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Research Survey on Wireless Sensor Networks

T.Chithrakumar[1] * Dr. M. Thangamani[2] R.Rajan[3]

[1,3] Assistant Professor, Sri Ramakrishna Engineering College, Coimbatore, Tamilnadu,
[2] Assistant Professor, Kongu Engineering College, Perundurai, Erode District, Tamilnadu,

ABSTRACT

Wireless sensor network (WSN) is a wireless network consisting of spatially distributed autonomous devices using sensors to monitor physical or environmental conditions. A wireless sensor network system incorporates a gateway that provides wireless connectivity back to the energetic world and distributed nodes. WSNs use sensor nodes that placed in wide areas or in common places and with a large number that creates a lot of troubles for the researchers and system designer, for giving a proper blueprint for the wireless sensor network. The problems are refuge, direction-finding of data and giving out of big amount of information etc. This research focuses the types of wireless sensor networks and the feasible solutions for handling the listed problems and solution of many other problems. This paper will bring the understanding about the wireless sensor networks and types.

Keywords: WSN, Sensor nodes

1. Introduction

Wireless sensor networks mainly used different applications. In real world this wireless sensor networks used in different fields like military applications, vehicular networks, health care system, rail ways and aircraft system etc. the wireless sensor networks have different cluster networks. wireless sensor networks has become a recent research field and development for large number of applications that can turn into much useful from such systems and has led to the increase of cost effective small, economical and self-sufficient battery powered computers, also called sensor nodes. A sensor node, also known as a mote is a node in a sensor network that is capable of performing some organizing, collecting sensor information and communicating with other connected nodes in the network. After that the process data wirelessly broadcast the results to transfer network. Wireless sensor networks are extremely remote networks of lightweight and small wireless nodes, deployed in enormous numbers, to monitor the system or environment by the measurement of physical parameters like pressure, temperature, or relative humidity [1].

Wireless sensor networks are mainly used in the field of industry, agriculture, military defense, environment monitoring, remote control and city management[2] [3] etc. Wireless sensor networks it is similar to Mobile Adhoc Networks. In wireless sensor networks has various sensor nodes and each nodes connecting itself but in mobile adhoc network is not possible. This wireless sensor nodes are connected with each other nodes in the same cluster group.

2. Categories of Wireless Sensor Networks

Wireless sensor networks are classified into Portable Wireless Sensor Networks, Room-Based Wireless Sensor Networks, Wireless submerged and earth Sensor Networks, Wireless Multimedia Sensor Networks

2.1 Portable Wireless Sensor Networks (PWSNs)

Portable wireless sensor networks defined as a wireless sensor networks that have portable sensor nodes as compared to the frequently used wireless sensor networks in which sensor nodes are fixed. Portable wireless sensor networks have more adaptability than the fixed wireless sensor networks because portable sensor networks is deployed for any situation and they be capable of handle with quick topology changes.

In general the wireless sensor networks is simply distributed with fixed nodes to achieve monitoring missions in the area of interest but due to vibrant changes of hostile surroundings and events, a pure fixed wireless sensor networks may face the following troubles

- Connectivity of the entire network and total coverage of the sensing area could not possible in wireless sensor networks [4].
- As sensor nodes generally works with battery powered and level to errors. The node can be dead if the energy of battery is reduced [5].
- For some applications like tracing, the network needs bigger nodes to face the entire area that is lead to improve the cost of network.

