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A Review Report on Wireless Sensors Network

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Abstract: Wireless Sensor Networks (WSNs) are rapidly spread out in military, health care, health monitoring, environmental and several other applications. Otherwise we have faced several challenges. In this paper, we present the challenges in spread out WSNs for different applications. In this paper we have discuss the application and where the WSNs are used and why

I. INTRODUCTION

In the recent years, Sensor networks have been spreadout for a variety of applications. In few cases viz. fire safety in high rise buildings, the sensors are connected to send the collected data and are thus known as Wireless Sensor Networks (WSN). Formally, a wireless sensor network in its simplest form can be defined as wireless sensor network refers to a group of spatially and dedicated sensors for monitoring and recoding the physcial condition of the environment and organizing the collected data at a central location .WNSs measure environmental condition like temperature sound, pollution levels etc

Rest of the paper is presents the major applications of WSNs, the node and network architecture is presented in the paper

II. APPLICATIONS OF WSNS

At present sensors capable of remarking different physical phenomenon have been designed successfully. Acceleration of Micro-Electro-Mechanical Systems technology has made design of smart sensors possible. Sensors are now capable of observing not only environmental conditions like tem- perature, pressure flow etc. but can also be spreadout for observing lot of others phenomenon. They can sense the environment, calculate and send data wirelessly to control unit (CU) for further processing and decisions. WSNs hby wires. although, wired networks are rare and do not find wide an applications. In most cases, the spreadout prescribes for a wireless environment. As a result the sensor networks use wireless communication ave great potential for many applications such as habitat monitoring, intrusion detection and target tracking and surveillance, oceanography, environmental monitoring, structural health monitoring, infrastructure monitoring, precision agriculture. Sensors have been thought to be extremely useful to monitor health of patients.. WSN have been deployed for the systems of vessels and also for traffic con- trol on spreadout of WSN for monitoring infrastructure like bridges, dams, buildings, pipelines etc is common and can give early warnings of harm to these structures. Like as early warnings help in decreasing loss of property and also human life.

A. Military Applications

Wireless sensor networks can be an integral part of mili- tary Command, Control, Communications, Computing, Intel- ligence, Surveillance, Reconnaissance and Targeting (C4ISRT) system During cold war era acoustic networks were spreadout in the US for submarine surveillance . Some of these sensors are still in working to monitor seismic activity in the region. Military C4ISRT prescribes rapid spreadout,self-organization liablity tolerance characteristics for diagonising. WSNs have all these characteristics making them a very believilable sensing technique for military C4ISRT. Sensor networks are densely deployed, have les costs of spreadout and failure of some sensors does not put affect on the performance. This makes the concept of spreadout sensor networks highly suitable for battlefields. However, such applications require protection against rouge sensors. Some of the military applications of sensor networks are handling friendly forces, devices and ammunition; battlearena security; reconnaissance of facing forces and terrain; attacking ; battle damage assesment

B. Environmental Applications

Bother for environment are enhancing with every pass- ing day. Environmental\Ecological Scientists are functioning hard to find the affect of industrial and other project on the environment specifically the climate change. instead from monitoring environment, monitoring wild life, aqua life, movement of birds are some other worries for environmentalists. Remote sensing satellites help in gathering data for forecast on weather, rainfall, thunderstorms and also for spoting of forest fires. observing of health of soil and moisture are needed for good agricultural yields.

Spreadout of sensors for environment monitoring re- quires integration of information across temporal, spatial and spectral scales. More distant, sensors for measuring environment are needed to be deployed in remote places in air, on surface and also underwater. Such deployment prescribes for unat- tended operation for long duration. Hence, sometimes it may be required to furnish the sensors with power rummage systems like solar cells. The communication systems are need to be operate under different medium and also in the occupancy of obstructions.

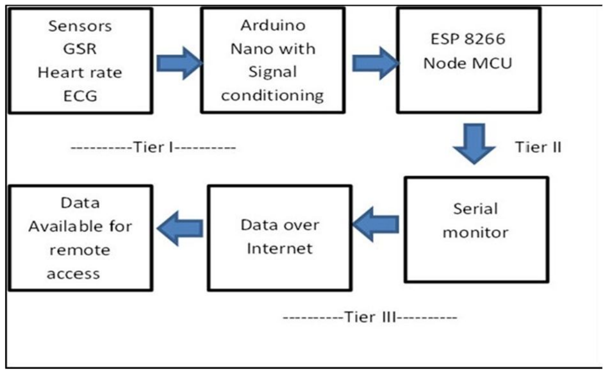

Fig. (1). Typical wireless medical sensor network in a hospital environment.

