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A Review on Different P Parameter of Wireless Sensor Network

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***Abstract*: Wireless sensor network (WSN) has emerged as one of the most promising technologies for the future. This has been enabled by advances in technology and availability of small, inexpensive, and smart sensors resulting in cost effective and easily deployable WSNs. However, researchers must address a variety of challenges to facilitate the widespread deployment of WSN technology in real-world domains. In this survey, we give an overview of wireless sensor networks and their application domains including the challenges that should be addressed in order to push the technology further. Finally, we identify several open research issues that need to be investigated in future.**

***Keywords*: Wireless sensor network (WSN), Characteristics, Applications, Research challenges.**

1. Introduction

Wireless sensor networks (WSN), an element of pervasive computing, are presently being used on a large scale to monitor real-time environmental status. However, these sensors operate under extreme energy constraints and are designed by keeping an application in mind. Designing a new wireless sensor node is extremely challenging task and involves assessing a number of different parameters required by the target application, which includes range, antenna type, target technology, components, memory, storage, power, life time, security, computational capability, communication technology, power, size, programming interface and applications. This paper analyses commercially (and research prototypes) available wireless sensor nodes based on these parameters and outlines research directions in this area [1].

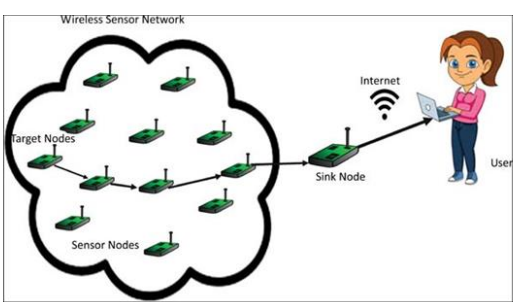

Fig. 1. Wireless sensor network (WSN)

A Wireless sensor network (WSN) consists of wireless sensor nodes or motes, which are devices equipped with a processor, a radio interface, an analog-to-digital converter, sensors, memory, and a power supply. The processor provides the mote management functions and performs data processing. The sensors attached to the mote are capable of sensing temperature, humidity, light, etc. [2]. A sensor network is composed of a large number of sensor nodes, which are densely deployed either inside the phenomenon or very close to it. The position of sensor nodes need not be engineered or pre-determined. This allows random deployment in inaccessible terrains or disaster relief operations. On the other hand, this also means that sensor network protocols and algorithms must possess self-organizing capabilities. Another unique feature of sensor networks is the cooperative effort of sensor nodes. Sensor nodes are fitted with an on-board processor. Instead of sending the raw data to the nodes responsible for the fusion, sensor nodes use their processing abilities to locally carry out simple computations and transmit only the required and partially processed data [3].

2. Characteristics of wireless sensor networks

- Dynamic network topology
- Scalability to large scale of deployment
- Wide range of densities
- Re-programmability
- Maintainability
- Power consumption constrains for nodes using batteries or energy harvesting
- Ability to cope with node failures
- Mobility of nodes
- Heterogeneity of nodes
- Ability to withstand harsh environmental conditions
- Ease of use.

3. Research challenge to wireless sensor network

There are some important research challenges [11] in the wireless sensor network:

