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A Research Analysis of Routing Protocols Based on Mobile Sink Wireless Sensor Network

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Abstract- *Here In This Paper,* Using mobile sinks to collect data in wireless sensor networks and investigating the effect of mobility models on the network performance has been an interesting area of research.. the sensor nodes those are closer to sink node not only collect data within their sensing range but also forward data packets for nodes which are far away from the sink. This leads to unbalanced power consumption among sensor nodes and the nodes nearby sink depletes energy faster and die before other nodes in the network and connectivity within the network may be lost. sink mobility in network partition and gives requirements like energy efficiency, better coverage of nodes by the sink node while collecting data directly from the sensor nodes. There are several static methods available for collecting data form sensor nodes. In mobile sink based approaches, sink traverse the network as mentioned in the proposed algorithm and collects data from single hop sensors. Sinks have enough energy, memory and computational power. We exploited this approach and proposed a new mechanism for minimum sink movement for better network coverage and enhance network stability.

Key words: sinks node, Sensor Networks, sensor network, sink traverse, data processing.

1 INTRODUCTION

The communication protocol consists of five standard protocol layers for packet switching: application layer, Transport layer, network layer, data-link layer, and physical layer. In this survey, we study how protocols at different layers address network dynamics and energy efficiency. Functions such as localization, coverage, storage, synchronization, security, and data aggregation and compression are explored as sensor network services. Implementation of protocols at different layers in the protocol stack can significantly affect energy consumption, end-to-end delay, and system Efficiency. It is important to optimize communication and minimize energy usage. Traditional networking protocols do not work well in a WSN [1].

Since they are not designed to meet these requirements. Hence, new energy-efficient protocols have been proposed for all layers of the protocol stack. These protocols employ cross-layer optimization by supporting interactions across the protocol layers. Specifically, protocol state information at a particular layer is shared across all the layers to meet the specific requirements of the WSN[2]..

Sink mobility can be a special case of node mobility. Using sink mobility instead of a static sink, for collecting the data overall network performance increases [3] [4].

The Mobile Sinks traverse through the sensor field according to a controlled arbitrary mobility model in order to maintain a fully-connected network topology and collect data within their coverage.

There are 3 major parts involved in implementing Sink Mobility to Wireless Sensor Networks to improve the performance of network:

1.Sink node movement,
2.Data packets routing and
3.Data gathering.

A Wireless Sensor Network (WSN) consists of a large number of tiny wireless sensor nodes (often referred to as sensor nodes) that are, typically, densely deployed. Ad hoc networks are defined as the category of wireless networks that utilize multi-hop radio relaying since the nodes are dynamically and arbitrarily located. Ad hoc networks are infrastructure independent networks [5]..

• Sensor Node: A sensor node is the core component of a WSN. The sensor nodes can take on multiple roles in a network, such as simple sensing; data storage; routing; and data processing.

• Clusters: Clusters are the organizational unit for WSNs. Because of the dense nature of these networks it requires the need for them to be broken down into clusters to simplify tasks such a communication [6].

• Cluster heads: Cluster heads are the organization leader of a cluster. They often are required to organize activity in the cluster. These tasks are not limited to data-aggregation and organizing the communication schedule of a cluster [7].

• Base Station: The base station is at the upper level of the hierarchical WSN. It provide the communication link between the sensor network and the end-user.

• End User: The data in a sensor network can be used for a wide-range of applications [8]. Therefore, a particular application may make use of the network data over the internet using a PDA or even a desktop computer

1.1 Multiple Sink Placement Strategies

1. Random Sink Placement Strategy
2. Geographic Sink Placement Strategy
3. Sink Placement in Candidate Location with Minimum Hop
4. Sink Placement in Centroid of the Nodes in a Partition

5. Intelligent Sink Placement Strategy
6. Genetic Algorithm Sink Placement Strategy
7. Self Organized Sink Placement Strategy

WSN provides the capability of revolutionary detection over a wide range of different applications. Because the sensor networks have features such as:

1. Reliability
2. Accuracy
3. Flexibility
4. Cost efficiency
5. Ease of Installation

intelligent sensors may serve prudential supervision and collect information from machine crashes, earthquakes, floods and even about terrorist attacks. Sensor network makes possible [9]..

6. information gathering
7. Information processing
8. Environment monitoring for a variety of civilian and military applications.

These distributed and formed nodes constitute a sensor network system as shown in

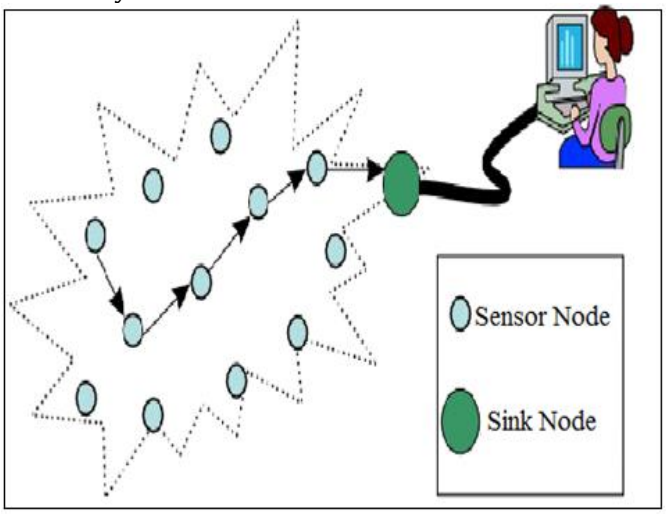

Fig1. Wireless Sensor Network

1.2 Components of Wireless Sensor Network

1.Sensor Node: - A sensor node is main component in the Wireless Sensor Networks. It plays many roles in WSN like sensing the data, storing the data, routing and processing the data [10].

2. Sink Node: - A node which aggregates the data and pass the data to the main node by using the internet is called sink node.

3. Cluster Head: - CHs are the main leader of a cluster. All the activities in the cluster are monitored by cluster head. Cluster Heads are also responsible for data aggregation and communication in the network.

4. Base Station: - It is located at the upper level of Hierarchical WSN. It provides the communication link between the sensor network and the end users.

5. End User: - The data collected in WSN is used as an informative resource for many applications. So, these applications use the data on a PDA or a desktop [11].

1.3 Characteristics of WSNs

The Characteristics of WSNs are as follows:

a. Power consumption constraints for nodes using batteries or energy harvesting.
b. Ability to cope with node failures
c. Mobility of nodes
d. Dynamic network topology
e. Communication failures
f. Heterogeneity of nodes
g. Scalability to large scale of deployment
h. Ability to withstand harsh environmental conditions Ease of use Unattended operation.

1.4 Advantages of WSNs

a. WSN can be made up without any fixed infrastructure.
b. WSN can be used for non-reachable places like across the sea, mountains, rural areas or deep forests [12]..
c. It is flexible if there is ad hoc situation when additional workstation is required.
d. Implementation cost of WSN is cheap.
e. It can be accessed through centralized monitor.
f. It can work under the harsh condition.
g. It has deployment up to large scale.
h. It can add easily new devices at any time.

1.5 Sink Nodes Gather The Location Information Of Sensor Nodes.

A. Meeting position aware routing (MPAR):-

1. Dense node deployment, Random sink mobility and multi-hop communication;
2. Position prediction technology.Self-adaptive in time domain.
3. To avoid frequent route changes;
4. To keep the least destination reselection;
5. To perform well in energy efficiency and data latency;

B. The multicast-query-based data dissemination (MQDD):-

1. A localized protocol;
2. To use multicast and unicast;
3. Simple line structure to inform the event;

No need global topology information;

2. To perform well in energy efficiency, average delay and data delivery ratio.

2. RELATED WORK

2.1 Data Transmission From Sensor Node.

1. The cost of data transmission from each sensor node to the sink is very high, thus nodes die quickly and hence reducing the lifetime of the network [13]..
2. The sink is able to move, sensors can communicate with the sink when it is near to them, and so hop by hop delivery path of data becomes shorter.

3.The use of mobile sink in WSNs introduces some complications, such as detecting and tracking sink location to ensuring reliable data transfer between sensor nodes and the mobiles sink, and managing sensor nodes to support sink mobility[14].
4.The authors compare five clustering routing protocols; Low Energy Adaptive Clustering Hierarchy (LEACH), Threshold Sensitive Energy Efficient Sensor Network (TEEN), Distributed Energy Efficient Clustering (DEEC) and two variants of TEEN which are Clustering and Multi-Hop Protocol in Threshold Sensitive Energy Efficient Sensor Network (CAMPTEEN) and Hierarchical Threshold Sensitive Energy Efficient Sensor Network (H-TEEN) [15].
5.The mobility of sink in the five proposed protocols and compare their performance. The main difference between our work and [16] is that our work provides analytical simulations in terms of network lifetime and average energy consumption for different hierarchical chain based routing protocols.

2.2. Recent Technological Service

1 Recent technological advances have enabled the inexpensive mass production of sensor nodes, which, despite their relatively small size, have particularly advanced sensing, processing and communication capabilities [17].
2 Sensor nodes sense the environment and use their communication components in order to transmit the sensed data over wireless channels to other nodes and to a designated sink point, referred to as the Base Station.
3 The collaborative use of a large number of sensor nodes, a WSN is able to perform concurrent data acquisition of existing conditions at various points of interest located over wide areas.
4 The energy expenditure of the sensor nodes occurs during the wireless communication, the environment sensing and the data processing.
5 Since most of the routing protocols developed for wired networks pursue the attainment of high Quality of Service, they are practically improper for application in WSNs

2.3 Wide Range of Applications In Wireless Sensor Networks.

1.Wireless sensor networks can be used in wide range of applications such as measuring temperature, humidity, pressure, noise level, monitoring the vehicular movement, military applications and health applications.
2. Many factors can act as challenges in design a routing protocol for wireless sensor network and in order to achieve an efficient communication in WSNs,
3.Energy Consumption-we have to choose one of two options, multi-hop routing or single-hop routing. Multi-hop routing is more energy conservation but it can cause more overhead for topology management [18]. On the other hand, single-hop routing has less overhead but it consumes much more energy than multi-hop because of the direct transmission to the sink.
4.Data Aggregation:- The aggregated data is a combination of data collected from different sources and combined together in order to decrease the data packet size. There are some functions can be used to aggregate the data such as minima, maxima, duplicate suppression and average.
5.Scalability:- the routing scheme for such areas should consider this amount of nodes and must be able to handle all nodes in the sensing field.

2.4 Communication Protocol For Wireless Microsensor Networks.

1. Energy-Efficient Communication Protocol for Wireless Microsensor Networks made the conclusion about LEACH that it minimizes global energy usage by distributing the load to all the nodes at different points [6]. LEACH reduces consumption of energy by as much as 8x compared with direct transmission and minimum transmission-energy routing. The first node death in LEACH occurs over 8 times later than the first node death in direct transmission, and minimum-transmission-energy routing and a static clustering protocol, and the last node death in LEACH occurs over 3 times later than the last node death in the other protocols[20].
2. An Improved PEGASIS Protocol to Enhance Energy Utilization in Wireless Sensor Network describe about PEGASIS, that it is chain based hierarchical routing protocol that is near optimal for a data-gathering problem in sensor networks. PEGASIS perform better than LEACH by eliminating the overhead of dynamic cluster formation, minimizing the connected distance between nodes, limiting the number of transmissions and reception among all nodes and using only one transmission to the BS per round[4].
3. Reduction of Energy Dissipation in WSNs Using Multi-Chain PEGASIS, propose a multi-chain PEGASIS that uses token passing approach for increasing energy efficiency and lifetime of wireless sensor networks [5].

2.5 Routing Protocols In Wireless Sensor Network.

1. Data fusion helps to reduce the amount of data transmitted to BS resulting in less energy dissipation compared to previous protocols. long transmit distance between sender and receiver. As the energy consumption is directly proportional to distance hence more energy dissipation takes place. There is burden on Cluster Head to acquire data of all nodes in clusters. Thus results in energy dissipation of one CH. Whole network need to depend only on CH whenever it dies whole network get failed.
2. Short transmit distance due to which Energy dissipation (Energy dissipation is directly proportional to square of distance) is less compared to LEACH protocol. Less overhead, load is distributed evenly among the network results in less energy consumption.
3. The main drawback of PEGASIS is that chain has to be reconstructed again as it does not execute its functions whenever any leader node in chain dies. It takes long time to reconstruct a long link chain due to which delay occur in data transmission and unnecessary energy dissipation occur in forming chain again. Delay in data transmission

thorough long link chain decrease performance of PEGASIS.

4. Less overhead and minimum delay in data transmission. Mobile Base Station and short link chains lead to increase in energy efficiency of network and thus increasing network lifetime. As less amount of data is transmitted by each chain so very less Energy dissipates.

2.6 Same Performance of Wireless Sensor Network

1. destination node whenever they want to delivery data with either one-hop model or multi-hop planer model. One-hop model is the simplest delivery method and tries to communicate directly with the destination node.