Portable wireless sensor networks and there is no need to deployed network infrastructure when co operating mobile nodes communicate with each other, in order to achieve various kinds of functions [6].Portable wireless sensor networks are distributed in an common environment and having more possible of safety attacks. Safety is one of key issue in Portable wireless sensor networks s and need to be solved. The attacks in Portable wireless sensor networks can occur from any side or any direction to any targeted node because

Portable wireless sensor networks are consists of mobile wireless nodes that forms the temporary network without any centralized infrastructure [7,8]. The complex security mechanisms and algorithms cannot be implemented in wireless portable sensor nodes. The reason of not implementing any safety algorithm due to resource constraints regarding bandwidth, computational power and memory size. The traditional safety mechanisms are invalid for portable wireless sensor networks due to the mobility of wireless nodes in network topology and this mobility creates dynamic attributes in topology that results invalidity of security mechanisms. The safety attacks (internal or external) can be controlled or minimized by using the cryptography and authentication mechanisms but both techniques can handle the external attacks in portable sensor networks and are unable to handle the internal attacks in PWSNs because the wireless sensor nodes can be easily stolen when deployed in hostile or in an open environment. For this case, the network can be controlled or destroyed by the nodes which have accessed the network [9].

One of the attack in WSN is the node duplication attack and number of protocol proposed for tackling these type of attacks but no suitable mechanism is find out for PWSNs. However an appropriate mechanism is described [10]. They described the mobility property and proposed protocol for mobility assistance for the detection of node Duplication attacks in PWSNs. The

protocol is the Unary Multi Time Location Storage and Exchange (UMTLSE) that assigns each observer a task of tracking a particular set of other nodes. All the observers only store one time location entitlement for every tracked node and detect the duplication when they come across each other.

In this portable wireless sensor networks following information collection, information processing and map-reading table maintenance are placed in different nodes. The complexity of sensors and the cost of construction can be reduced by using Multi-layer Portable sensor networks closest path routing protocols proposed on the base of new architecture, for adapting sensors to update the network topology. The researchers also include a simulation of SP that reduces the energy utilization and offers a respectable solution for node movement in portable sensor networks.

2.2. Room-Based Wireless Sensor Networks (RB-WSNs)

The wireless sensor networks are networks of incorporated micro sensors for monitoring and information gathering for some of the environment conditions *i.e.* temperature, vibration, sound, motion and pressure. While in room, these networks might be used for room weather or implementation of wire-less sensor networks within a room ability in single probe missions or in order to interchange electrical wires, and chemical and physical sensing of the soils, surfaces and atmospheres of the room. Single path routing scheme is a perfect for room-based missions of micro-sensor nodes. WSNs need to be optimized if they are to be used for room .The modifications should be according to room requirements [20].

The concept of Earthly wireless sensor networks (EWSN) can be applied to room *i.e.* room based sensor net-work. Grouping the design and enabling technologies for room based sensor devices. The idea is to use inexpensive collecting of sensor nodes to collect important information instead of doing the same using a large expensive sensors. The research that's been carried out at the Survey of room, was mainly aimed at room temperature A system-on-a-chip computing model and platform and the agent middleware for RBWSNs have been presented. This system architecture focused on the LEON3 soft processor core is targeted at effective hardware support of collaborative processing in these networks [15].

2.3 Wireless Submerged and Earth Sensor Networks (WSESNs)

The probabilistic connectivity of the WSESNs has been discussed. WSESNs are one of the distinctive extension of terrestrial WSNs. WSESNs' various network architecture and channel characteristics, the connectivity study is much more complicated than in the ad hoc networks and earthly WSNs. This connectivity issue might have not been addressed previously. Thus, a mathematical model was developed to study and examine the probabilistic connectivity in WSESNs, which gathered the possessions of environmental parameters [20] *i.e.* the earth composition and earth humidity, and several system parameters *i.e.* the sensor entombment depth, the operating occurrence, the density of the sensor devices, the drop antenna height, the number and the mobility of the above ground drop and the tolerable latency of the networks. The upper and lower bounds for the connectivity probability are calculated systematically. Simulation and investigation studies were performed, whereas the theoretical bounds were

authenticated, and the effects of system parameters and some environmental parameters on the performance were explored [8].

