An Overview of Wireless Sensor Networks for Health Monitoring in Hospitals via Mobile

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Abstract: Health monitoring is one of the emerging areas for computing technologies. Health monitoring via mobile is using the application of mobile computing technologies for amending communication between doctors and patients. As mobile devices have efficaciously become part of our life it can incorporate health care more seamlessly to our everyday life. There have been many recent advances in sensor technologies which enable us to integrate low- power, low-cost devices with emerging intelligent health monitoring systems. In this paper we present an overview of wireless sensor networks for health monitoring in hospitals with the use of mobile communication.

Keywords: Health monitoring ,mobile computing technologies
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I. INTRODUCTION

The expeditious development of wireless networks has led to the exigency of new integrated mobile health care system which provides medical treatment remotely on time. [1]These health care systems incorporate the use of wearable health sensors and mobile computing technology to provide effective treatment at real time basis.[2] The system is convenient and advantageous since it can deliver health information of patients remotely directly to doctors. For doctors, after receiving the information from the patients, appropriate treatment can be made.[2]
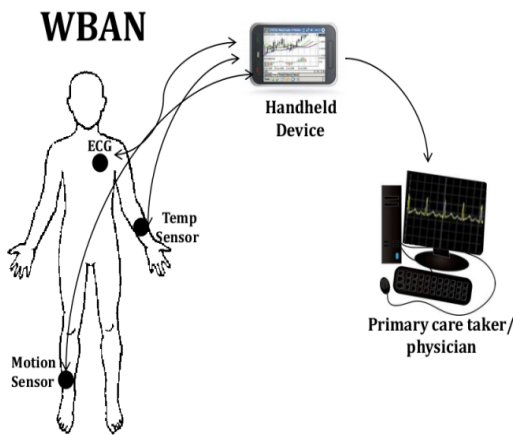

Figure1. Wireless Body Area Network

As shown in the Figure1 the Body area networks are type of wireless sensor network is incorporated by several small sensors aspired to be deployed on patient's body which are capable of collecting the data (health parameters such as body temperature, blood pressure, pulse rate, ECG and so. on) and transmit condition to doctors and nurses.[3]

II. RELATED WORK

Statistical research time is being consecrated to the area of wireless healthcare systems and computing technologies .

A number of recent envisions have focused on computing wearable health devices. [4]These projections have been undertaken by various government agencies and other private organizations. These projects govern many areas in healthcare i.e. ECG monitoring, glucose level monitoring, stress monitoring, cancer detection, elderly people monitoring and so on. Some real life projects and applications are mentioned in the following.[5]

HealthGear is a product of Microsoft Research. It embodies a set of physiological sensors connected via Bluetooth or other short range wireless communication to a cell phone. It is basically a wearable real-time health system for monitoring and examining physiological signals.

MobiHealth is a mobile healthcare project accumulated by the European Commission. It allows patients to be fully wandering around while undergoing continuous health monitoring by utilizing UMTS and GPRS networks.

Ubimon is from the Department of Computing, Imperial College, London. The aim of this project is to address the consequences related to using wearable and implantable sensors for distributed mobile monitoring. Two areas under consideration are the management of patients with arrhythmic heart disease and the follow up monitoring of post-operative care in patients who have had surgery.

CodeBlue is a research project at Harvard University, US. It incorporates sensor nodes and other wireless devices into a disaster response setting. It's system is designed to work across various distinguished network densities and a wide range of wireless devices. From a tiny small sensor mote to more powerful devices such as PDSs, PCs can be combined in CodeBlue.

eWatch is a wearable sensor and presentments platform developed for context aware computing research. It fits into a wrist watch form making it highly available, instantly viewable, and socially acceptable. eWatch provides tactile, audio and visual notification while

sensing and recording light, motion, sound and temperature.

The Vital Jacket mobile device is an intelligent wearable garment that is able to continuously monitor electrocardiogram (ECG) waves and Heart Rate for different fitness, high performance sports, security and medical applications. Here data can be sent via Bluetooth to a PDA and stored in a memory card at the same time.

All these projections aspire to provide low-cost continuous ascertaining of a person's health issues. The major focus is on the cost effectiveness and power consumption of these devices. Although these devices are for a greater cause, they have severe social consequences related to security, privacy and legal aspects. For example, some of these practical applications are heavily trusted on wireless like technologies. [6]These technologies can baffle security threats like eavesdropping,alteration and denial of services. They also have to cope with the concerns of health endagerments for the implanted devices. As our discourse is of the social encroachments of these practical applications, we will potray the major issues related to them in the next sections.[7]

III.OVERVIEW OF MOBILE WIRELESS SENSOR NETWORK

A. Sensors

Sensing is profound to all sensor networks, and its quality depends intemperately on industry advances in signal stipulating, microelectromechanical systems (MEMS), and nanotechnology. Sensors fall into three categories: *Physiological* sensors evaluate ambulatory blood pressure, Uninterrupted glucose monitoring, core body temperature, blood oxygen, and signals related to respiratory inductive plethysmography, electrocardiography (ECG), electr - oencephalography(EEG), and electromyography(EMG).