1. Architect security solutions into systems from the start.
2. Current sensor network system lacks novel defences in

Table 1
Literature Survey

S.no.	Author/Year	Propose	Algorithm/technique	Result
1	Yuki Nishikawa et al [2018]	Maintenance solution for Infrastructure and Slopes with Telecommunication (MIST) is proposed which monitor and sense the deformation of the ground caused by heavy rain in mountain. Also, operating the system for a long life is proposed	IEEE802.15.4 (ZigBee)	
2	Kyosuke Fukuda et al [2018]	transmit control and the data separation for PhyC-SN with eventdrivensensoris proposed	The Gaussian probability model for predicting the future sensing information is used for estimating the difficulty of data separation	our proposed data separation and transmit control achieves the highly accurate data separation andthe largely reducing redundant sensing information.
3	M. Udin Harun Al Rasyid et al [2015]	implementation and monitoring of EMG sensors in aWireless Body Area Network (WBAN)	Application using e- Health sensors platform, Arduino Uno, and Wi-Fi module	Gender differences affect the percentage of muscle strain that have been detected. Differences in activity also affect the percentage of muscle strain that have been detected. Application works successfully
4	Udin Harun Al Rasyid et al. [2014]	This paper presents and discusses the performance of slotted and unslotted Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) protocol WSN for medical system, with a few additions to the protocol and adequate tuning parameters	CSMA/CA Algorithm IEEE 802.15.4	The simulation results show that of unslotted
5	Mojtaba Razfar [2013]	In this paper a system will gather the acceleration information received from multiple sensors toreliably and robustly relay the orientation of the rocket back to the actuator system.	The star topology in wsn	The throughput of thenetwork receives more data with less loss (due to collision of packets for instance)
6	Xinhua Liu et al [2012]	In view of real-time coverage and convergence of mobility coverage, an actuator real-time placement algorithm based on regular hexagonal grid for WSANs (ARP-RGH) is proposed	An actuator real-time placement algorithm based on regular hexagonal grid for WSANs (ARP-RGH)	ARP-RHG algorithm has good coverage and convergence

conventional networks. Securing wireless communication links against attacks like eavesdropping, tampering, traffic analysis, and denial of service is a challenge.

3. Many applications are likely to engage the deployment of sensor networks under a single administrative domain in order to simplify the threat model.
4. Possibilities to exploit redundancy, scale, and the physical characteristics of the environment in the solutions. Building sensor networks which continue to operate even if some fraction of their sensors is compromised, we have an opportunity to use superfluous sensors to resist further attack. V. Resource constraints involving ongoing flow directions with asymmetric protocols where most of the computational burden falls on the base station and on public- key cryptosystems efficient on low-end devices.
5. Challenges are to find ways to with-stand the lack of physical security through redundancy or knowledge about the physical environment.

4. Applications of wireless sensor network

Sensor networks might incorporate many alternative kinds of sensors like seismic, low sampling rate magnetic, thermal, visual, infrared, acoustic and radar, that are ready to monitor a large variety of ambient conditions that embody the following [12]:

- Temperature
- Humidity
- Conveyance movement
- Lightning condition
- Pressure
- Soil makeup
- Noise levels
- Presence or absence of certain types of objects
- Mechanical stress levels on connected objects
- Current characteristics like direction, speed and size of an object.

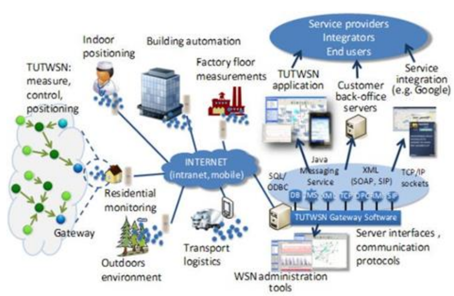

Fig. 2. Wireless sensor network Applications

Sensor nodes may be used for event ID, continuous sensing, event detection, location sensing, and local control of actuators.

The ideas of micro-sensing and wireless association of these nodes promise several new application areas. we categorize the applications into environment, military, health, home and different commercial areas. It's possible to expand this classification with additional classes like space exploration, chemical processing and disaster relief.

A. Military applications

Wireless sensor networks are often an integral part of military command, control, communications, computing, intelligence, surveillance, reconnaissance mission and targeting (C4ISRT) systems. The rapid deployment, self- organization and fault tolerance characteristics of sensor networks make them a really promising sensing technique for military C4ISRT. Since sensor networks are based on the dense deployment of disposable and cheap sensor nodes, destruction of some nodes by hostile actions doesn't have an effect on a operation as much as the destruction of a conventional sensor, that makes sensor networks idea a much better approach for battlefields. a number of the military applications of sensor networks are monitoring friendly forces, equipment and ammunition; battleground surveillance; reconnaissance mission of opposing forces and terrain; targeting; combat casualty assessment; and nuclear, biological and chemical (NBC) attack detection and reconnaissance mission.

Monitoring equipment, friendly forces and ammunition: Leaders and commanders will perpetually monitor the status of friendly troops, the condition and also the handiness of the equipment and also the ammunition in a battleground by the employment of sensor networks. Each equipment, troop, vehicle, and significant ammunition may be connected with tiny sensors that report the status. These reports are gathered in sink nodes and sent to the troop leaders. The information also can be forwarded to the higher levels of the command hierarchy whereas being aggregated with the information from different units at every level.

