

EXPLORING CHALLENGES, FEATURES AND APPLICATIONS OF WIRELESS SENSOR NETWORK

Geeta Kocher

Department of Computer Application, Chandigarh Group of Colleges Jhanjeri, Mohali, Punjab, India

Kuldip Kumar

Department of ECE, Chandigarh University, Mohali, (Punjab), India

ABSTRACT

Wireless Sensor Network is a kind of remote correlation that encompasses an enormous number of sensor center points that are good for distinguishing, activating, and transferring the gathered data, which have generated astounding sway all over. A wireless sensor network is a massive sensor local area that can only perform limited evaluation and has a limited power supply. The sensor hubs are equipped with radio points of interaction, allowing them to communicate with one another and form an organization. With the significant advancements in PC and sensor development, wireless sensor networks are used in a wide range of industries, including the military, healthcare, organic agriculture, and other commercial applications. This paper aims to present a recent composition on various aspects of wireless sensor organization capacity and examine the benefits and challenges of remote organization over standard association. In this paper various examination problems in applications based on remote sensor networks are summarized.

Keywords

Sensor Nodes, Security, Applications of WSN, Wireless Sensor Network

1. INTRODUCTION

Today is the decade of modern technology, where technology has emerged in our lives is reliant upon these advancements. Wireless Sensor networks are an important space of examination as in recent time. It comprises reduced gadgets called sensor hubs. A sensor network encompasses more sensor hubs; these hubs are to be designed not set in stone for their position [1]. Every sensor hub can perform a restricted measure of productivity. The primary power source in the sensor hub is battery sunlight-based cells are used as optional capability to drive up batteries [2]. Remote sensor network has been considered as one of the fundamental headways that can change the future into great. This network encompasses little battery-controlled bits with restricted computation and radio correspondence abilities. Generally, wireless sensor networks are divergent in their kind and characteristics where numerous hundred and thousands of tiny sensors suppress heterogeneous features of different nodes.

Presently a day, sensors are wherever for example, in vehicles, in our PCs, in contraptions, in processing plants, in transport, in machines, and so on, the meaning of wireless sensors can be clarified as gathering of hubs that gather and cooperatively sense information to control the environmental determinants and climate as expressed and related to few conditions. These networks have tiny battery-controlled bits with limited computational & radio correspondence capabilities. Each sensor in the sensor network consists of three subsystems: a weather sensor subsystem, a handling subsystem that performs computations on diagnosed information, and a correspondence subsystem that trades messages with adjacent sensors is responsible. The utilization of sensors can sufficiently perceive the outer environment, and then sending information to a remote organization to meet the requirements of the client. The focus should be on the safety of wireless sensor networks because of the high specificity and material aided by the complex design, once the problem has occurred, the result is not possible. The improvement of IoT is indistinguishable from wireless sensor organization and the ability of individuals to influence rapidly is furthermore firmly connected with it.

Remote sensor networks are employed to collect a huge scope of information and data and to manage a wide range of complex situations with the application of wireless sensor networks that cover all processes. In the strategic field, it is very well adopted to separate the advisory area and the organization of forces in different

situations and it has a capacity of recognizing organic and compound contamination and atomic radiation as far as compound observing and assurance assortment in the field.

The data security of wireless sensor networks is worried in numerous unique circumstances, like military clinical catastrophe avoidance also different fields. Remote sensor networks utilize open wireless correspondence innovation to send information that is exclusively helpless against inner and outside assaults. Regardless, the measure of computation dependent on cryptography safety techniques is not satisfactory for wireless sensor network organizations to pick a proper encryption strategy to ensure the safety of remote sensor network data.