C. Health Applications

WSNs are widely deployed in health care industry. These networks, more commonly termed as, Wireless Medical Sen- sor Networks are now cutting-edge component of health-care industry and are capable of improving quality-of- care to the patient without sacrificing the comfort. WMSN consists of lightweight devices with limited memory, low computation processing, low-battery power and low band width.

These medical sensors are deployed on patient's body and collect the individual's physio- logical data and sends the collected data via a wireless channel to health professionals' hand-held devices.

Wireless medical sensor technology has offered enormous advantages to healthcare applications, such as continuous patient observe mass causality disaster observe, large-scale in-field medical track, emergency response, etc.

D. Infrastructure Monitoring

Infrastructure development is the key to the growth of every society. Cost of building infrastructure such as , roads, bridges, dams, pipelines, airports etc. are huge and spread over long durations. Monitoring the utilization and health of such systems is vital for economic growth. With the threats due to terror activities ever rising, it is critical to protect such key components of national infrastructure. Further, even during establish of such projects, accidents are caused due to design libality human errors. Under construction bridge on the Chambal River in Kota (Rajasthan) collapsed in Dec. 2009 claiming 48 lives. It is possible to at least get early sig- nals of impending failure of such accidents using WSN

All around the years, many transport infrastructures- bridges, tuels or viaducts-have collapsed due to natural disasters or because of poor maintenance. The best example is the bridge in Minneapolis in 2007 in which 13 people killed and injured 145. In 2008, this bridge was re-built us- ing a sensing system to collect data regarding structural be- havior and corrosion Monitoring bridges is one of the more successful applications of Smart Roads. Just like, the Massachusetts Institute of Technology (MIT) made a research project to detect the number of potholes in a road, by Boston taxis to cover the whole city. A similar approach was undertaken by the Uni- versity of Sri Lanka to monitor Sri Lanka´s roads.

Additionally, observing systems in underpassage are also widespread in all corner of the world. From air flow to visibility, and a wide range of gases (CO, CO_2, NO_2, O_2, H_2S and PM-10) are the most demanded parameters to monitor air quality inside tunnels. From this time, most of these systems are wired inserting the spreadout of Wireless Sensor Networks would save money, enhance safety and lower inseration time.

Apart from the above applications, researchers have de- veloped and deployed WSNs for specific applications like Improve Road Monitoring , Electricity Substation Moni- toring pipeline infrastructure monitoring habitat monitoring [10], railway infrastructure monitoring presents versatile software architecture for civil structure monitoring with wireless sensor networks. Many and many applications employing WSNs are being built

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III. ARCHITECTURE OFWSN

Hospital sensoring diagram presents architecture of a typical sensor node. A typical sensor unit is required to be of small size and has on-board sensors, wireless transceivers, a small processor and a battery. The nodes may be stationery or moving, may or may not be aware of their location, may be homogeneous or heterogeneous and may or may not have a power generation unit. However, in our study, we will be considering that nodes are

1) Stationery
2) Unaware of their location
3) Homogeneous and do not have capability to recharge the power unit comprising mainly of battery. The sensor produces analogue signals based on the observed phenomenon. These signals are converted to digital data by the ADC and fed to the processing unit. The processing unit, which generally has an on board storage in small quantity, manages the procedures that make the sensor node collabo- rate with the other nodes to carry out the assigned sensing tasks. A transceiver unit connects the node to other nodes and also with the Base Station thus forming the WSN. The nodes, when sprayed in a targeted area, are capable of form- ing a communication network on the fly.

A Sensor nodes are generally deployed in irregular topol- ogy and are densely populated . The remote sensors sense the phenomenon, pre-process it after converting the sensed quantity into data and transmit it further. The observed phenomenon is finally processed at a central location having sufficient processing capabilities known as Base Station . Data traversal from motes to the base station requires a path to be established. This path is generally multi-hop. Depending upon the routing algorithm, the path may use one of the sen- sor nodes as head of the cluster of sensors and may transmit the data along the path.

A. Scalability

The number of nodes deployed in an application is dtermined by the requirements of application. The density may range from few nodes to thousands of nodes depending upon the application. Communication and data aggregation algorithms are required to works under varying densities. In low density networks, only few nodes may send the data whereas sensing of data by multiple nodes in densely popu- lated networks may produce multiple data values of the same phenomenon at a given time. The data aggregation algo- rithms need to be capable of identifying duplicity of data. Further, multiple sensors sending the same data values drain the batteries as well.

