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Literature Survey on Wireless Sensor Network

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Abstract:

The abstract of this paper discusses the wireless sensor network which is a modernistic addition in the fields of radio networks and also provides new applications with a new prototype for sensing and broadcasting information from various environments with potential to serve many and desired applications at very low cost. In wireless sensor network, a collection of small sensor nodes communicates through radio interface. Due to the requirement of low device complexity with low energy consumption a balanced communication and signal or data processing capabilities must be found.

Introduction:

With enormous benefits and immeasurable possibilities of connecting various devices and networks together, this has attracted many companies to put eloquent efforts to address important issues and challenges. Starting from the 3 millennium wireless sensor networks created an interest from industries and research aspects. The origin of WSNs can be seen in military and heavy industrial applications, far removed from the light industrial and consumer WSN applications that are prevalent today. The first wireless network that bore any real resemblance to a modern WSN is the Sound Surveillance System (SOSUS), developed by the United States Military in the 1950s to detect and track Soviet submarines. This network used submerged acoustic sensors – hydrophones – distributed in the Atlantic and Pacific oceans. This sensing technology is still in service today, albeit serving more peaceful functions of monitoring undersea wildlife and volcanic activity.

A wireless sensor net work consist of specially distributed self governing sensors to monitor physical or environmental conditions such as temperature, humidity, sound, vibrations, pressure etc and it also passes the information through network to a main location. Wireless sensor network (WSN) is built up of a group of several hundred or thousand of sensor nodes, where each node is connected to one sensor node. Radio transceiver with an internal antenna or connection of an external antenna, a microcontroller, an electronic circuit for interfacing with sensors and an energy source are some typical parts of a single sensor network node. Each sensor network node can be composed of various sensors that are used to collect data is transferred to the user through network and also control some physical processes. WSN uses a star topology with an advanced multi hop wireless mesh topology network. WSN consist of basic 3 components i.e., sensor nodes, user and interconnected backbone.

The basic requirements of WSN are as follows:

- Scalability- WSN must be capable of being easily expanded or upgraded on demand.
- Reliability- WSN must be worth trusting and it should provide what is needed for the user.
- Responsiveness- WSN should quickly react in the desired or positive way.
- Mobility- WSN must be able to move from one place to another.
- Power efficiency- WSN must be power efficient.

Survey:

O.Younis, S. Fahmy.: HEED: A Hybrid,Energy-Efficient, Distributed Clustering Approach For Ad Hoc Sensor Networks, In: IEEE Transactions on Mobile Computing 3 (4), pp. 366–379 (2004). In this paper, Heterogeneous - Hybrid Energy Efficient Distributed Protocol (H-HEED) for Wireless Sensor

Network has been proposed to prolong the network lifetime. This paper proposes the impact of heterogeneity in terms of node energy in wireless sensor networks have been mentioned. Finally the simulation result demonstrates that H-HEED achieves longer lifetime and more effective data packets in comparison with the HEED protocol.[32]

Kemal Akkaya, Mohamed Younis, "A Survey On Routing Protocols For Wireless Sensor Networks ", Ad Hoc Networks 3, pp. 325-349 (2005). This paper surveys recent routing protocols for sensor networks and presents a classification for the various approaches pursued. Data-centric, hierarchical and location-based are three main classifications that are examined in this paper. Network flow and QoS modeling are also discussed.[33]

Fikret Sivrikaya and B¨ulent Yener wrote a paper about **"Time Synchronization in Sensor Networks: A Survey"**. This paper reviews the time synchronization problem and the need for synchronization in sensor networks, then presents in detail the basic synchronization methods explicitly designed and proposed for sensor networks.

Gomez, J., A. T. Campbell, M. Naghshineh and C. Bisdikian wrote a paper about **"Conserving Transmission Power In Wireless Ad Hoc Networks"** in 2001. In this paper, the detailed design of PARO and evaluate the protocol using simulation and experimentation is presented. Through simulation that PARO is capable of outperforming traditional broadcast-based routing protocols (e.g., MANET routing protocols) due to its power conserving point-to-point on-demand design. Some initial experiences from an early implementation of the protocol in an experimental wireless test bed using off-the-shelf radio technology is also discussed.[34]

Bara'a A.Attea and Enan A.Khalil "A New Evolutionary Based Routing Protocol For Clustered Heterogeneous Wireless Sensor Networks" volume 12, Issue 7, July 2012. This paper propose the undesirable behavior of the EA when dealing with clustered routing problem in WSN by formulating a new fitness function that incorporates two clustering aspects, viz. cohesion and separation error.[35]