2. GENERAL ARCHITECTURE

WSN can also be defined as a company of tiny size and less elegant gadgets called convenient hubs for identifying the environment and providing data collected from the tested area; The collected info. is communicated directly or through a multi-jump to synchronize, permitting it to be adopted locally or connected to different organizations through door hubs. [5] as illustrated in Figure 1

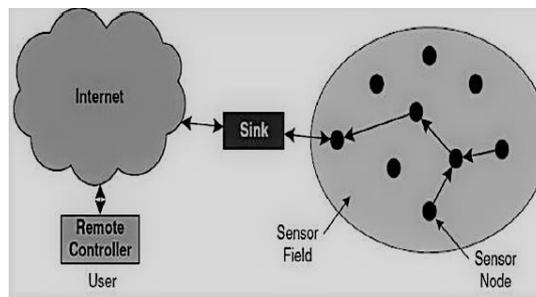


Figure 1 Architecture of typical WSN [5]

2.1 Components of Session Node

The principal portions of sensor hubs “comprise a finding unit, a holding unit, a handset and a supply unit, a handling unit, a handset, and a power unit. The finding module finds the actual number which is then interchanged into an advanced 1 through Analog to Digital Converter for instance simple to Digital converter. From that point, processor is employed to send and gathers info. from different hubs or from the BS. A supply module is the most conspicuous module in any sensor hub as found in Figure. 2. When the battery is degraded, it can't be interchanged for unattended application. Different units are application subordinate module like mobilizer, power generator and location finding system.

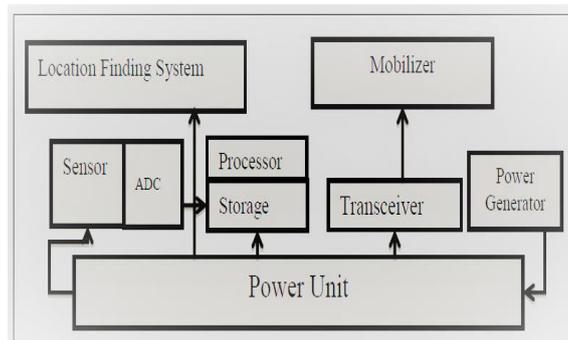


Figure 2 Sensor node parts [5]

3. CHALLENGES IN WSN

WSN have huge potential because they enhance the capability of screens to remotely interact with the real world. The sensors are capable of collecting large amounts of obscure information sensors that can be received remotely and can be set up where communicating information and power cables is unscientific. Topology control in wireless sensor networks is influenced by a variety of testing element. In order to maximize the

potential of censored organizations, we must first investigate the impressive limitations and specific problems of these organizations [3]. Although hubs desire to be synchronized for information connectivity, synchronization conferences for sensor networks must actually address the problems of this organization with wireless sensor networks; Many difficulties should be avoided.

3.1 Energy

The first and regularly most significant plan challenge for WSNs is energy effectiveness. Power utilization can be dispensed to three utilization spaces: detecting, correspondence, and information handling each of which requires streamlining. These sensors undergo their restricted collection of energy performing computations and sending data in a remote climate. Sensors are muscled through, which should be either supplanted or re-energized when exhausted. All things considered, energy moderating type correspondences and calculations are basic. The sensor hub life shows a strong dependence on battery life.

3.2 Limited Bandwidth

The wireless sensor network, less power is burned- through in handling information than communicating it. As of now, remote correspondence is restricted to an information rate in the request of 10-100 kbit/s. transfer speed restriction straightforwardly influences messages trades among sensors, and synchronization is incomprehensible without message trades. Sensor organization regularly work in transmission capacity and execution compelled multi- jump remote interchanges medium. These remote interchanges join work in the radio, infrared or then again optical reach.

3.3 Node Costs

A sensor network comprises of a huge system of sensors. It targets the cost of a singular hub which is fundamental to most of the monetary measurement of sensor organization. Obviously, the expense of energy sensor hub must be saved low for the worldwide measurements to be adequate. On utilization of sensor organization, huge number sensors may be dissipated over a climate like a climate observing. It will be more satisfactory and fruitful to clients who need cautious thought, if the general expense was proper for sensor organization.

3.4 Scalability

The quality of the sensor hubs sent to the detection area may be in the hundreds or at least thousands of requests. In addition, the sensor network must receive adequate steering control calculations to respond to opportunities in the environment. While most sensors rest until some opportunity arises, some excellent sensor information is of coarse quality.

3.5 Security

One of problems in wireless sensor networks is to give high-protection needed with obliged assets. The communication between hubs must be sufficiently obtained to maintain privacy. It is for the most part requires while handling the tactical application like front-line defence activities and so on.