B. Communication

Sensor networks have unique set of challenges for net- working. Deployment of WSNs for an application can be justified only if it continues collecting and sending data for longer stipulated life. that radio communication is a major consumer of energy in WSNs. A contrast of the price of computation to communication in upcoming future platforms

C. Data Collection and Dissemination

In WSNs, each sensor collects data periodically and transmits it to the BS. Alternatively, the collected data may be sent to a cluster head. The frequency of data collection and its transmission is application dependent. Data gathering is known as the systematic group of sensed data from many sensors to be eventually transmitted to the base station for handlimgs Transmission of data by all the sensors to the BS is inefficient and puts additional burden on already energy deficient sensor nodes. Data aggregation techniques are employed to process the data either at the sensor or at an intermediate node to reduce the number of transmitted data packets to save energy. However, the data aggregation algorithms are network topology dependent which affects routing and also closely related the data gathering at the nodes .

D. Hardware Constraints

A node consists of four major units; sensing unit, a proc- essing unit, a transceiver unit and a power unit. These four units are required to be packed in a match box size casing. However, most of the applications require the size to be even smaller. Apart from limitation on the size, the nodes are re- quired to be lightweight. In some cases, the size may be less than a cubic centimeter making it possible to remain sus- pended in the air. However, size and weight are not the only constraints on sensor nodes. The nodes are required to :

1) Consume extremely low power,
2) Operate in high volumetric densities,

3) Have low production cost and be dispensable,
4) Be autonomous and operate unattended,
5) Be adaptive to the environment.

The communication circuitry though requires low duty cycle; designing energy efficient low duty cycle communica- tion circuit is a challenge. Further, in spite of availability of more computational power in small size processors, process- ing power and memory are still scare resource in a node.

E. Sensor Network Topology

Topology maintenance in WSNs is challenging because of large number of sensor nodes and also frequent failures either due to power depletion or destruction. It is generally not possible to engineer the topology before deployment and thus the data gathering and communication requires working under irregular and dynamically changing topology.

F. Environment

WSNs may be deployed in varying environmental and ambient conditions. These may be required to operate under- sea, in desert, in extreme cold conditions, on road intersec- tions, may be tied to animals (Project Tiger) and so on. Every environment is different and the nodes need to sense the phenomenon and the communication systems shall work. This requires a careful study of the environment on the per- formance of the network.

G. Transmission Media

The wide range of applications of sensor networks makes the choice of transmission media more challenging. Radio Communication is the main transmission media in WSNs. However, selection of frequency for communication faces challenges due to regulations on frequency spectrum. These regulations suggest use of ISM bands for communication which are unregulated. Further, the size of antenna and power consumption by communication circuitry within the node is highly dependent on the frequency. It suggests that the UHF band is better for these networks. 2.4 GHz band has been found to suitable for these networks. This band pro- vides good energy efficiency and also small antenna size. The unregulated nature of ISM band causes difficulties be- cause the same frequency can be used by other applications as well resulting in radio interference.
Infrared which is license free and not affected by inter- ference is the alternate to radio communication. . However, the requirement of Line of Sight between the sender and re- ceiver makes it a reluctant choice for sensor networks.

IV. RESEARCH CHALLENGES IN WSNS

However, future applications may require solution to the following issues:

A. Quality of Service

Throughput, delay, correctness of measured phenome- non, transmission errors even with unreliable communication links and node failure and lost data packets are important QoS parameters. However, in WSNs, achieving QoS is diffi-cult due to constrained energy and computation capabilities. Further, the required QoS is highly application dependent. In event driven systems, delivering the data reliably and with- out errors within acceptable delay is more important than sending periodic information of no event. Improving throughput is another important consideration. Single path routing limits the achievable network throughput. For appli- cation requiring high throughput, routing protocols employ- ing multiple paths are better suited. Real time applications require time bound data delivery.

B. Security

P0roviding security in WSNs is a challenge due to use of wireless communication, low computing and energy re- sources, tiny size of nodes, scattered deployment of nodes which makes the integraablity unidentical, and big risk of physical attacks to neglected sensors. WSNs require confidenti- ality, integrity, authenticity, and availability to make their operations secure Unlike traditional networks, sensor nodes are deployed physically in open areas where there is added risk of intervention with people and environment. Almost all security mechanisms use keys for providing security. Management of keys involves generation and dis- tribution of keys and also revocation of compromised keys. Further, use of keys increase computations resulting in in- creased energy consumption. All these factors suggest that the security threats and protection against these threats in WSNs need to be addressed differently.