2.4 Wireless Multimedia Sensor Networks (WMSNs)

Wireless Sensor Networks (WSN) have recently been the focus of a significant amount of attention and effort of the research community. The main motivation has been to address the challenges posed by the WSN paradigm, i.e., limited node power, processing, and communication capabilities, dense network deployment, multi-hop communications, and heterogeneous application-specific requirements [3]. The vast majority of these studies applies to conventional WSN applications which need reliable and efficient communication of scalar event features and sensor data such as temperature, pressure, humidity.

With the availability of low-cost small-scale imaging sensors, CMOS cameras, microphones, which may ubiquitously capture multimedia content from the field, Wireless Multimedia Sensor Networks (WMSN) have been proposed and drawn the immediate attention of the research community[15]. WMSN applications, e.g., multimedia surveillance networks, target tracking, environmental monitoring, and traffic management systems, require effective harvesting and communication of event features in the form of multimedia such as audio, image, and video. To this end, additional challenges for energy-efficient multimedia processing and communication in WMSN, i.e., heterogeneous multimedia reliability definitions, tight QoS expectations, and high bandwidth demands, must be addressed as well.

In a WMSN Lab to experiment with multimedia applications in sensor architectures. Frame manipulation is required to minimize the amount of data to be sent. Visual Computing techniques such as background subtraction, object recognition, etc, may play an interesting role in this applications. We are also defining and evaluating network protocols for WMSN taking into account traffic characteristics.

The Wireless Multimedia Sensor Networks (WMSNs) comprise of tiny sensor-nodes that can sense, compute, actuate, communicate, and have control components. Various applications of the Wireless Sensor Multimedia Networks (WMNs) include objective rambling, environment monitoring, traffic administration systems and ecological monitoring; these kinds of applications involve efficient communication of event happenings and feature multimedia form *i.e.* image, audio and video [10].

Wireless Multimedia Sensor Network (WMSN) is a novel appliance of Wireless Sensor Networks (WSNs), as Multimedia data needs continuous transmission of data, increased bandwidth, storage and power, and low latency rate so WMSNs requires much attention[17]. So far different routing protocols have been proposed for proficient data communication in WSNs. Usually in WSNs, the routing algorithms designed to route tiny scalar data for comparatively short time interval. The basic ingredients of WSNs routing protocol are use of minimum hops, maximize the available power, achieve low latency rate and less load of traffic, finding more than one path to destination etc [18]. With sensor networks another significant concern is the creation of Holes which is because of the fact that during routing, the nodes nearby the destination are used more frequently so in result the batteries of such nodes gets exhausted in advance. Thus such nodes failed to transmit the sensor information to the base station [11].

Hop and Load based On Demand Energy Routing protocol (HLODER) has been developed for WMSNs, to eliminate the above described issues. In HLODER, the algorithm finds half disjoint by hop counts, load of traffic and energy of nodes. As HLODER is a reactive On Demand routing protocol so a compression is made between HLODER and insignificant On-demand Distance Vector (ODV), a reactive protocol. The HLODER protocol found more intelligent in path selection as it chooses such paths which can carry affording traffic rate by having lesser hop distance. Furthermore, due to absorption of energy of nodes, HLODER also tackles with crack creation problem [12].

Generally interaction of node is originated with two stage optimization problem in which the first step is to increase the total numbers of already acknowledged sensor nodes and the second step is to enlarge the lifetime of the network. The interaction of node can also originates as one stage optimization problem having more complex mathematical logic. The commonality among all described proposals is the segregation of some sort of routing for wireless multimedia sensor networks which provides energy efficient assurance of QoS. For the selection of most consistent paths, The researchers followed the concept that multiple path communication among two nodes, Multipath Data Transfer protocol offers concurrent multiple paths. Their proposed algorithm divides the work between all nodes which equally extends the overall life of WMSNs [19].