4. FEATURES OF WIRELESS SENSOR NETWORK

Some features of wireless sensor network are stated below:

4.1 Freedom of Organization

The coordinator can immediately set up a remote organization sensor network at full capacities regardless of when and where, and the upkeep and the executives work after the effective development is totally done inside the organization.

4.2 Uncertainty of Network Topology

According to the point of view of organization order, the organization geography of remote sensors is variable. For instance, sensor hubs that comprise the organization's geography can be expanded or diminished whenever, and the organization's geography graph can be isolated or converged whenever.

4.3 Control Mode is not Centralized

Remote Sensor Organization brings control over the base station and the sensor hub, the host is capable of managing, directing, and managing the autonomous function between each sensor hub control mode or each non-autonomous function. There is a barrier to each other, so the solidity of the Remote Sensor Organization is unusually high, making it hard to completely destroy [6].

4.4 Low Protection

Wireless sensor network utilizes remote method for passing on data, so the sensor hubs during the time spent passing data is not difficult to be attacked by the rest of the world. Subsequently, the spillage of data and the harm of wireless sensor organization (WSN), the vast majority of the remote sensor network hubs are uncovered, which incredibly lessens the security of the remote sensor organization [7].

4.5 Security of Wireless Sensor Network

Notwithstanding the qualities and contemplations referenced above, security dangers and prerequisites are additionally basic for an assortment of wireless network applications.

4.5.1 Dynamic assaults

Dynamic assaults, (for example, hub replication assaults, Sybil assaults, wormhole assaults, and compromised hub assaults) can be additionally ordered into two classifications: outer assaults and inner assaults. In outer assaults, (for example, Sybil assaults and wormhole assaults), a hub doesn't have a place with a sensor organization and it can initially snoop on parcels sent or got by typical partaking hubs for the inevitable reason for vindictive treating, meddling, speculating, or spamming, and afterward infuses invalid bundles to disturb the organization functionalities.

4.5.2 Availability

The accessibility of the organization ought not to be impacted regardless of whether sensors can give restricted capacity, restricted power, and restricted computational capacity. Along these lines, an instrument controlling of rest designs is essential for a sensor to expand its lifetime.

4.5.3 Node confirmation

For this a sent sensor center point exhibits its authenticity to its connecting sensors and the box center point. Appropriately, an invalid outcast would not have the option to send threatening data into the associations and the main center point can certify that got distinguished data has come from an authentic sensor center point, not from malicious untouchables. This also proposes that a sensor center that took an interest in WSNs will affirm and it has the choice to get to the sensor association.

4.5.4 Area mindfulness

The harm can't be spread from the deceived region to the whole organization by security assaults regardless of whether the sensor hub is compromised. A protected correspondence conspire should restrict the harm's extension brought about by the interlopers; the system of area mindfulness is utilized for this reason.

4.5.5 Privacy

Path-key foundation in each meeting should be secure against malignant interlopers regardless of whether those assailants gather transmission bundles.

4.5.6 Key foundation

For sensor-to-sensor key foundation, a common key is set up by 2 correspondence hubs secure interchanges. Accordingly, every detected information sent between members could be checked and ensured regardless of whether an aggressor snoops on the correspondences between hubs or infuses unlawful detected information into networks, this prerequisite actually gives a sufficient degree of safety.

5. APPLICATIONS OF WIRELESS SENSOR NETWORK

Wireless sensor organizations (WSNs) are comprising an enormous no. of sensor hubs with restricted energy assets. Significant target of WSN is to collect the data precisely and monetarily. The development of WSN was roused by applications, for example, wrongdoing examination, target following, airplane control, nursery observing, marine climate checking [9]. Distant sensor network has a wide extent of employments like present day apps, clinical apps, cultivation apps, and significantly more. Some of them are as follows:

