WIRELESS SENSOR NETWORKS IN HEALTH CARE SYSTEM

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ABSTRACT

In a health care monitoring system it is necessary to constantly monitor the patient’s physiological parameters. Recent, advances in wireless networks and electronics have led to the emergence of Wireless Sensor networks (WSNs). WSNs have been considered as one of the most important technologies that can change the future. Advances in WSN have opened up new opportunities in healthcare systems. Sensor-based technology has invaded medical devices to replace thousands of wires connected to these devices found in hospitals. This technology has the capability of providing reliability in addition to enhanced mobility with limited computation and radio communication capabilities. Each sensor in a sensor network consists of three subsystems: the sensor subsystem which senses the environment, the processing subsystem which performs local computations on the sensed data, and the communication subsystem which is responsible for message exchanges with neighbouring sensors. WSNs have been under rapid development and has become essential in healthcare (biomedical, food safety), as well as for research and development. In the future, we will see the integration of a vast array of wireless networks into existing biomedical technology. This paper will investigate the application of WSN in health care systems and how WSN concepts are integrated in our computer engineering program.

Keywords: Patient, Hospital, Wireless sensor network

[1] INTRODUCTION

Globally, the elderly population is growing and the general population is aging. Life expectancy continues to increase with new advancements in health care. Subsequently, the length of retirement is increasing. Currently, healthcare using wireless medical sensor networks (WMSN) is one of the most important applications of wireless sensor networks. Wearable medical devices in sensor networks and emerging applications will improve general living standard in under-served populations with the advances of wireless and mobile communication technologies. A wireless sensor network consists of a large number of wireless-capable sensor devices working collaboratively to achieve a common objective. Wireless sensor network systems can help people by providing healthcare services such as medical monitoring, memory enhancement, medical data access, and communication with the healthcare provider in emergency situations through the SMS or GPRS. Not only the patient, but also their families will benefit from these. Also, these systems provide useful methods to remotely acquire and monitor the physiological signals without the need of interruption of the patient’s normal life, thus improving life quality [6,7]. These systems do not require the patient to be limited to his bed and allow him to move around but requires being within
a specific distance from the bedside monitor. In most cases, health monitoring will be done by infrastructure-oriented wireless networks such as commercial cellular/3G networks or wireless LANs.

[2] WIRELESS SENSOR NETWORK

Wireless sensor networks (WSN), sometimes called wireless sensor and actuator networks (WSAN), are the sensors used to monitor physical or environmental conditions, such as temperature, sound, pressure, etc. and to cooperatively pass their data through the network to a main location.

The WSN is a collection of few to several hundreds or even thousands nodes, where each node is connected to one (or sometimes several) sensors. Each such sensor network node has typically several parts: a radio transceiver with an internal antenna or connection to an external antenna, a microcontroller, an electronic circuit for interfacing with the sensors and an energy source, usually a battery or an embedded form of energy harvesting. A WSN has one or more monitoring systems which collect data from all sensor devices. These systems are the interface through which the WSN interacts with the outside world.

Applications of WSNs:

Area monitoring
Health care monitoring
Environmental/Earth sensing
Air pollution monitoring
Forest fire detection
Landslide detection
Water quality monitoring
Natural disaster prevention
Industrial monitoring

When wireless sensor networks are designed for medical applications they are often referred to as wireless medical sensor networks (WMSNs). We can install smart sensor nodes on the patient in an inconspicuous way can prevent a large number of deaths caused by cardiovascular diseases every year. The medical staff can do treatment preparation in advance as soon as they receive vital information regarding heart rate and irregularities of the heart while monitoring the health status of the patient, and there is no delay if the patient is suddenly in a critical condition.
Ubiquitous healthcare system: this is the concept to place a wireless sensor on a patient’s body which can form a wireless network to establish communication between the patient’s health status and monitoring PC.

The wireless sensor network in health care can be designed in two ways:

1) WBSN- Wireless Body sensor network

Coordinator and sensors nodes: this deals with the sensors which collects the physiological signals from the patients. Sensor nodes: each nodes have different functionalities. Each network senses different physiological parameter. It can be in given interval or simultaneously. Coordinator nodes: this collects the information received by the various sensors and transfers it to the monitoring devices.

2) WMHRN- Wireless Multi-Hope Relay Node

It consists of several wireless nodes. The Relay node present in it has only capability to transfer physiological signals, such as heart beat, BP, etc to the base station or to other relay nodes. Their are no. of relay nodes which can be together termed as relay network. A relay network is a broad class of network topology commonly used in wireless networks, where the source and destination are interconnected by means of some nodes. In such a network the source and destination cannot communicate to each other directly because the distance between the source and destination is greater than the transmission range of both of them. In comparison to coordinate node the WMHRN, the power can be supplied from the battery which would result in a huge cost savings.

WMHRN has two phases. The first phase is finding the minimum path from the coordinator node to the monitoring system. The second phase is transmission of data through selected minimum path which decreases delay in transmission. By reducing the delay, the speed will be increased. When the speed is high, system can detect abnormal physiological parameters and issue alarm rapidly.

[3] PERFORMANCE EVALUATION

The previous section gave a comprehensive schema of our proposed WBSN. One way to analyze the performance of WBSN system is to measure the end-to-end delay, energy consumption, coverage range.

Delay in transmission refers to the time taken for a parameter to be transmitted across a network from source to destination. Here source is the patient’s body and destination is the monitoring system. Energy consumption is the total amount of power that is electricity required by the sensors used in WSN. The energy consumption and lifetime of the network are related to each other. Coverage range is the range about which transmission of parameters can be done.
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[4] ADVANTAGES

1. It avoids a lot of wiring.
2. It can accommodate new devices at any time.
3. It’s flexible to go through physical partitions.
4. It allows providers to deploy technology at the bedside, as part of normal health care workflow.
5. Also used for detection of chronic diseases beforehand.

[5] DISADVANTAGES

Since wireless communication ranges are not confined, malevolent threats even pose more significant risks to the patient. For example a patient’s body data can be accessed in an unauthorized manner, can be modified, and consequently this can pose a life-threatening risk. The wireless technology offers public access points which hinder the efficient transfer of data. Also wireless technologies are four times more expensive than wired technology due to their difficult setup.

[6] FUTURE DEVELOPMENT

In addition to the system can also provide more than one numbers so that more than one user can receive emergency message. According to availability of sensors or development in biomedical trend more parameter can be sense and monitor which will drastically improve the efficiency of the wireless monitoring system in biomedical field.

[7] CONCLUSION

This new technology has 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. The biggest benefit to having a wireless network is that it allows providers to deploy technology at the bedside, as part of normal health care workflow. Also used for detection of chronic diseases beforehand. It can be used in military for security purposes assists seamless communication between individual and machine. This paper has thus, helped review the basic research on Wireless Body Area Networks in Smart Health Care. This work provides an overview on research propagation within human body.

REFERENCES:


