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# Mobile Wireless Sensor Networks

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**ABSTRACT:** Mobile Wireless Sensor Networks (MWSNs) have evolved and focused on networks with mobile sensor nodes that can detect a wide variety of events from conventional standard wireless sensor networks. Also, they can change their position frequently in a specific sensitive area. MWSNS applications can be divided into time-driven, event-based, on-demand and monitoring-based applications. Mobile sensor node configuration, residual energy usage, mobility, topography, scaling, localization, data collection routing, quality of service (QOS), etc. are key factors in designing energy efficient MWSNS for certain purposes. This chapter deals with an overview of MWSNS and some notable developments in designing energy efficient MWSNS for large scale environments.

**KEYWORDS:** Mobility, mobile sensor mode, routing, topology, data collection, Mobile Wireless Sensor Networks (MWSN)

## I. INTRODUCTION

Mobile Wireless Sensor Networks (MWSNs) Sensor nodes play an important role in today's real-world applications that are mobile. MWSNs are more versatile than standard WSNs because they can use sensor nodes in any situation and deal with rapid topographic changes. The microcontroller at the mobile sensor terminals is powered by various sensors (i.e. light, temperature, humidity, pressure, motion, etc.), a radio transceiver and a battery. The main applications of MWSNs are economics, environmental monitoring, mining, meteorology, seismic surveillance, sound detection, health care applications, process monitoring, infrastructure security, environmental awareness computer, undersea navigation, smart locations, cargo surveillance and tactical military surveillance. MWSNs have two sets of challenges; Hardware and environment. Key hardware controls Limited battery power and low cost requirements. That is, mobile sensor nodes must be energy efficient, use only the less complex mechanisms required for microcontrollers and a simplex radio. Motion models to define sensor node / distance motions, and how the location, speed, and acceleration of mobile sensor nodes change over time predict future node positions. In MWSNs, the main environmental factors are shared media and different topography. Indicates that shared media channel access should be restricted in some way. Therefore, network topology plays a significant role in the design of the routing protocol and also determines the transfer path of data packets to achieve the desired destination. When there are motion sensor nodes, the performance of network topologies such as flat / unstructured, chain, tree, and cluster topologies is not sufficient for large-scale MWSNs. A hybrid network topology is the best way to solve these types of problems for large scale environments.

## II. LITERATURE SURVEY

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Even when the sensor nodes are in high motion, the DCN maintains communication with the cluster head, and the CIDT does not need to update the wood structure for the specific circuit. Furthermore, sending data with DCT reduces CIDT power consumption, connection failure, final first delay and cluster head traffic. The slightest complication of



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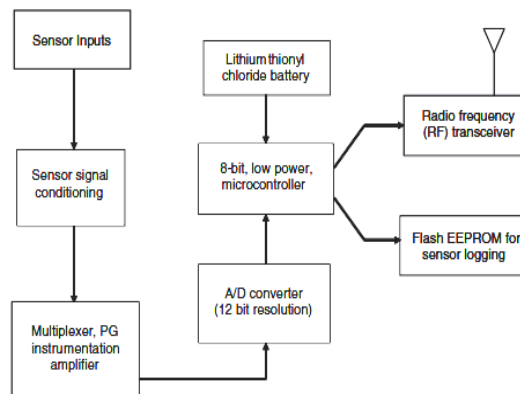
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creating a wooden structure involves a sink, which reduces the energy consumption of the masonry head. Furthermore, CIDT helps to reduce frequent cluster formation and maintain a cluster for a considerable period of time. In the static phase phase, each cluster member sends its collected data to the cluster head during its allotted time slot, and collects the cluster head data and sends it to the base station via intermediate cluster heads via the Direct Line Distribution Spectrum (DSS) technique. Simulation results demonstrate that CIDT achieves better performance compared to Leach, Heat, and MBC in terms of PDR, performance, latency, and total power consumption, even in the mobile sensor environment.