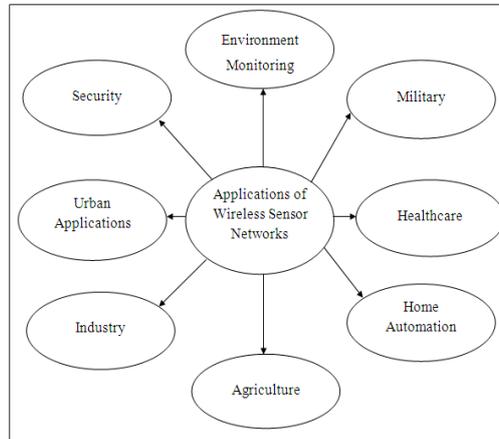


Figure 3 Applications of wireless sensor network

5.1 Healthcare Applications

Wireless sensors are utilized in the medical services region. In some cutting-edge medical clinics' sensor networks are built to screen case health information, to check the medication organization track and screen victims and specialists furthermore inside a medical clinic [11 Long stretch nursing home: this application is revolved around the nursing of old people. In the town farm cameras, pressure sensors, heading sensors, and sensors for the revelation of muscle development foster an intricate association. It support fall discovery, obviousness identification, important bodily function observing, and dietary/practice observing. These applications lessen staff cost and quick the response of development circumstances.

5.2 Medical

Wireless sensor system has increased its usage in medical applications as it is benefits in ease of use, decreased chance of contamination, reduced chance of failure, reduce affected person soreness these applications bring on thrilling opportunities for new programs in scientific marketplace. Pulse reader, blood pressure monitor, heart rate monitor such movable devices are important. Presently, all these technologies are available without wires and patients are free from these wires as previously the sensors were attached to the patient. Now, in this era of wireless, these wireless devices are used for the gateway connection which will send the data about patients health to healthcare centres network by making connection.

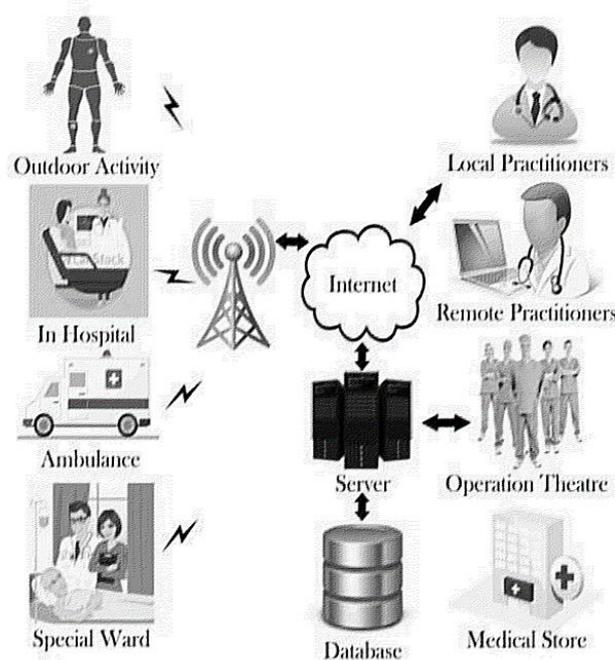


Figure 4 Application of WSN in healthcare

5.3 Environment Data Collection

In ecological information assortment application, are involved gather different sensor information in a timeframe. In the biological data combination application, a gigantic number of center points continually identifying and conveying data back to a lot of base stations that store the data using standard procedures. In ordinary utilization situation, the hubs will be equitably appropriated over an outside climate. In ecological observing applications, it isn't fundamental that the hubs create the ideal systems all alone [14]. All things considered, it very well might be feasible to ascertain the ideal steering geography outside of the organization and afterward impart the important sensor information to the hubs as required. This is conceivable in light of the fact that the actual geography of the organization is moderately consistent.



Figure 5 Application of WSN in environment

5.3 Home Application

As the advancement is moving, it is moreover progressing our home appliances for their smooth and satisfactory execution. These sensors can be found in coolers, microwaves, vacuum cleaner, security system, window control, and besides in water. Now we can deal with contraptions locally even from distance with the help of WSNs.

