Wireless Sensor Network for Healthcare

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Abstract: Now a days Wireless sensor network are considered as the key research areas in computer science and healthcare application industries. The extensive healthcare systems provide rich information and alerting mechanisms against odd conditions with continuous monitoring. It having significant benefits, the area has still major challenges which are investigated in this paper. We provide several state of the art examples together with the design considerations like inconspicuous, scalability, energy efficiency, security and also provide a comprehensive analysis of the benefits and challenges of these systems. It minimizes the need for caregivers and helps to treat the chronically ill and elder people it to survive an independent life, besides provides quality care for the babies and little children whose both parents are engaged in any works. Driven by the convergence between the need to collect data about people's physical, physiological, cerebral, cognitive, and behavioral processes in spaces ranging from particular to civic and the recent vacuity of the technologies that enable this data collection, wireless detector networks for healthcare have surfaced in the recent times.As the y technology advances in low- power networked systems and medical detectors, in recent times we've witnessed the emergence of wireless detector networks(WSN) in healthcare.

Index Terms: Wireless sensor network, Sensor nodes, WSN Network Topologies, Wireless Sensor Network for Health care.

I. INTRODUCTION

Wireless Sensor Network (WSN) is an infrastructure-less wireless network that is utilize in a large number of wireless sensors in an special type manner that is used to monitor the system which is, physical or environmental conditions. A Sensor node is a small and inexpensive device and it possesses the capacity to gather the sensor information from the environment, process the information and communicate with other nodes. WSN technologies are used to determine and analysis the health care condition of a person . An important component of ever-present healthcare is wireless sensor network (WSN). The WSNs has the ability to make the life more comfortable by improving the quality of health care . The use of wireless technology has increased day by day due to its convenience and low cost. A wireless sensor network (WSN) usually consists of a large number of sensor nodes in order to gather the information from the environment. Wireless sensor networks in healthcare are mostly used to determine the activities of daily living (ADL) and it provide data for long term studies.

The emergence of wireless sensor networks (WSNs) in healthcare applications is fueled by a growing array of wearable vital sign sensors and location tags that can continuously track healthcare personnel and patient status/location in real-time mode. Despite the increased range of potential application frameworks – from pre-hospital, in-hospital, ambulatory and home monitoring to longterm database collection for longitudinal trend analysis — the security gap between existing WSN designs and requirements for medical applications remain unaddressed.

Generally, WSN devices are very limited in terms of power, computation and communication. They are often deployed in accessible locations, thus increasing security vulnerabilities. Dynamic ad hoc topology, multicast transmission, location awareness, critical data prioritization, and coordination of heterogeneous sensors for healthcare applications exacerbate the security challenges. This paper presents an analysis of various WSN security systems from the demand perspective of healthcare applications, and considers the importance of security for the successful deployment of pervasive computing solutions in the healthcare industry.

II. SENSOR NODE wireless sensor network is a group of special type of sensor with a communication frameworks for monitoring and recording the conditions of patient at diverse locations.

A Wireless sensor network consists a set of connected by thousands of small sensor nodes. These sensor nodes obtain information on the environment such as temperature, pressure, humidity or pollutant, and send this information to a base station. The latter sends the information to a wired network or activates an alarm , depending on the type of data monitored .Commonly the sensor monitored parameters are temperature, humidity, pressure, wind direction and speed, illumination intensity, vibration intensity, sound intensity, power-line voltage, chemical concentrations, pollutant levels and vital body functions. sensor network that is capable of performing some processing, gathering sensory information and communicating with other connected nodes in the network and exchange information and data

Actually sensor node is a small device which has the ability to gather the information from the external environment. A sensor node, which is also known as a sensor pod or a mote, actually it is a component of a larger network of sensors. Each node has the responsibility to gather the information from the external environment and the data send to the processor. A sensor network contains more than one detection stations called sensor nodes, each of them are small, lightweight and portable. Every sensor node is provided with a transducer, microcomputer, transceiver and power source. The transducer generates electrical signals according to the physical effects which sensed by the sensor nodes. The microcomputer processes and stores the data and sensor output. The responsibility of the transceiver is to receives the commands from the central computer and transmits data to the computer. The power for each sensor node to detect the signals and to respond is derived from a battery. A Sensor is a device that responds to the

signals and detects some type of input from both the physical or environmental conditions . After completing the processing the output is in the form of electrical signal which is transmitted to a controller for further processing.