3. WSN Security and Security Issues

Generally WSNs are used to collect information from various locations of physical world and also they are deployed in controlled and uncontrolled environment [3]. So by their applications and deployment nature Wireless sensor networks are ultimately insecure. These networks have numerous limitations like node (less computational power, less memory, less energy etc.), network (because they are acting as mobile as hoc network) and physical (deployed in different environments like public and hostile) limitations which makes them supplementary vulnerable to various security attacks. Ad hoc nature of sensor networks opens the unique challenges to the reliability and security. Owing to the limited computational and processing constrains traditional security techniques and policies are not suitable in order to maintain confidentiality, Authentication, Availability and Integrity in WSN, s [1].

The wireless sensor network has four security issues like Interruption, Interception, Modification and Fabrication. In Wireless sensor networks researcher identified several possible security attacks like passive information gathering, node subversion, false node, node malfunction, node outage, message corruption, traffic analysis, routing loops, selective forwarding, sinkhole, Sybil, wormholes[16]. These attacks also disturb WSN layers specifically application, transport, network, data link and physical layers. Different counter measures and defense techniques are presented by researchers for layered security like malicious node detection and isolation, unique pair wise keys for application layer, limiting connections numbers, client puzzles for transport layer, Key management secure routing, Authentication, Encryption, Redundancy, Probing, monitoring, two way and three authentication and three way handshake for network layer, link layer encryption, rate limitations, error correcting code for data link layer and adaptive antennas, spread spectrum for physical layer. However we need to

have a security framework in order to provide countermeasures against security attacks in WSN [10, 11].

4. Conclusion

Networks are moved from connection network to wireless networks quickly but wireless networks are costly but in wireless networks is growing everyday and recent field in the area of research. Wireless sensor networks are cost effective because it saves the energy by using low power sensor nodes with the addition of different features. Wireless sensor networks have a variety of features and types that can contain a lot of problems arising in special scenarios. The only require is the choice of the right approach on the right place, for getting the maximum advantage from the wireless sensor networks and its types. This research is a plan to find out an algorithm that improves the performance and security issues, of the wireless sensor networks.

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Authors Biography

Mr. T. Chithrakumar is currently working as Assistant Professor in Department of Information Technology. He obtained his M.E. degree in Computer Science and Engineering from V.S.B College of Engineering Technical Campus, Coimbatore in the year 2015 and completed his B.Tech. degree in Information Technology from Ranganathan Engineering College, Coimbatore in the year 2011. His areas of interest include Data Mining, Networks, Cloud Computing, Mobile Adhoc Network. He has Teaching Experience of 2 years at Sri Ramakrishna Engineering College, Coimbatore. He has published papers in the area of Networking, Cloud Computing and Adhoc networks in National/International conferences and reputed journals.

Dr. M. Thangamani possesses nearly 23 years of experience in research, teaching, consulting and practical application development to solve real-world business problems using analytics. Her research expertise covers data mining, machine learning, cloud computing, big data, fuzzy, soft computing, ontology development, web services and open source software. She has published nearly 100 articles in refereed and indexed journals, 15 articles in SCI with high impact factor journals, books and book chapters and presented over 85 papers in national and international conferences in above field. She has delivered more than 79 Guest Lectures in reputed engineering colleges and reputed industries on various topics. She has got best paper awards from various education related social activities in India and Abroad. She is on the editorial board and reviewing committee of leading research journals, which includes her nomination as the Editor in chief to International Scientific Global journal for Engineering, Science and Applied Research (ISGJESAR) & International Research Journal in Global Engineering and Sciences (IRJGES) and on the program committee of top international data mining and soft computing conferences in various countries. **Further information can be visit in www.drthangamani.com**

Mr. R. Rajan is currently working as Assistant Professor in the Department of Information Technology. He obtained his Master of Engineering degree in Pervasive Computing Technologies from Kings College of Engineering, Pudukottai in 2012 and completed his Bachelor of Technology degree in Information Technology from Sri Ramakrishna Engineering College, Coimbatore in 2010. He has 3 Years and 6 Months of academic experience. He is specialized in the area of Wireless Networks, Web Service and Embedded System. He has participated in various Seminars, Workshops, & Faculty Development Programmes and published papers in national and international conference / journals. He is a life member of CSI.