Battlefield surveillance: Approach routes crucial terrains, ways and straits may be quickly lined with sensor networks and closely watched for the activities of the opposing forces. As the operations evolve and new operational plans are prepared, new sensor networks may be deployed anytime for battleground surveillance.

Reconnaissance mission of opposing forces and terrain: Sensor networks may be deployed in crucial terrains, and a few valuable, detailed, and timely intelligence regarding the opposing forces and terrain may be gathered within minutes before the opposing forces can intercept them.

Targeting: Sensor networks may be incorporated into guiding systems of the intelligent ammunition.

Combat casualty assessment: just before or after attacks, sensor networks may be deployed within the target area to collect the combat casualty assessment information.

Nuclear, biological and chemical attack detection and reconnaissance: In biological and chemical warfare, being near ground zero is very important for timely and correct detection of the agents. Sensor networks deployed in the friendly region and used as a chemical or biological warning system will give the friendly forces with essential response time that drops casualties drastically. We can additionally use sensor networks for elaborated reconnaissance mission after an NBC attack is detected. For instance, we are able to create a nuclear reconnaissance mission while not exposing a rescue team to nuclear radiation.

B. Environmental applications

Some environmental applications of sensor networks embody following the movements of birds, insects, and tiny animals, observing environmental conditions that have an effect on livestock and crops, irrigation, flood detection, chemical/ biological detection, precision agriculture, biological, Earth, and environmental monitoring in marine, soil, and atmospheric contexts, meteorological or geophysical research, forest fire detection, macro-instruments for largescale Earth monitoring and planetary exploration bio-complexity mapping of the environment and pollution study.

Forest fire detection: Since sensor nodes could also be strategically, randomly, and densely deployed in a forest, sensor nodes will relay the precise origin of the fire to the end users before the fire is spread uncontrollable. Lots of sensing element nodes may be deployed and integrated using radio frequencies/ optical systems. Also, they'll be equipped with effective power scavenging strategies, like solar cells; as a result, the sensors could also be left unattended for months and even years. The sensor nodes can collaborate with one another to perform distributed sensing and overcome obstacles, like trees and rocks that block wired sensors" line of sight.

A bio-complexity mapping of the environment needs sophisticated approaches to integrate data across temporal and spatial scales. The advances of technology within the remote sensing and automatic information assortment have enabled higher spatial, spectral, and temporal resolution at a geometrically declining price per unit area. Alongside these advances, the sensor nodes even have the flexibility to attach with the internet that permits remote users to manage, monitor and observe the bio-complexity of the environment.

Although satellite and airborne sensors are helpful in observing massive biodiversity, e.g., spatial complexity of dominant plant species, they're not fine grain enough to observe tiny size biodiversity that makes up most of the biodiversity in an ecosystem. As a result, there's a necessity for ground level deployment of wireless sensor nodes to observe the bio-complexity. One example of bio-complexity mapping of the environment is done at the James Reserve in Southern California. monitoring grids with every grid having 25–100 sensor nodes are enforced for fixed view multimedia and environmental sensor information loggers.

Flood detection: an example of flood detection is the ALERT system [9] deployed within the United States. Many kinds of sensors deployed in the ALERT system are precipitation, water level and weather sensors. These sensors provide data to the centralized information system in a pre-defined manner. Research projects, such as the cougar Device database Project at cornell university and also the DataSpace project at Rutgers, are investigating distributed approaches in interacting with sensor nodes in the sensor field to supply photograph and long-running queries.

Precision Agriculture: Some of the advantages is the ability to observe the pesticides level in the drinking water, the extent of soil erosion, and also the level of air pollution in real time.

C. Health applications

Many of the health applications for sensor networks are providing interfaces for the disabled; telemonitoring of human physiological data; diagnostics; drug administration in hospitals; integrated patient observation; and pursuit, monitoring the movements and internal processes of insects or other small animals and monitoring doctors and patients within a hospital.

Telemonitoring of human physiological information: The physiological data collected by the sensor networks may be kept for an extended amount of time, and might be used for medical exploration. The installed sensor networks also can monitor and find older people's behavior, e.g., a fall. These tiny sensor nodes permit the subject a larger freedom of movement and permit doctors to spot pre-defined symptoms earlier. Also, they facilitate a better quality of life for the subjects compared to the treatment centers. Faculty of medicine in Grenoble—France designed the "Health smart Home" to validate the practicability of such system.