2. this mechanism can be possible to make new route before any node along the path toward the sink die. From the simulation results, when the difference of charged energy level is below 20%, the same performance of wireless networks can be accomplished.

3.Cluster-head is elected among the nodes that have the highest energy levels to keep the lifetime of wireless networks longer. the bandwidth of wireless network is lower than that of wired network, the more the number of nodes transmitting data, the higher the probability of collision.

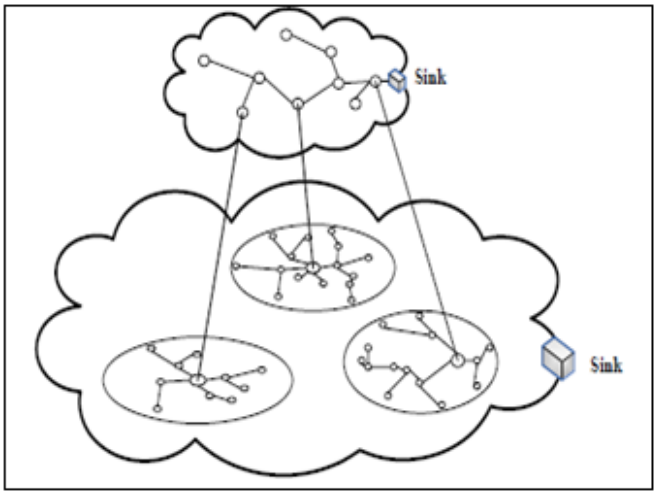

Fig. 2 Topology of Minimum Transmission Energy with Clustering Hierarchy

2.7 Sink Nodes Gather The Location Information Of Sensor Nodes.

1.satellite positioning and RSSI positioning algorithms are used to obtain the location in formation of all nodes. Then, the constraints are analyzed and movement path selection model and lifetime optimization model with known movement paths are established.

2.They stay at the grid centers which are in the movement path for some time, and gather data of sensor nodes with distributed method.

3.Sink nodes gather the location information of sensor nodes and use the clustering method and graph theory method to find the movement paths.

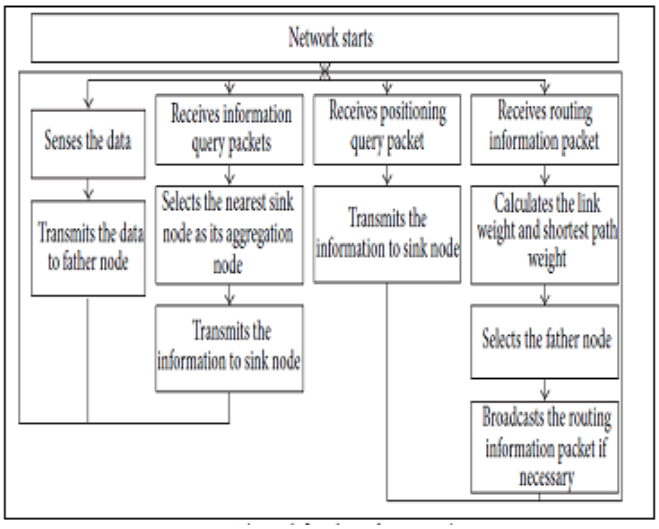

Fig.3 the work flowchart of sensor nodes

2.8 Routing Towards A Mobile Sink.

According to the definition of discrete mobility pattern described in Section III, the sink changes its location from time to time. A routing protocol that transfers data towards such a sink should perform the following operations that are not needed for traditional WSNs:

1.Notify a node when its link with the sink gets broken due to mobility.

2. Inform the whole network of the topological changes incurred by mobility.

3. Minimize the packet loss during the sink moving period.

4. the sink successfully without knowing the topological changes. However, the routing optimality is compromised without operation.

5. It is not possible to avoid packet loss, because a realistic failure detector (which usually relies on a timer) always has some delay. Therefore, the goal of operation is to minimize rather than eliminate packet loss.

