Applications Of Wireless Communication In Health Monitoring Devices

Abstract
Since the last decade the health-care monitoring system’s prime goal has been to develop a reliable patient monitoring system so that the health care professionals can monitor their patients, who are either hospitalized or executing their normal daily life activities. Wireless devices have invaded the medical area with a wide range of user-friendly applications by helping in monitoring the patient details in periodic interval is now dependent on the wireless technologies. In order to implement this wireless technology, mobile device based wireless health-care monitoring system that can provide the patient’s temperature, heart beat rate, muscles, blood pressure, blood glucose level, and ECG data are monitored, displayed, and stored by the proposed systems over a wireless network using a health monitoring system.

1. INTRODUCTION
At present in this rapidly transforming world where people have become so busy that work is given the first priority and Health comes later. Nowadays its hard to find time to take care of the elderly people and hence requires some technology which constantly monitors these patients and alerts the family members in case of emergency. There is also a need for the technology where it collects the vital information of the patient's body and hence avoids monitoring during emergency situations. Healthcare problems are being
more important for societies whose population is getting older. In 2025, 761 million of people in the world will be over 65 years. Coronary heart diseases are at the top of the world death cause list and every year 7.2 million people die because of these diseases. The aim of developing remote health monitoring systems is to monitor online medical parameters and to reach this information from everywhere. Because of the lesser cost in wireless communication technologies, implementations of them to monitoring systems have become easier.

In remote ECG monitoring systems, the ECG electrodes are connected to the recording unit with cables and also systems that uses WLAN and GSM/GPRS are proposed.

Figure 1.1: Health monitoring system using ECG sensor

Figure 1.2: The common remote monitoring system

If a simple and wireless ECG sensor can be designed to be used easily for the patient, it is possible to integrate with a portable PC for diagnosing critical cardiac events and heart beat and thus, an emergency alarm system can be obtained. This solution not only gives patient more freedom, but also provides early diagnosis of cardiac diseases with its alarming properties. If the patient moves away from home environment, system should not affect the monitoring process. Due to wireless technology it provides better treatments to patients though they are physically not present in hospital. This system is more useful for elderly people as they are more prone to chronic diseases and need continuous health monitoring. The system requires three key aspects: accessibility to information,
convenience of use and cost effective. These devices are fitted on patient’s body to collect body parameters like pulse rate, body temperature, blood glucose, blood pressure ECG, etc. From these sensors the signal is transmitted to personal computer, smart phone, microcontroller, etc and accordingly medical treatments are given to the patients. Wireless technology could be the best solution for mass emergency situations like natural or human-included disasters and military conflict where patients’ records such as previous medication history, identification and other vital information are necessary. With the assistant of hand held devices in which wireless network integrated, the amount of time the doctors need to identify the problem, trace back the medication history of the patient and consult fellow doctors will be reduced significantly.

Moreover, databases of patients that can be built up by continuous medical monitoring will be accessed and updated easily. As a result, the amount of paper works required and the duplication of patient record will be dropped down. With all of these potentials, wireless systems for medical application are now not only focused by healthcare provider and the government but also by researches and industry. Health care sensors are playing a vital role in hospitality. Patient monitoring system provides a major improvement in hospitals because of its advanced technology. A wireless system is hence used to measure heartbeat and body temperature.

Figure 1.3: The general working of the human monitoring system

With the assistance of these wireless devices in which wireless network integrated and hence the amount of time the doctors need to identify the problem, trace back the medication history of the patient and consult fellow doctors will be reduced significantly. Moreover, databases of patients that can be built up by continuous medical monitoring will be accessed and updated easily. As a result, the amount of paper works required and the duplication of patient record will be dropped down. With all of these potentials, wireless systems for medical application are now not only focused by healthcare provider and the government but also by researches and industry. In home patient monitoring system needs to satisfy the criteria like the size and weight of the wearable devices which needs to be small and should not affect the daily activities of the patient. Power consumption should be low and lifetime of devices should be more.
2. BACKGROUND AND PROBLEM STATEMENT

At present, in this rapidly transforming world where people have become so busy that work is given the first priority and health comes later. Nowadays it's hard to find time to take care of the elderly people and hence requires some technology which constantly monitors these patients and alerts the family members in case of emergency. There is also a need for the technology where it collects the vital information of the patient's body and hence avoids monitoring during emergency situations. Finally, a technology which can help the physically disabled and the people living alone at the time of emergency is required for today's world.

