapidated ones, can be easily augmented with a WSN network whereas wired installations would be expensive and impractical. Devices are placed in the living space and turned on, self-organizing and calibrating automatically.

3. *Real-time and always-on.* Physiological and environmental data can be monitored continuously, allowing real-time response by emergency or healthcare workers. The data collected form a health journal, and are valuable for filling in gaps in the traditional patient history. Even though the network as a whole is always-on, individual sensors still must conserve energy through smart power management and on-demand activation.

4. *Reconfiguration and self-organization.* Since there is no fixed installation, adding and removing sensors instantly reconfigures the network. Doctors may re-target the mission of the network as medical needs change. Sensors self-organize to form routing paths, collaborate on data processing, and establish hierarchies.

Research activities: Following are the activities include in our research topics.

a. Design and develop a wearable body sensor portable device which will have the ability to continuously get the statistics from the sensors and transmit the data over the wireless network to the base computer station at nearby area. This device has been designed to keep it working in extreme conditions along with the capabilities to calculate the critical condition to give proper alerts the users.

b. Develop a software protocol resides on the central server at hospital which will be responsible for keeping the proper communication channel between the patients and doctors.

c. Develop a mobile application for known platform which will continuously fetching the data from central communication channel and display it to user in graphical format as and when requires. This mobile application will also provide some alerts to user in case of emergency case.

d. Develop a central web portal to monitor the current patient's statistics, to configure doctor's mobile device, patients history tracking, patients treatment monitoring and doctors information managing.

4. PROPOSED PLAN OF WORK

As in the daily hospital practice it has been noticed that even after patients keeping under the ICU or monitoring, patients require an full time personal assistance and doctor has to conscious about the patients statistics every time. Reading the monitoring graphs and the reading personally and getting the reading over the phone or by any other means are two different things.

The main goal of the proposed system is to monitor the patients statistics over remote device like mobile or tablet in graphical format and to get the emergency alert in case of emergency.

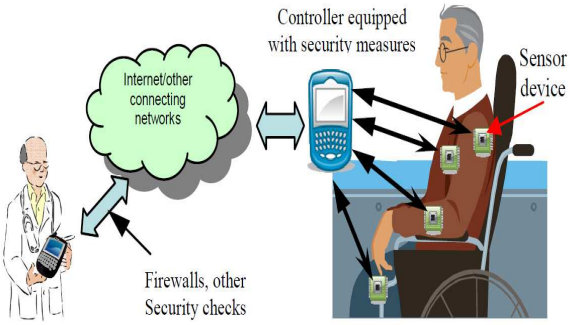

Figure1. Overall system architecture

Figure 1.displays the overall structure of the proposed system. The proposed system has been divided in to three main phases of development and implementation. Let's see the each phase in brief.

a. *Patients monitoring device:* this device is connected to the patients and al the sensors attached to patients body. Figure 2. Shows the sample circuit with the ECG electrodes connected to device. This device will be less with the sensors like, Gyro meter, accelerometer, ECG sensor, temperature sensor and heart beat sensor. The main device where all sensors are connected will transfer sensors values to central server through Wi-Fi module.

b. *Centralized web portal and database server application:* This is the main web application responsible for monitoring and managing the entire operation of the proposed system. First part of this module will deal with patient's device and get all the reading and store it to database for further utilization. Second part of the module will be a web application which let the doctors view the patient's statistics over the mobile device.

c. *Mobile application:* Mobile application has been designed by keeping the idea of remote statistics monitoring of patients connected to the monitoring device and alert generation for doctor in case of emergency Figure 3. Shows the sample view of the GUI of mobile application where we can see how doctor can monitor the patient's state

VI.EXPECTED OUTCOME AND FUTURE SCOPE

Figure 2. Compact sensor device

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Figure 3.Sample GUI of Mobile application.

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