III.WIRELESS SENSOR NETWORK FOR HEALTH CARE

Researchers in networking, medical and computer fields are working together to enable the broad vision of smart healthcare. Some researchers have already addressed the importance of integrating large-scale wireless telecommunication technologies such as WiMAX, Wi-Fi Mesh, and 3G with telemedicine. For further improvements, the coexistence of small-scale personal area technologies such as radio frequency identification (RFID), Bluetooth, ZigBee, and wireless sensor networks with large-scale wireless networks will enable context-aware applications. In addition to widespread deployment of existing and relatively more mature wireless network technologies, the development of small, unobtrusive sensor devices that enable accurate and reliable data delivery is critical. Moreover, the glue that integrates all these technologies is the application, which is the coordinator between caregivers and caregivers, sensor devices and all actors in the overall system cycle. As applications are at the core of the highquality healthcare service concept, the need for intelligent and context-aware healthcare applications will increase.

Case covering systems are gaining in significance as the swiftly growing global elderly population increases demands for care. Actually these systems uses some wireless technologies to transfer vital signs for medical assessement for better health care. A case monitor not only cautions caregivers to life- hanging events; numerous also give physiological input data used to control a directly connected life support garment. The end of design is to give a better health care system that is farther provident and applicable to people. The need for a home health monitoring system is now on the rise due to the exponential increase in healthcare costs over the formerly several decades. The proposed homebased health monitoring system using an Android smart phone includes aspects of carrying medical parameters similar to body temperature, heart rate, and ECG. Processing of collected data using ARM7(LPC2148) microcontroller and reused data is displayed on Android mobile phones of potter or cousins. Also, the data can be displayed on a particular computer. The system uses a low- cost element to transmit ECG- suchlike data to Crocker for monitoring; Comment and case position(5) Cases are covered at low cost anyway.

IV. SYSTEM OVERVIEW

Medical sensor network systems integrate a variety of devices, some wearable by the patient and some implanted Within the living space. Together they notify health workers Provider on resident's health status. Data is collected, compiled, pre-processed, stored and acted upon Various sensors and devices are used in the architecture(Pressure sensor, RFID tags, floor sensor, environment sensor, dust sensor etc.). Multiple body networks may bepresent in a single system. Traditional health care provider Networks may connect to the system directly or through a gateway to its database. Some of the elements of the network are mobile, Others are stationary. Some can use line power, but others depend on batteries. Any fixed computing or communications infrastructure may be used if it exists, but The system can be deployed without retrofitting into existing structures.

The components of the architecture

1. Body Network and Subsystems. This network comprises tiny portable devices equipped with a variety of sensors (such as heartrate, heart-rhythm, temperature, oximeter, accelerometer), and performs biophysical monitoring, patient identification, location detection ,and other desired tasks. These devices are small enough to be worn comfortably for a long time. Their energy consumption should also be optimized so that the battery is not required to be changed regularly. They may use “kinetic” recharging. Actuators notify the wearer of important messages from an external entity. For example, an actuator can remind an early Alzheimer patient to check the oven because sensors detect an abnormally high temperature. Or, a tone may indicate that it is time to take medication. The sensors and actuators in the body network are able to communicate among themselves. A node in the body network is designated as the gateway to the emplaced sensor network. Due to size and energy constraints, nodes in this network have little processing and storage capabilities. More details about the particular body networks we have developed are available [10].
2. Emplaced Sensor Network. This network includes sensor devices deployed in the environment (rooms, hallways, furniture) to support sensing and monitoring, including: temperature, humidity, motion, acoustic, camera, etc. It also provides a spatial context for data association and analysis. All devices are connected to a more resourceful backbone. Sensors communicate wirelessly using multi-hop routing and may use either wired or battery power. Nodes in this network may vary in their capabilities, but generally do not perform extensive calculation or store much data. The sensor network interfaces to multiple body networks, seamlessly managing handoff of reported data and maintaining patient presence information.
3. Backbone. A backbone network connects traditional systems, such as PDAs, PCs, and databases, to the emplaced sensor network It also connects discontiguous data, patient pulse-rate, and environmental temperature.sensor nodes by a high-speed relay for efficient routing.The backbone may communicate wirelessly or may overlay onto an existing wired infrastructure. Nodes possess significant storage and computation capability, for query processing and location services. Yet, theirnumber is minimized to reduce cost.
4. Back-end Databases. One or more nodes connected to the backbone are dedicated databases for long-term archiving and data mining. If unavailable, nodes on thebackbone may serve as in-network databases.
5. Human Interfaces. Patients and caregivers interface with the network using PDAs, PCs, or wearable devices. These are used for data management, querying, object location, memory aids, and configuration, depending on who is accessing the system and for what purpose. Limited interactions are supported with the on-body sensors and control aids. These may provide memory aids, alerts, and an emergency communication channel. PDAs and PCs provide richer interfaces to real-time and historical data. Caregivers use these to specify medical sensing tasks and to view important data