### III. MOBILE WIRELESS SENSOR NETWORKS?

Mobile Wireless Sensor Network (MWSN) is defined as a wireless sensor network (WSN) in which the sensor nodes are mobile. MWSNs are a small, growing field of research in contrast to their well-established predecessor. MWSNs are more versatile than standard sensor networks because they can be used in any situation and can withstand rapid topographic changes. However, many of their applications are similar to those of environmental monitoring or monitoring. Typically, the terminals will have a radio transceiver and a battery-powered microcontroller, as well as a sensor to detect light, heat, humidity, and temperature.



### IV. EVOLUTION OF MOBILE WIRELESS SENSOR NETWORKS

We performed extensive tests to evaluate performance based on the news distribution rate (the news distribution rate divided by the number of content messages delivered to the sink is the total number of messages sent over the WSN) and the end-to-end delay.

Our main concerns in evaluation are scalability and regression to tip movement. Henceforth, the appropriate configuration parameters for feeding estimates are network size (number of nodes) and node motion (maximum speed).

We defined a constant node density for all experiments, thus determining the network size simulation area.

It is assumed that each end of our simulations (including the sink tip) moves according to a random gait pattern [1]. A random direction and velocity between 0 and maximum velocity is generated every second. This movement is divided into five sub-movements, i.e., one every 200 milliseconds to effectively perform a gentle movement.

### V. HOW DOES MOBILE WIRELESS SENSOR NETWORKS WORK

Protocols specifically designed for MWSN are always adaptations of multihop and sometimes existing protocols. For example, Angle-based Dynamic Source Routing (ADSR) is an adaptation of Dynamic Source Routing (DSR), a wireless mesh network protocol for MWSNs. ADSR uses location information to create an angle between the node you want to send, the potential sharing nodes and the sink. This is used to ensure that the packets are always shipped towards the sink. Furthermore, the Low Energy Adaptive Clustering Sequence (LEACH) protocol for WSNs has been replaced with LEACH-M (LEACH-Mobile) for MWSN. The main problem with hierarchical algorithms is that mobile nodes are prone to frequent switching between clusters, resulting in large overlays from nodes that need to be constantly reconnected with different cluster heads.

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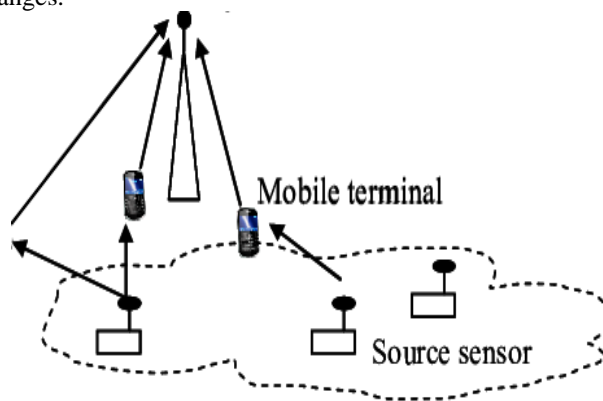
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Another popular routing technique is to use location information from a GPS module attached to the nodes. This can be seen in protocols such as Zonal Routing (ZBR), which geographically define clusters and use location information to update nodes with existing clusters. In comparison, geographically opportunistic routing (GOR) divides a flat protocol network segment into phases and then uses location information to send data as opportunistically forward as possible on each hop. Multipath protocols provide a robust mechanism for routing, so it looks like a promising direction for MWSN routing protocols. One such protocol query-based data center is Multipath (DCBM).

**Should You Know About Mobile Wireless Sensor Networks Work?**

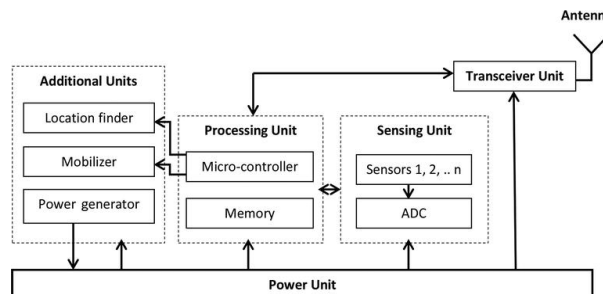
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Motion models to define sensor node / distance motions, and how the location, speed, and acceleration of mobile sensor nodes change over time predict future node positions.