Mostly, sensor nodes are deployed in unattended fields and wireless channel is used for communication. The net- works are thus prone to rogue nodes placement and channels can be jammed. A spurious node may continue to transmit causing excessive collisions. Further, the data may be inter- cepted and/or modified on the wireless channel. Security solutions based on long cryptographic keys and requiring frequent replacement/ exchange of keys are not suitable due to energy and computing constraints. Use of the same key across the network is risky as the only one compromised node can reveal the key. Current solutions like establishing pair wise keys with neighbours, selecting keys from a pool of pre-defined keys are also impractical due to reasons such as node failure, large number of node pairs etc. Spread spec- trum techniques generally employed for security against jamming attacks are (i) energy intensive and (ii) require wider spectrum. With the number of sensors being very large, frequency hoping is impractical

V. CONCLUSION

A comprehensive study of Wireless sensor has been completed. We presented the application of WSN, militery application, environmental application, health application, infrastructure monitoring, architecture of WSM, transmission media. This paper is one Which may be offering a better platform to prompt the Industries representatives, academia, & researchers for good and Better results of different sorts of issues & challenges in wireless sensor network

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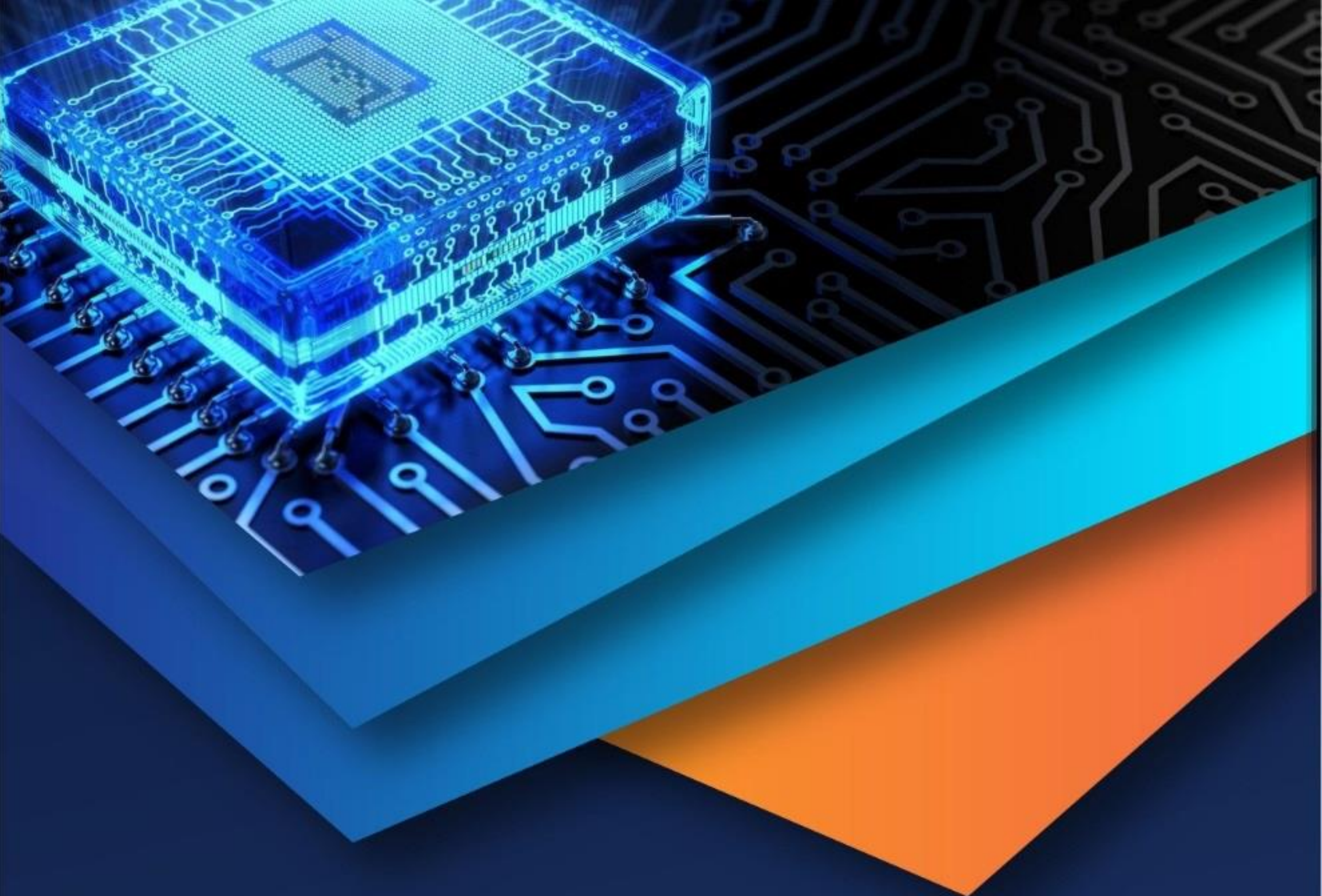

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