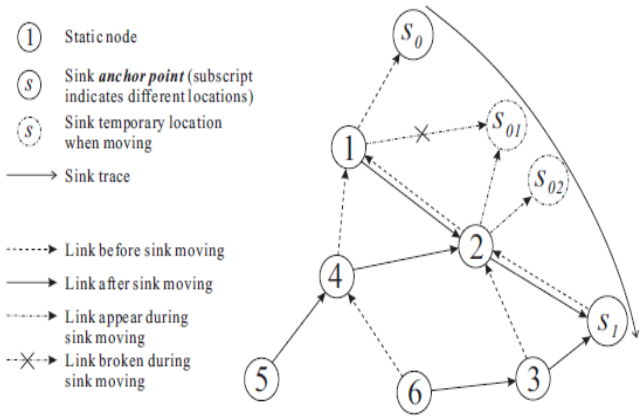

Fig.4.This example illustrates possible scenarios where additional operations are necessary. Assuming the sink, after its (long) pause at s0,
moves to s1, (1) the link breakage happening when the sink reaches intermediate location s01 (where it loses

connectivity with node 1) should be notified to node 1, otherwise the node will have to drop packets sent from other nodes, (2) nodes 3, 4, and 6 should be informed about the topological changes at a proper time, otherwise, for example, 6 might take the following sub-optimal routing path:

2.9 Need Of Mobility In WSN.

Mobility allows better load balance energy consumption among the node in sparse WSN, enhance sensing coverage and network lifetime elongation. Implementing mobility better routes for packet delivery from sensor node to sink can be found as well as data reliability can be enhanced if sensor nodes move closer to the events.

Mobile WSNs need

1.advanced topology management capabilities, i.e. the ability to specify simultaneously the speed and direction of each individual node;

2.the ability to track and localize nodes;

(iii) a reliable source of energy to avoid unnecessary pauses or abrupt stops;

(iv) speed of the mobile device etc.

2.10 Deploying Multiple Mobile Sinks in Event-Driven WSNs.

We make the following simplifying assumptions in building the system model

• Sensors remain stationary at the nodes of a bidimensional
square grid composed of same-size cells.

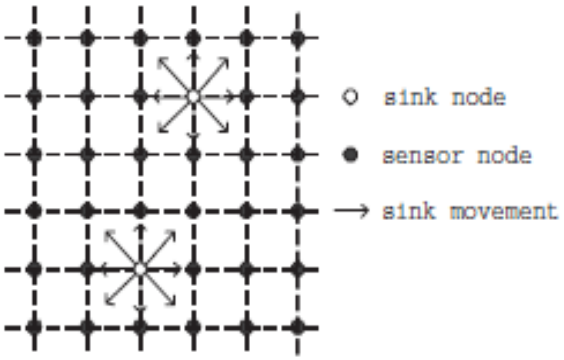

Fig.4. A two dimensional grid with sensor nodes and sink nodes

Sensor nodes are homogeneous and wireless channels are bi-directional, symmetric and error-free.

• Sensor nodes communicate with the sink by sending data via multiple hops along the shortest path; a hop is of one cell side length, i.e., the distance between two adjacent nodes in the grid equals the transmission range of nodes.

• Data transmission and reception are the major energy consuming activities.

• The sinks can move freely on the grid from one node to another in eight directions. After the sink arrives at a node, sensors can communicate with the sink. For analytical simplicity, the traveling time of the sink between two nodes is considered negligible, and the sojourn time
of the sink visit at sensors is equal.

• The event occurs at any grid cross point independently with stationary distribution.

2.11Exploiting Sink Mobility for Maximizing Sensor

1. Sensors remain stationary at the nodes of a bi-dimensional square grid composed of same-size cells.

2. The sink can move freely on the grid from one node to another. During its sojourn time at a node, sensors can communicate with the sink. For analytical simplicity, the traveling time of the sink between two nodes is considered negligible.

3. Data transmission and reception are the major energy consuming activities.

4. Sensor nodes are homogeneous and wireless channels are bi-directional, symmetric and error-free.

5. Each node has a limited initial energy and unlimited buffer size.

6. Sensor nodes communicate with the sink by sending data via multiple hops along the shortest path; a hop is of one cell side length, i.e., the distance between two adjacent nodes in the grid equals the nodes' transmission range.

2.12 SECURITY & EFFICIENCY FEATURES.

1 the first hierarchical routing approaches for sensors networks. Taxonomy of the different architectural attributes of sensor networks is developed.

2 wireless sensor networks has been developed where both security & efficiency features have been dealt.

3 The sensing area has been divided into a number of equilateral areas, called as clusters. Each cluster consists of six equilateral triangles called cells.

4 The protocol consists of a number of rounds but after forming the clusters they do not change in

3. Objective

Research in WSNs aims to meet the above constraints by In this study, we present a top-down approach to survey Sink Mobility in recent years. Our work differs from other surveys as follows:

[1]A Review on Different Sink Mobility for Routing Protocols in Wireless Sensor Networks

[2] While our survey is similar to our focus has been to survey the more recent literature.