Tracking and monitoring doctors and patients within a hospital: every patient has tiny and light weight sensor nodes connected to them. Every sensor node has its specific task. For instance, one sensor node may be detecting the heart rate whereas another is detecting the blood pressure. Doctors may carry a sensor node that permits other doctors to find them inside the hospital.

Drug administration in hospitals: If sensor nodes may be connected to medications, the probability of obtaining and prescribing the incorrect medication to patients may be reduced, because patient will have sensor nodes that may determine their allergies and needed medications. Computerized systems as delineated have shown that they will facilitate minimize adverse drug events.

D. Home applications

Home automation: As technology advances, smart sensor nodes and actuators may be buried in appliances, like vacuum cleaners, micro-wave ovens, refrigerators, and VCRs. These sensor nodes within the domestic devices will interact with one another and with the external network via the web or Satellite. They permit end users to manage home devices locally and remotely without much effort.

Smart environment: Smart environment's design will have 2 completely different views, i.e., human-centered and technology-centered. For the first one that is the human-centered, a smart environment needs to adapt to the wants of the end users in terms of input/output capabilities. For the second that is the technology- centered, new hardware technologies, networking solutions, and middleware services have to be compelled to be developed. A situation of how sensor nodes may be used to produce a smart environment. The sensor nodes may be embedded into furnishings and appliances, and that they will communicate with one another and also the room server. {The room|the space|the area} server also can communicate with other room servers to find out about the services they offered, e.g., printing, scanning, and faxing. These room servers and sensor nodes may be integrated with existing embedded devices to become self-organizing, self-regulated and adaptational systems based on control theory models. Another example of smart environment is the "Residential Laboratory" at Georgia Institute of Technology. The computing and sensing in this environment must be reliable, persistent, and transparent.

E. Alternative commercial applications

Some of the commercial applications are building virtual keyboards, monitoring material fatigue; constructing smart office spaces; managing inventory; vehicle pursuit and detection; monitoring product quality; robot control and guidance in automatic manufacturing environments; determined.

5. Base results

Environmental control in office buildings; interactive museums; plant process control and automation; monitoring disaster area; interactive toys; transportation; smart structures with sensor nodes embedded inside; plant instrumentation; local control of actuators; detecting and monitoring automobile thefts; machine diagnosis and instrumentation of semiconductor process chambers, rotating machinery, wind tunnels, and anechoic chambers.

Environmental control in office buildings: The heat and air conditioning of most buildings are centrally controlled. Therefore, the temperature within {a room/an area/a space} will vary by few degrees; one facet can be hotter than the opposite because there's just one control within the room and also the air flow from the central system is not evenly distributed. A distributed wireless sensor network system may be installed to regulate the air flow and temperature in several parts of the room. It's estimated that such distributed technology will cut back energy consumption by 2 quadrillion British Thermal Units (BTUs) in the United States, which amounts to saving of $55 billion annually and reducing thirty-five million metric tons of carbon emissions.

Interactive museums: In the future, kids will be able to interact with objects in museums to learn more regarding them. These objects will be able to reply to their touch and speech. Also, kids will take part in real time cause-and-effect experiments, which may teach them about science and environment. Additionally, the wireless sensor networks will offer paging and localization within the museum. An example of such museums is the San Francisco Exploratorium that features a combination of data measurements and cause and-effect experiments.

Detecting and monitoring automotive thefts: Sensor nodes are being deployed to find and identify threats within a geographical area and these threats will be reported to remote end users by the internet for analysis. Managing inventory control: Every item in a warehouse might have a sensor node attached. The end users will determine the exact location of the item and tally the amount of items within the same category. If the end users wish to insert new inventories, all the users have to be compelled to do is to connect the suitable sensor nodes to the inventories. The end users will track and find where the inventories are at all times.