**VI. THE MOBILE WIRELESS SENSOR NETWORKS PROCESS**



Sensor terminals include one or more sensors (i.e. temperature, light, humidity, humidity, pressure, luminosity, proximity, etc.), microcontroller, external memory, radio transceiver, analog to digital converter (ATC), antenna and battery. Again, board storage, battery power, processing, and radio capacity are limited due to the small size of the terminals [15].

However, the mobile sensor node configuration is similar to the normal sensor node. However, some additional units are considered in mobile sensor nodes such as localization / position detectors, mobilization and power generator.



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The configuration of the mobile sensor node is shown in the figure. The location or position detector unit is used to identify the position of the sensor node and mobilization provides movement to a sensor node. The power generator unit is responsible for generating power to meet the further energy requirements of the sensor terminal using any specific techniques such as a solar cell.

#### Mobile sensor node architecture:

Typically, the sensor terminals are one or more sensors (i.e. temperature, light, humidity, humidity, pressure, luminosity, proximity, etc.), microcontroller, external memory, radio transceiver, analog to digital converter (ATC), antenna and battery. Again, board storage, battery power, processing, and radio capacity are limited due to the small size of the terminals.

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#### Network topology

Network topography plays an important role in MWSNs transferring data from mobile sensor nodes to the sink / base station. Then, the sink and remote user / server are connected via the Internet.

The performance of large-scale mobile wireless sensor networks depends on the data collection or spatial management program. Therefore, Topology also offers the best QoS guaranteed reliable network in terms of movement, traffic, end-to-end connection, etc. In addition, the topographic sensor in MWSNs defines the dimension of the node group, manage the addition of new members and the withdrawal of members from a group and group. Considering such features in network topology can provide efficient data collection of low power usage and create superior MWSN. The current network topography of WSNs is flat / unstructured, wood, masonry, chain and hybrid.

Different network topography is followed to achieve maximum data collection and network performance, depending on the nature of the MWSNs. Depending on the nature of the network, different network topography is followed to obtain maximum data collection.

The analysis facilitates the assumptions of the motion behaviors of the input sensor nodes of the motion model. Furthermore, the analytical model provides performance parameters for simple cases of mathematical calculations.

#### Mobility entity

Nowadays, researchers are considering MWSNs for large-scale applications, which include numerous sensor nodes and sink nodes. Here, motion can be applied to sensor nozzles or sinks depending on application requirements.

