

Advancement in Healthcare Applications Using Wireless Sensor Networks

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ABSTRACT: 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 future¹⁶. These networks consist of small battery-powered motes 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 comprise tiny wireless computers that sense, process, and communicate environmental stimuli, including temperature, light, and vibration. WSNs have been under rapid development and has become essential in such domains as industrial operations (factory, production, supply chains), health care (home monitoring, biomedical, food safety), environmental (agriculture, habitat preservation), infrastructure (energy, traffic and transportation, flood gauges, bridge stress, power grids, water distribution), and military, as well as for research and development. Advances in wireless sensor networking 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. In the future, we will see the integration of a vast array of wireless networks into existing specialized medical technology. This paper will investigate the application of current state-of-the-art of wireless sensor networks in health care systems and will address how WSN concepts are integrated in our computer engineering program.

Keywords:- WSN, Wireless technology and patient Monitoring system

I. INTRODUCTION

The upcoming field of wireless sensor networks combines sensing, computation and communication executed with tiny devices. Wireless sensor networks represent an emerging set of technologies

that have a wide range of effects over the medical the industrial areas. Wireless sensor networks are made up of a group of sensor nodes or devices. In the health care research enhances the application and optimization of wireless sensor networks for monitoring physiological parameters. In this 21st century ,the healthcare industry has been an drastic improvement due to the introduction of wireless sensor networks over a short term period .the development of wireless sensor networks will lead to an drastic challenges such as reliable data transmission, mobility support, timely data transmission etc. The improvement of wireless communication in healthcare monitoring system has made the patient monitoring system more flexible. Wireless technology could be the best solution for the mass emergency situations longevity has been given rise to increasing understanding of age disabilities and diseases, which can leverage large economical barriers the expenses of these diseases extend beyond financial.

II. WIRELESS SENSOR NETWORKS

A wireless sensor network a network consisting of spatially disturbed autonomous device using sensors to monitor physical or environmental conditions WSN system incorporates a gateway that provides wireless connectivity act to the wired world and distributed nodes. Wireless sensor networks sometimes called wireless sensor and actuator networks (WSAN). The WSN are composed of individual embedded systems which are used for the environmental interaction secondly processing the information within the limit and transferring the information through wireless media.

The applications of wireless sensor networks are divided into three types they are.

- Patient monitoring
- Homely and elderly care center monitoring for chronic patients
- Collection of long term databases of clinical data

2.1 PATIENT MONITORING:

The wireless sensor network plays a major role in the patient monitoring system in the clinical set up. An emerging application for wireless sensor networks involves their use in medical care. In a hospital or clinic, outfitting every patient with tiny, wearable wireless vital sign sensors would allow doctors, nurses and other caregivers to continuously monitor the status of their patients. In an emergency or disaster scenario, the same technology would enable Medics to more effectively care for large numbers of casualties. First responders could receive immediate notifications on any changes in patient status, such as respiratory failure or cardiac arrest.

Our modular and Space labs offer a broad portfolio of innovative monitoring and information systems to support decision-making and help improve patient configured monitors and telemetry systems assure immediate access to comprehensive patient data when and where needed. Parameter modules enable you to customize monitoring to specific patients. Sophisticated clinical tools are integrated into our monitors to optimize care and efficiency, and connectivity solutions assure reliable performance throughout your network. Patient monitoring are emerging to meet the increasing demands of an aging population, decreasing healthcare resources, and an emphasis on reducing hospital days. 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, which is safer and more convenient.

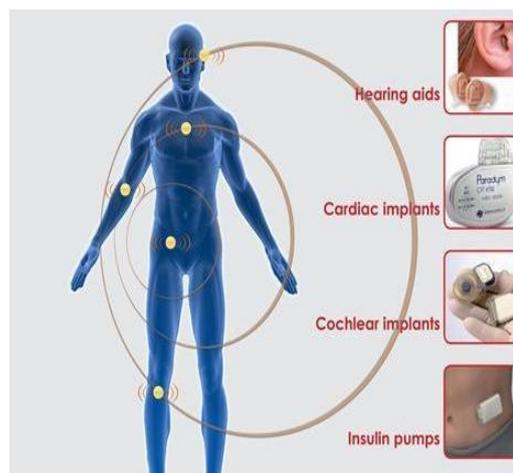


Fig 1: Wireless patient Monitoring System

2.2 Home and Elderly care Centre monitoring for chronic and elderly patient:

It plays a major role in the home and elderly care, where it is very cost effective and high quality healthcare for the elderly people. At home the healthcare can be reached by the use of wireless medical sensor networks. The common problems such as physiological and behavioural data can be identified using the wireless sensor networks. While these networks could be very helpful in diagnosis purpose for the elderly people at home. This system enhances more when it takes up to the next level, such as by connecting to a communication system via broad band it provides lot of information for the physicians, the care givers and other family members and thus also provides flexibility for the family members and physicians in analyzing of the patient health condition without any stress. These are the examples for the home healthcare and elderly care centres: Hongwei Huo et al have developed a prototype of wireless sensor network .this system is very help full in collecting home parameters automatically and the collected data is transferred to the central server over different public networks. As soon as the data is received the central server has the ability to automatically send the message to the other user via voice call, message, mail or through other resource available. Here it is said that a smart system consist of an number of cognitive sensors which are used to provide information that can be used for monitoring the elderly by detecting any abnormalities in their daily routine life time. If such abnormality occurs the system is generated and sends an early warning message to the family members, physician or other caregiver.

Here only 9% of the physicians work in the rural, thus there is a scarcity of physician in the rural areas comparatively, thus the wireless medical sensor overcomes these demerits and provide a successful healthcare unit in all the villages.

2.3 Collection of Long-Term Databases of Clinical Data

The wireless sensor networks are also used in the database storage systems. Here the long term databases are collected and stored for the information purposes. The data that is gathered in a sensor is of two types they are

- Healthcare application leverage wireless sensor networks used to analyze the data gathered.
- The continuous gathered data could be analyzed using the computational techniques to find solutions for the unsolved one.

III. CONCLUSION

Wireless sensor network have the ability to face some of the upcoming challenges. The design of better wireless networks will be the solution for the part of the problem that the healthcare faces. this paper studied the application of the wireless network system in the healthcare was splitted into three categories they are 1.Patient monitoring,2.home and elderly patients and collection of clinical data. The study revealed that the existing application of the wireless sensor networks in the healthcare system have some short comings that have to be addressed earlier. Where the research committee have done an great job in identifying the limitations and find solutions for the problem health care unit faces.

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