Vehicle tracking and detection: There are 2 approaches to trace and detect the vehicle: first, the line of bearing of the vehicle is set locally within the clusters, it is then forwarded to the base station, and second, the raw data collected by the sensor nodes are forwarded to the base station so that the location of the vehicle can be

Shengchao Su et. al. [13] proposed an optimal clustering algorithm that is Fuzzy-c means to balance the node's energy consumption and prolong the lifetime under energy-constrained wireless sensor networks. An improved Fuzzy-C means clustering algorithm is proposed to divide the sensor nodes into a specified number of clusters. In this paper, the objective function focuses on the distance from each member node to the CH and weighted sum of membership value.

For calculation of results we assume the probability of signal collision and impedance in the wireless channel is negligible and no packet loss error is occurred. In perspective of the energy consumption of data receiving, transmitting and fusion, aggregation of residual energy and the number of nodes in the network will be statistically examined to assess the energy efficiency. In each scenario, the position coordinates of the nodes are generated randomly. To ensure the fairness and correctness, the experiment conducted 100 times over and again. Figure 3 shows the sensor nodes in the geographical are scattered. Figure 4 shows the CH over time after the first round. Figure 5 shows all the dead nodes. The node's average residual energy and variance of residual energy is shown in Figure 6.

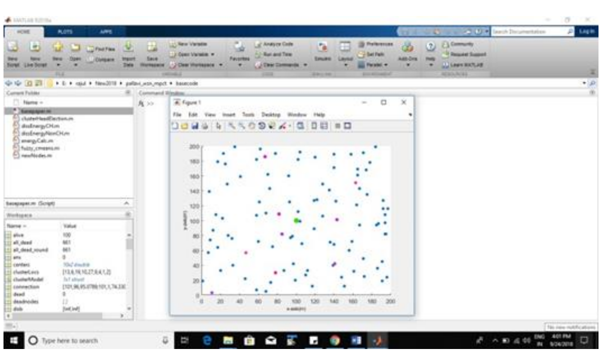

Fig. 3

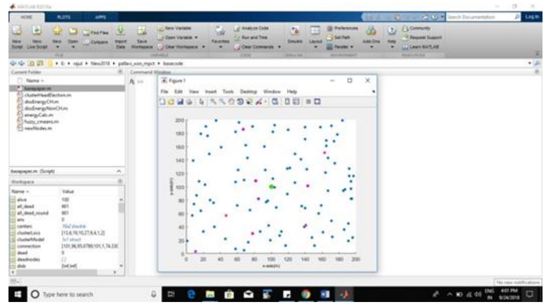

Fig. 4

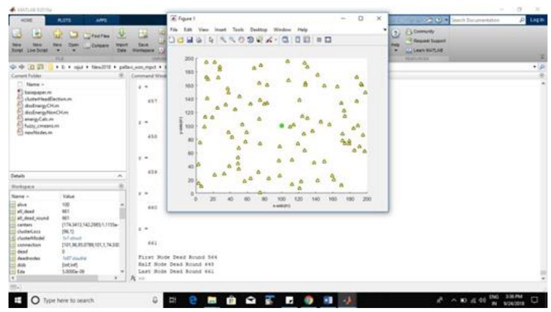

Fig. 5

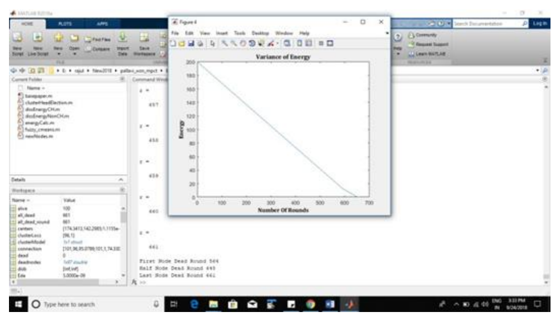

Fig. 6

In the above base work cluster head is elected at every round, due to which there is loss of energy. This requires more energy consumption. In our propose work for less energy consumption, cluster head is selected only when cluster head energy is less than specified threshold value.

6. Conclusion

WSN is a promising future technology and presently used in range of application that requires minimum human intervention. In this paper we have surveyed the WSN characteristics and research issues. Also, WSN applications have described in details.

7. Future plan

We have shown different applications of WSN in different-different areas. Sensor node utilizes the energy for such applications. We have reviewed in above survey today energy consumption is most big issue so to make energy efficient network we have planning to adopt a GA-based clustering algorithm. In this we will try to achieve more energy efficient model.

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