Biokinetic sensors assess acceleration and angular rate of rotation derived from human movement.

Ambient sensors measure environmental physical process, such as humidity, light, sound pressure level, and temperature.[8]

B. Wearable Body Sensor Networks

Wearable Body Sensor Network is constituted with the wearable or Implantable bio-sensors with the computing technology in patient's body. These sensors collect precise necessary reading from patient's body. For each organ there will be a group of sensors which will collect the readings and send their readings to the cluster head. [6] The cluster heads can intercommunicate with each troubles to the gregarious life of an individual who is using the wireless sensor devices. In some cases such as traver -sing the emplacement of a patient or person if compromised may lead to grave consequences. People with malevolent intent may use the private and personal inform - ation to harm or scathe the person.[11] Security and pri - vacy concerns in objective healthcare applications of wireless sensor networks have been always part of active and dyna- mic research. Security consequences in general wireless sensor networks are a major arena of research in recent times. Likewise many people have specifically acco-

others. They send the aggregated information to the cardinal cont- roller. The central controller is responsible for transmitting patient's health information to the personal computer or cell phone/PDA. Advised that for wireless communication inside the human body, the tissue medi -um behaves as a channel through which the information is sent as electro -magnetic (EM) radio frequency (RF). So in WBSN, infor- mation is transmitted as electromagnetic (EM) radio freq- uency (RF) waves. The cardinal controller of the WBSN communicates with the Patients Perso - nal Home Server [PPHS] using any of the three wireless protocols: Bluetooth, WLAN (802.11) or ZigBee.*rable Body Sensor Network.*

C. System Overview

The medical sensor network system incorporates heterog-enous devices, some wearable computing devices on the patient and some placed inside the living space. Together they inform the healthcare provider or hospitals about the health status of the patients. Information is collected, aggr-egated, pre-vulcanised, stored, and acted upon using a dist-inguished type of sensors and devices in the architectture. Multiple body networks may be present in a single system. [9]

Conventional hospitals and healthcare provider networks may connect to the system by a gateway, or dire-ctly to its database. Some elements of the network are mo-bile, while others are stationary. Some can use line power, but others depend on batteries.[7] If any fixed computing or communi -cations infrastructure is present it can be used, but the system can be deployed into existing structures without retrofitting.

IV. SOCIAL ISSUES

A. Security and Privacy Issues

Security is one of the most crucial and significant aspect of any system. People have distinguished perspective considering security and hence it is determined in many ways. In general words, security is a conception similar to safety of the system as a whole. The US department of commerce site has defined security as a precondition that outcomes from the establishment and sustainment of pro-tective assesses that ascertain a state of impregnable from hostile acts or influences.[8]The communications in sensor networks applications in healthcare are mostly wireless in nature. This may result in various security threats to these systems.

These threats and attacks could pose serious sted security issues with regards to hospital and healthcare integrated with computing applications.

B. Threats and Attacks

Security severance in healthcare applications of sensor networks is a major concern. As it is also worth to observe that since hospital and healthcare practical applications of sensor networks are almost very similar to WSN applic-ation environment, most of the security and privacy concerns are also similar and hence corresponding. The

security and privacy issues can be divided into two broad levels:

System security and Information security. We have disco - ursed these in the subsection of this discussion. Authors in [11] classified the threats and attacks [11] into two major categories ── Passive and Active. A passive attack may occur while routing the data packets in the system. The assailants may change the destination of packets or make gouging discrepant. The attackers may also steal or alter the information or the health data by eavesdropping to the wireless communication media. Active threats are more harmful than their passive counter parts. Criminal heeded people may even find the location of the user or patient by eavesdropping.

This may conduce to life imperiling or jeopardizing situation. The normal course of sensor device system design is that the system has a little external security chara- cteristics and hence prostrate to physical tempering. This increments the susceptibility of the devices and poses more problematic and tougher security challenges. Similarly crucial and critical data transmission from WBAN networks through GPRS or similar networks can be stolen by eavesdropping.

V. CONCLUSION

The potential benefits by deployment of Wireless sensor networks in healthcare applications are easy access of updated patient data at any time and from anywhere.

It is wearable, portable , web based, real time system. Immediate response to emergency situations, provision of high quality healthcare with low cost individual health monitoring system. The system offers great conveniences to both patients and health care providers. The system has great scope to improve in future for betterment of patients and doctors.

The impact of these networks would be considerable and cover many aspects of daily life. The applications will not only lead to convenience but also lead to far reaching implications.

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BIOGRAPHIES

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