Wei Ye, John Heidemann, Deborah Estrin paper "An Energy-Efficient MAC Protocol for Wireless Sensor Networks" was published in 2002. This paper proposes S-MAC, a medium-access control (MAC) protocol designed for wireless sensor networks. Wireless sensor networks use battery-operated computing and sensing devices. A network of these devices will collaborate for a common application such as environmental monitoring. This paper presents sensor-MAC (S-MAC), a new MAC protocol explicitly designed for wireless sensor networks. While reducing energy consumption is the primary goal in our design, our protocol also has good scalability and collision avoidance capability. It achieves good scalability and collision avoidance by utilizing a combined scheduling and contention scheme. To achieve the primary goal of energy efficiency, we need to identify what are the main sources that cause inefficient use of energy as well as what trade-offs we can make to reduce energy consumption.[36]

Jennifer Yick, Biswanath Mukherjee, Dipak Ghosal "Wireless Sensor Network Survey". This paper was published in 2008. This paper gives an overview of several new applications and then reviews the literature on various aspects of WSNs. This paper classifies the problems into three different categories:

- Internal platform and underlying operating system
- Communication protocol stack and
- Network services, provisioning, and deployment.

This paper reviews the major development in these three categories and outline new challenges.[37]

Christian C. Enz Amre El-Hoiydi Jean Dominique Decotignie Vincent Peiris published a paper about **"Wisenet: An Ultra Low-Power Wireless Sensor Network Solution"** in 2004. This paper helps us to learn that the WiseNET platform uses a codesign approach that combines a dedicated duty-cycled radio with WiseMAC, a low-power media access control protocol, and a complex system-on-chip sensor node to exploit the intimate relationship between MAC-layer performance and radio transceiver parameters.[1]

X. Du, Y. Xiao, H.-H. Chen, Q. Wu presented their findings in 2006 about **"Secure Cell Relay Routing Protocol For Sensor Networks"**. In this paper, authors have present a novel secure cell relay (SCR) routing protocol for sensor networks. SCR routing protocol is resistant to several kinds of attacks on sensor networks, including selective forwarding, sinkhole, wormhole, Sybil, hello flooding attacks, etc. SCR is also an energy efficient routing protocol with acceptable security overhead. SCR routing utilizes the fact that sensor nodes (in most sensor networks) are dense, static and location-aware, to achieve good security, high delivery ratio and low energy consumption, which is confirmed by writers simulations.[3]

J. Zhao, R. Govindan published their paper about **"Understanding Packet Delivery Performance In Dense Wireless Sensor Networks"** in 2003. This paper shows that wireless sensor networks promise fine-grain monitoring in a wide variety of environments. Many of these environments (e.g., indoor environments or habitats) can be harsh for wireless communication. From a networking perspective, the most basic aspect of wireless

communication is the packet delivery performance: the spatio-temporal characteristics of packet loss, and its environmental dependence. These factors will deeply impact the performance of data acquisition from these networks. In this paper, writers report on a systematic medium-scale (up to sixty nodes) measurement of packet delivery in three different environments: an indoor office building, a habitat with moderate foliage, and an open parking lot. Our findings have interesting implications for the design and evaluation of routing and medium-access protocols for sensor networks.[4]

Man wah Chiang, Zeljko Zilic, Katarzyna Redecka and Jean Samuel Chenard "Architecture of Increased Availability Wireless Sensor Network Nodes". In this paper, the availability and serviceability of WSN nodes is considered that can be addressed by indulging the remote testing and repairing the infrastructure for individual sensor nodes using COTs components, they built and evaluate the system level test interface for remote testing repair and software upgrade. This also contains contents regarding the design approaches which were carried to investigate the complexity using the proposed infrastructure. Wireless broadcast can be easily used in various testing with optimum cost.[5]

Weipeng JING, Yaqiu LIU, Qu WU, Li BIAN "An Improved Reliable Router Algorithm in WSN". In this paper the authors presented a fault tolerant routing method of WSN. A cluster based network architecture based on primary backup cluster head, as well as the switching mechanism between master cluster head and backup cluster head is discussed. Moreover the study shows that the reliable routing algorithm can implement the experted function and also ensure the reliability of topology path that enhances the network life cycle efficiency and reduces the packet loss drastically.[7]

Fred Stann, John Heidemann, "RMST: Reliable Data Transport In Sensor Networks". In this paper the analysis and resulted experiments for implementing reliable data transport in sensor networks is presented. The paper contends that the best implementation involves both the transport and MAC layer for reliability in distributed sensor network architectures. The paper advocates that for expanding the application of direct diffusion, RMST constitutes a good basis which provides guaranteed delivery and fragmentation/ reassembly. RMST is a selective NACK based protocol which is applicable to other sensor network routing protocols that leverages the strength of diffusion yet minimize the extra over head.[8]

Lucian Moreira Sa'de Souza, "FT- Cowise Nets: A Fault Tolerance Framework for wireless Sensor Networks". This paper presents FT- Cowise Nets framework designed to improve the availability of heterogeneous WSNs through an efficient fault tolerance support. The frameworks establish the possibility of integration of different technologies and implement them to heterogeneous WSNs in a transparent way.[9]