In every hospital, it is necessary to monitor the patient's continuously. This methodology requires sensors to be placed on the bedside monitors or PCs which limits patients to his/her bed.

3. MATERIALS AND APPLICATIONS

Data acquisition between the client i.e., the patient and the server i.e., the hospital server on health condition of the respective patient at every instant. The standard parameters that have to be kept track by our device are:

<table>
<thead>
<tr>
<th>SENSORS</th>
<th>STANDARD VALUE</th>
<th>THRESHOLD VALUES</th>
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<tbody>
<tr>
<td>Easy Pulse Sensor</td>
<td>120mm Hg for systolic and 80mm Hg for diastolic</td>
<td>Low BP: 90 mm Hg systolic or 60 mm Hg diastolic</td>
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<tr>
<td></td>
<td></td>
<td>High BP: above 200/110 of Hg</td>
</tr>
<tr>
<td>Temperature sensor(LM 35)</td>
<td>98.6 F or 37 C</td>
<td>equal to or greater than 104 F or 40 C</td>
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In any case, if the current pulse rate or the temperature of the patient exceeds the threshold value, the emergency notification and GPS is activated. The values of the parameters are received by the nearest hospital from the patient in the form of a popup notification for the necessary emergency actions that are to be taken. The following applications are that of the various wireless technologies with respect to the health care domain:

3.1 Life Star® vital signs monitoring Systems

Life start monitoring systems is a combination of many measuring devices and wireless technologies [Lifestar]. The testing results are transmitted via Bluetooth technology to the LifeStar handheld device. Users’ information can be used instantly on the handheld devices or transmitted again to the LifeStar Network, where the data is stored.

Fig 3.1: Wireless vital signs monitoring system [Lifestar]
3.2. The Wireless B.O.H.M. Center:

Similar to LifeStar system, The Wireless B.O.H.M. Center is used for self-monitoring and management of vital signs by patients [BOHM]. The system consists of five healthcare devices integrated Bluetooth and cellular communications. The Wireless B.O.H.M Center (as shown in fig 3.2) can be used to monitor 5 patients’ vital signs simultaneously, including heart rate, body temperature, blood glucose levels, body fat and 1-Lead ECG.

3.3. Quatech Airborne (TM) and Airborne Direct (TM):

Airborne modules are an effective method to integrate old machines, which do not have wireless communication capability, with modern wireless healthcare system. The interface modules allow the old machines last longer [Airbone].

Airborne modules help these machines have wireless communication, reduce wiring and make it compatible with modern network. Quatech Airborne and Airborne Direct support 802.11b/g are: Airborne(TM) 802.11b/g embedded Wireless Device Server Module; Airborne(TM) 802.11b/g embedded Wireless Ethernet Bridge Module, Airborne...
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Direct(TM) 802.11b/g external Wireless Device Server, and Airborne Direct(TM) 802.11b/g external Wireless Ethernet Bridge.

4. METHODOLOGY
Data is acquired using the easy pulse sensor and LM35. The GPS sends the global positioning of person. The reading of the two parameters is displayed on the LCD display. The GSM modem sends a message in prescribed format containing the readings of parameters. The registered number receives a message on cellular phone where he/she can track the person.

Figure 4.1: The methodology regarding the data flow

5. Conclusion
Although wireless medical applications have been successfully implemented not only in research but in practice as well, there are still many challenges for developers and researchers. This new technology of wireless communication has a great potential to offer a wide range of benefits to patients, medical personnel, and society through continuous monitoring in the ambulatory setting, early detection of abnormal conditions, supervised rehabilitation, and potential knowledge discovery through data mining of all gathered...
information. We have addressed several key technical issues such as sensor node hardware architecture, software architecture, network time synchronization, and energy conservation. Human’s ECG, body temperature and heart rate information are acquired and sent to a PDA using IEEE 802.15.1 Bluetooth standard. If an emergency situation occurs, the PDA sends the information to the central server using either WLAN or GSM/GPRS wireless technology. Easy usage and portability of the system with alarming features has an important role in diagnosing the cardiac diseases and treatment.

Also this system can be used to record events for some diseases like cardiac arrest, ventricular tachycardia or arrhythmia. Also a PDA based portable wireless health monitoring and clinical alarm system is performed.

6. ACKNOWLEDGEMENTS

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7. REFERENCES

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