Routing protocols for MWSNs

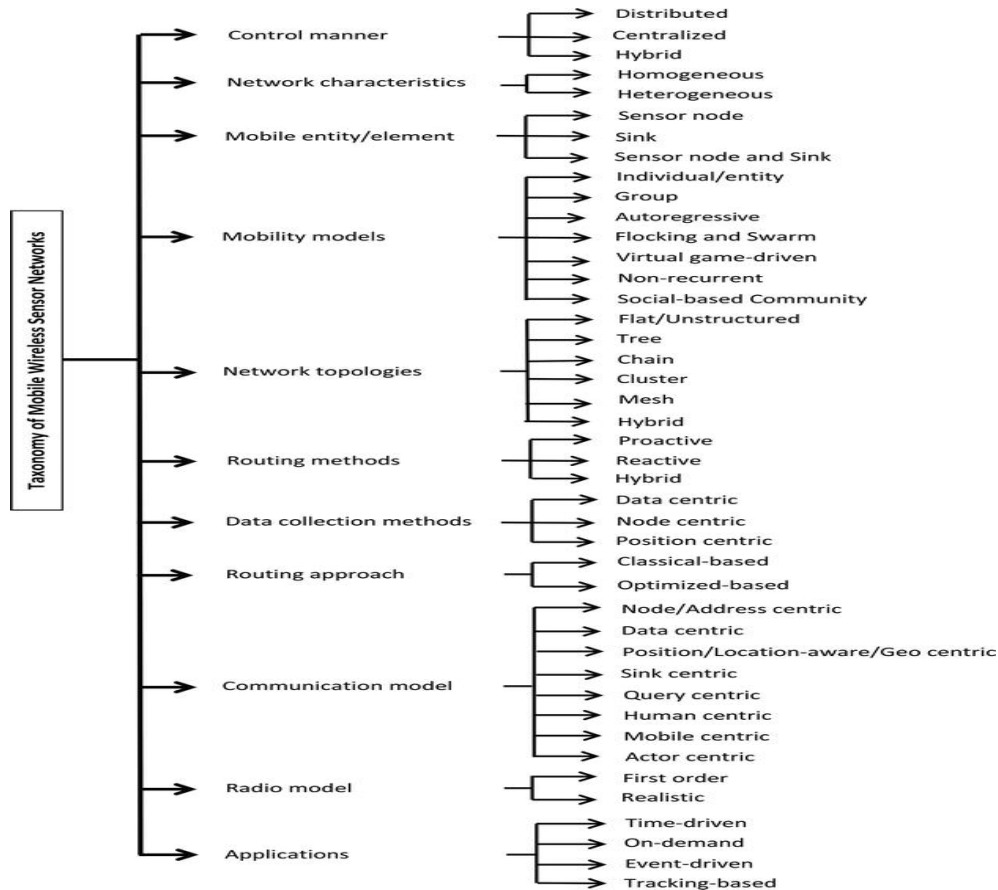
Routing approaches for MWSNs can be centralized, distributed, or hybrid. Efficient and reliable routing protocol design for MWSNs considers network topology, sensor node operation, power consumption, network coverage, data transfer methods, QoS, connectivity, data collection, sensor node and communication connectivity diversity, scaling and security. Existing routing algorithms are compiled based on their routing structures such as flat, hierarchical and location-based routing algorithms. Again, step-by-step routing can be broadly classified as classical and optimal step-by-step routing. Furthermore, the path establishment follows the path from source to destination in active, reaction and hybrid based routing [5, 19, 20]. This image shows the classification of mobile wireless sensor networks.



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**Mobility models**

The movement is designed to describe the movement of mobile sensor nodes towards / away and how the location, speed and acceleration of mobile sensor nodes change over time. Motion models are often used for simulation purposes, and are used to investigate new communication or navigation techniques. Motion management schemes for mobile wireless sensor networks describe the use of motion models to predict the future positions of the sensor node. These models can provide functional barriers to simple events through scientific calculations. In contrast, simulation models are seen as a well-defined realistic motion scene, and it provides constructive solutions to more complex events.

**VII. CONCLUSION**

This chapter details about the research carried out on large-scale mobile wireless sensor networks. It also analyzed research challenges in designing hardware structures, operation, algorithms, and protocols for large-scale technical challenges and large-scale MWSNs. We discussed most of the current literary works of MWSNs such as mobile sensor node configuration, motion, topography and routing protocols. Finally, we categorized existing motion models and classifications of MWSNs.

Mobile Wireless Sensor Networks (MWSN) play an important role in today's real-world applications where sensor nodes are mobile. At the mobile sensor nodes are the microcontroller, various sensors (i.e. light, temperature, humidity, pressure, motion, etc.), a radio transceiver, which is powered by a battery. The main applications of MWSNs are economics, environmental monitoring, mining, meteorology, seismic surveillance, sound detection, health care applications, process monitoring, infrastructure security, environmental awareness computer, undersea navigation, smart locations, cargo surveillance and tactical military surveillance. MWSNs have two sets of challenges; Hardware and environment. Key hardware controls Limited battery power and low cost requirements. That is, mobile sensor nodes should be energy efficient, less complex mechanisms inquired to use only microcontrollers and a simplex radio.



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