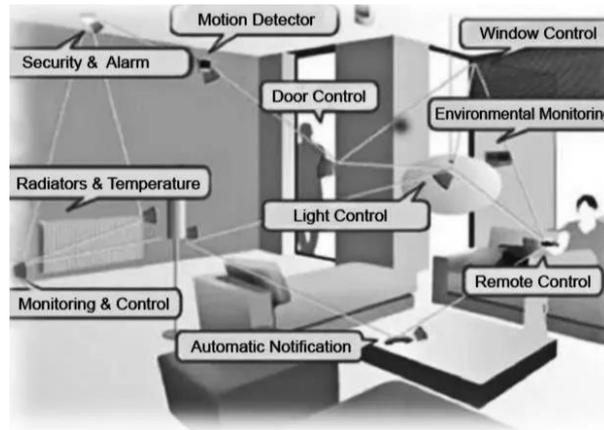


Figure 6 Application of WSN in home application

5.4 Military Applications

Wireless sensor networks have been emerged as extraordinary instrument for military applications including interference distinguishing proof, diverse limit checking information gathering, splendid systems support in a dark passed on locale. These organizations can give remarkable organizations to military and flying corps like information arrangement, disaster area perception and attack area. Because of their capacities of consistent transmission WSNs expect to be huge part in military exercises. These associations offer a couple of advantages over ordinary sensor devices like transformation to interior disappointment generosity and low monetary arrangement sending [18]. Battlefield Surveillance and Intruder detection are the subfields of military applications where WSN can be deployed.[22].

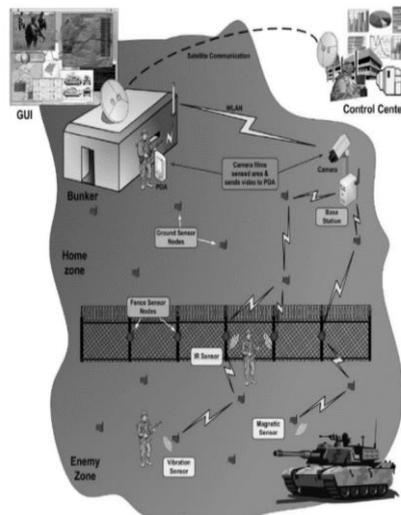


Figure 7 Application of WSN in military

5.5 Industries

WSN can be applied in various industrial applications to solve many real life applications. Robotics, Logistics and Machinery health monitoring are the sub categories of industrial applications. Improvement in wireless communications, microelectronics, digital electronics (DE), and highly integrated electronic devices and the increasing demand for highly efficient controlled electrical systems enable the development of monitoring and control tools to direct the research of many researchers [22].

5.6 Vehicle Training

Brilliant transportation is one more utilization of WSN. Organized cameras and different sensors that is utilized to screen the traffic stream to lessen clog, following of vehicles on city for criminal traffic offense and to

identify criminal operations around the basic framework like air terminals, rail line station etc. details the use of WSN in shrewd transportation. In, it gives the potential advantages of utilizing WSN based traffic checking framework for the improvement of value and security of vehicle transportation. In the paper depicts an answer for the shrewd transportation framework utilizing remote sensor organizations. In, it portrays the plan and execution of a natural remote sensor network that describes "air quality in Asuncion, Paraguay". Portable sensor gadgets in broad daylight transport vehicles offer a helpful means to develop an efficient outcome for this arrangement [4].

6. CONCLUSION

Wireless sensor networks will be networks made of various sensors sent with the help of finding an occasion and sending it away from the sink. Interest in WSN is growing rapidly because of the way these organizations have opened up opportunities to do basic work that people can do. Choosing, new medical care administrations depended on to assume a part in regular day to day existence in the years to come. This paper has surveyed the utilization of the Wireless Nerve Network in different fields. Further testing will continue with the Healthcare test structures including home management. The use of the Wireless Nerve Network in medical services programs has been parted into 3 categories: Patient Monitoring, Home and Adult Care looking at persistent and elderly patients, as well as a variety of long-term data sets of clinical information. This is updated found that the current use of Wireless Medical Sensor Networks in the medical services framework has a few shortcomings required care. The local WSN research site has worked hard to care for part of those boundaries currently available applications related to medical care; or possibly, improvements are still needed in terms of safety as well and security issues.

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