V.APPLICATION

Wireless sensor networks find applications in many areas such as industrial automation, automotive industry, precision agriculture, and medical monitoring. They can effectively be used in healthcare for health monitoring, smart nursing homes, in- home backing, telemedicine, and wireless body area networks.

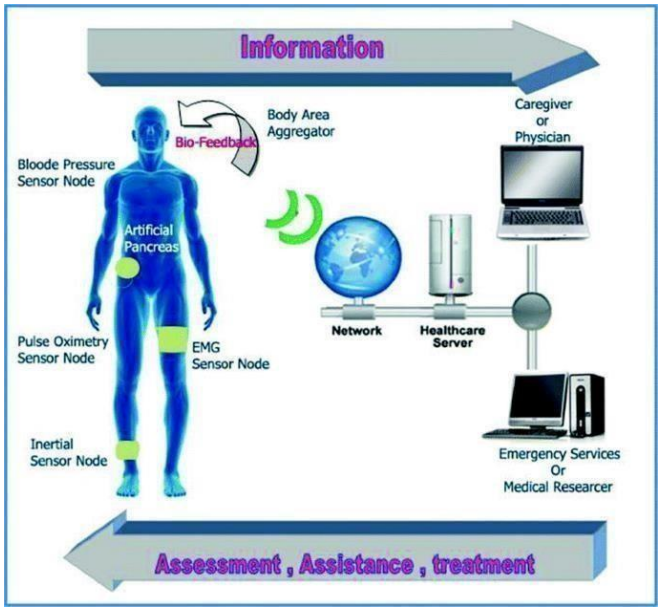
Health Monitoring: WSNs can be used to monitor a patient in the clinical setting or at home regardless of the patient's or a caregiver's location. Monitoring system is often necessary to constantly monitor a patient's vital parameters such as blood pressure, heart rate, body temperature, and ECG. Sensors and location tags can be used to track both healthcare personnel and patient. Since prevention is better than cure, managing wellness rather than illness is paramount. To achieve this, individual health monitoring is needed at a periodic interval. Due to the fact that the system is wireless, it is flexible and it is not required that the patient be limited to his bed . Wireless Body Area Networks: They cover real-time healthcare information gathering obtained from different sensors. Key characteristics of these networks include wireless communication protocols, frequency bands, data bandwidth, encryption, power consumption, and mobility. The design of wearable sensors enables the user to continuously monitor physiological data with the help of WSNs in healthcare. A body area network continues health monitoring during the patient's stay at the hospital or home. It can be useful for emergency cases, where it sends data about the patient's health to the healthcare provider. It can also help people by providing health services such as memory enhancement, access to medical data, cancer detection, asthma detection and blood glucose monitoring. Similarity 10% Incorporating the Internet of Things into Healthcare.
A t-home Healthcare: This addresses the social burden of the aging population. It is achieved by using medical WSNs. Longer life spans have led to age-related disorders and diseases. Providing quality health care to the elderly has become a major social and economic issue. Home healthcare provides affordable care to seniors while they live independently.

VI.ADVANTAGES OF WSN IN HEALTH CARE

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, which 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 where as wired installations would be expensive and impractical. are placed in the living space and turned on, selforganizing 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

Figures and Tables

FIG 1 Wireless Sensor Network For HealthCare



II. ACKNOWLEDGMENT

The authors would like to thank the anonymous reviewers for their comments in improving the quality of this paper.

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