[3]We survey the current provisioning, management and control issues in WSNs. These include issues such as localization, coverage, synchronization, network security, and data aggregation and compression.

[4] We compare and contrast the various types of Sink Mobility wireless Sensor networks.

[5]Study of Different current Sink Mobility for Wireless Sensor Networks technologies.

4. Exploiting Sink Mobility For Wireless Sensor Area Network And Its Work.

Types of wireless networks are defined on the bases of their **Size, Range** and the **Speed** of **Data Transfer:-**

4.1 *WIRELES – PERSONAL AREA NETWORK*

Interconnected Devices in Small Premises Example Invisible Infra Red Light and Bluetooth Radio Interconnects a Headphone to a Laptop by the Virtue of WPAN

4.2. WIRELESS LOCAL AREA NETWORK

Simplest Wireless Distribution Method that is Used for Interlinking Two or More Devices, Spread Spectrum Technology give Client Freedom to Move Within a Local Coverage Area.

4.3. WIRELESS METROPOLITAN AREA NETWORK

(A) Connect at High Speed Multiple Wireless LAN That are Geographically Close.

(B) The Set Up Makes Use Of Routers Or Switches For Connecting With High Speed Links Such As Fiber Optic Cable.

(C) WiMax Described as 802.16 Standard by the IEEE is a type of WMAN

4.4. WIRELESS MOBILE DEVICES NETWORK

(A) Today Telephone Are Nt Meant To Converse Only To Carry Data.

(B) The Advent Of Smart Phones Have Adds A New Dimension In Telecommunication.

4.5 PERSONAL COMMUNICATION SERVICE –

(A) PCS is Radio Band That Is Employed in South Asia and North America.

(B) The First PCS Service Was Triggered Sprint

4.6 TINY AREA NETWORK-TINY AREA NETWORK

(A) Some Time Called Campus Area Network, it provide Bandwidth, TINY AREA NETWORK working is like LAN but comparatively smaller**. 4.7. WIRED EQUIVALENT PRIVACY –**

(A) As Well As firewall could be Used For Securing the Network.

(B) Wireless Network is the Future of Global Village Sensor Network Referring To Security of Wireless LAN Network.

5. Conclusion

1. A multi-chain model of along with induction of sink mobility to maximize the network lifetime.
2. Our considerations are supportive in diminishing the delay in data delivery and distances between the connected nodes through smaller chains.
3. Sink mobility not only lessens the load on the chain leaders in starting rounds, but also reduces the stress on the sparse nodes at the end of network services.
4. We also propose an algorithm for fixed path sink mobility in our model.
5. Sink mobility has major advantages on static sink in enhancing the network services.

6. ADVANTAGES

1. Reduce cabling cost and geographically locate your measurement events.
2. Monitoring software designed and real time measurement.
3. Wireless sensor provides a low cost gathering system and health information to decrease consumption and better manage resources.

7. APPLICATIONS OF WIRELESS SENSOR NETWORK

(1) appliances to allow end user to manage home devices locally and remotely.
(2) Environment application includes tracking the movements of Animals chemical/biological detection, precision agriculture.
(3) Tracking date highly connected in time and breathing space e.g. secluded sensors for weather conditions, earth behavior.
(4) Tactical networks: Military communication, operations, auto-mated battlefields [2].
(5) traffic control, environment and habitat monitoring, object tracking, fire detection,
(6) surveillance and reconnaissance, home automation, biomedical applications, inventory control, machine failure diagnosis and energy management.
(7) Emergency services: search and rescue operations, as well as disaster recovery
(8) the beginning recovery and communication of uncomplaining data (record, status, diagnosis) from the hospital.
(9) substitution of a fixed communications in case of earthquake, hurricanes fire etc.
(10) Transmission of news, road condition, weather, melody Local ad hoc network with nearby vehicle for road/calamity guidance
(11) Sensor network System can be used in health care area some modern hospital and monitoring patients and doctors and inside a hospital.
(12) Entertainment: Many user's games, automatic pets, out-of-doors internet right of entry.
(13) Automating call forwarding, trans-mission of the actual workspace information services such as advertise location specific, location dependent travel guide services like printer, fax, phone, and server.

8. Future Work.

The performance of the network under the use multiple sinks that are used for collecting the data from the network. The proposed scheme's performance calculated in terms of network services. a multi-chain routing approach for increase lifetime of sensor networks in terms of Remaining energy per number of rounds by using of multi-hop concept.

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