Turgay Korkmaz and Kamil Sarac, "Characterizing Link and Path Reliability In Large Scale WSNs". This paper shows the combination of link level re-transmission and multipath routing is available solution in small scale WSNs. This also determines a relationship between RSSI and link reliability designing of a large scale WSN using hierarchal routing network limits the path length which increases the overall reliability significantly.[10]

Jonathan P.Benson, Tony O'Donoran, Corman J.Sreenan, "Reliability Control For Aggregation In WSN". This paper nominates and evaluates the use of an in-network control mechanism, which analytically calculates the correct reliability that an aggregate of given size must be forwarded in order to access more applications. Quantified effects of aggregation leads to determine the correct end to end correct reliability level necessary to control these effects by selecting and implementing the correct hop by hop reliability dynamically in network, for a given aggregate size.[11]

Cagil Can Qnix, Sinan Emre Tasei, Erkay Savas, Oxgur Ercetin and Elbert Levi, "SeFER: Secure, Flexible and Efficient Routing Protocol For Distributed Sensor Network". The paper present a secure routing protocol for sensor networks in which links are secured using different keys. The key behind this proposal is random key pre-distribution which require different nodes to be manufactured with a set of random keys selected. The protocol brings flexibility such that it allows a trade-off between route length and route setup cost, on terms of processing power and storage.[12]

Michael Broxton, Josh Lifton and Joe Paradiso, "Localizing \A Sensor Network Via Collaborative Processing Of Global Stimuli". The paper marketed the development and implementation of a sensor network localization algorithm that combines three aspects of ultrasound time-of-flight range finding within network alteration to reach at a localization method. This method realize on correlated light flashes and ultrasound pulses to elect anchor points which is used in standard linear late-ration algorithm.[13]

E.Ilker Oymam and Cem Ersoy, "Effect Of Overhead Energy To The Lifetime In WSN". The paper presents an evaluates the use of multi-hop communication link and compares the amount of energy gained acquired by correct routing energy calculation. The researchers have analyzed the effects of neglecting the overhead energy deception and routing decisions. [14]

Budhaditya Deb, Sudeept Bhatnagar and Badrinath, "A Topology Discovery Algorithm For

Sensor Networks With Applications To Network Management". This paper describes a topology discovery algorithm to select a set of distinguished nodes and construct a reach-ability map based on their information. The work presents a preliminary investigation into various aspects of topology discovery for sensor networks.[15]

Aggelos Bletbas and Endrew Lippman, "Spontaneous Synchronization In Multi-Hop Embedded Sensor Networks: Demonstration of a Server Free Approach". The researchers described the implementation of a simple time synchronization algorithm for wireless multi-hop sensor networks, which requires only local communication among the nodes instead of global co-ordination and beacons in the network. They also quantified its error as a function of diameter of network and experimentally showed the synchronization error is not necessarily increased linearly with the number of hops.[16]

Ayad Salhieh, Jennifer Weinmann, Manish Kochhal, Loren Schidebert, "Power Efficient Topologies Of WSNs". In this paper the researchers considered the topology that best supports communication among sensor nodes. They proposed a power-aware routing protocol and simulate the performance, showing that their routing protocol adapts routes to the available power. This leads to a reduction in the total power used as well as more even power usage across nodes.[17]

V.M Priyadarshini, N.Muthukumar and M.Natarajan, "Cellular Architecture Sensor for WSNs". In this paper they have worked on WSN nodes and arrange them in cellular manner to optimize the coverage area, reliability in receiving information and minimizing loss of information.[6]

Sanaz Naziri, Majid Haghparast and Somayeh Hasanpoor published a paper about **"Improving Lifetime And Reliability In Routing Real Time Wsns Based Of Hybrid Algorithm".** They proposed a hybrid algorithm which relates to the reliability and network lifetime enhancement. Using MATLAB software the mentioned algorithm has a substantial improvement in comparison with its counterparts. [19]

Edward Biagioni, Shu Hui Chen published their paper about **"A Reliability Layer for Ad-Hoc Wireless Sensor Network".** They have designed and implemented a multipath on-demand routing protocol reliability layer, which makes use of all possible paths to a given destination. The strategy behind this is to use a different node on each retransmission and to improve the delivery ratio or decreasing the number of end-to-end transmission. The simulation of transmission is congested conditions brings the reliability layer or help MDR in transmitting data faster with less energy usage.[20]

Conclusion:

This survey paper presents an overview of wireless sensor network. It gives us a lead to look into various concepts of WSN which will demand enhancement to achieve exaggerated results. Moreover, we have highlighted possible advancement and researches regarding this field. The above all aspects have been studied and advocated by various researchers and their work done have also been taken under deliberation. Still there are many issues to be resolved around. WSN applications such as communication, architectures, security and management unfolding these issues lead to reduce the gap between technology and applications.

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