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REVIEW

LOCATION BASED PROTOCOLS IN WSN: A REVIEW

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ABSTRACT

Nowadays, wireless sensor network (WSN) technology is one of the fast emerging and growing technology due to its several features such as easy installation, low maintenance requirements, self-organizing capability and a wide range of applications. The nodes used to form a network, adjust themselves according to the temperature and having good processing capabilities. These developments have led to many designed protocols, which are accountable for maintaining the routes and to confirm trustworthy 9communication with low power consumption. In this paper, the location-based routing protocols have been studied, investigated and compared.

KEY WORDS
Wireless Sensor Network (WSN), sensor node, location based routing protocols

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INTRODUCTION

The Wireless Sensor Network is built of nodes, which are connected to one or several sensor nodes which have sensing, computation and wireless communication capabilities [1,2]. These nodes are distributed all over the monitored area and associated with a base station, which regulates the path of the transmitted information. In1950's, WSNs were first in use when US navy established it for the detection of the Soviet submarine. In present days, these networks are used to determine various physical parameters such as temperature, pressure, sound, etc.

Each node is assembled with a radio transceiver associated with an antenna; a microcontroller based electronic circuit for interfacing the sensors and energy sources, usually batteries or an embedded form of energy harvesting [1]. The sensors collect information from the events occurring around it, process the gathered information and then transmit it to other sensor nodes or the base station. A sensor node can also receive information. Thus a network is created [2]. The modern WSNs are bi-directional in nature and are capable of controlling the sensing activities. Low power consumption, ability to cope up with failures, mobility, scalability and capability to withstand in unfavorable environmental conditions are the other attracting key features of WSNs [3].

Since the recharging of nodes is not feasible, therefore energy saving is an important issue in Wireless sensor network design. Also, nodes must possess self-organizing ability due to its highly distributing behavior [4]. The sensor nodes used in unfavorable conditions, such as environmental changes, often result in higher energy consumption and reduces performance of the sensor network. Therefore, to compensate for the higher consumption and to maintain the efficiency of the wireless network, certain mechanisms are used while designing the sensor networks, i.e, a robust routing protocol. There is no standard or single solution protocol. These may have different memory resources, strategies and complexities. The choice of the routing protocol is a very important task so that it fulfills the requirements of the network and performs all the necessary tasks of the network [5].

The main constraint in WSNs routing is mainly due to the lack of infrastructure, the unreliability of wireless links, failure of sensor nodes and strict energy saving requirements [1].As resources are extremely limited in wireless sensor networks, hence it is important to use them efficiently. The main objective is to make the routing protocols in such a way that it maximizes the lifetime of the network without sacrificing quality of service [6].

There are various approaches for making the protocols that consider the sensor resources. Initially, protocols were focused on the sensor energy resources only but nowadays they also consider the sensing resources [7]. The proposed major routing protocols for WSNs are divided into seven categories, Location based routing protocols are one of them.

Location based routing is established on the location of node [8], which defines the address of each node. These protocols exploit the position information to convey the signal. The data transmission consumes more energy; therefore energy conservation is one of the most important challenges for this routing. To estimate the energy consumption, all the routing protocols should evaluate the distance among two specific nodes, which is determined by the strength of the incoming signal. In this routing, the inactive nodes sleep to save the energy. Location information enables the networks to select the best route for the reduction of consumed energy and optimizes the entire network [9].

Since sensors are spatially deployed all over the region [6], different techniques are used to find location of the node, such as anchor based or anchor free, centralized or distributed, GPS based or GPS free, fine grained or coarse grained, stationary or mobile sensor nodes, and range based or range free [10], along

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with various algorithms such as flooding restriction scheme, virtual area partition or position computation scheme, distance estimation, best routing choice scheme [8,9]etc.

The basis of location based protocols is the localization of sensor nodes for determining the node location using special algorithm because without the idea of geographical position of nodes the data and information communication would be useless. The simplest method for localization of nodes is by using GPS. But this method cannot be used if there are a large number of nodes in a network as it becomes very expensive. The proposed algorithms are however application specific or are not suitable for wide range localization. The geometrical placement or the position of the nodes in WSNs is estimated through the communication of localized and unlocalized nodes, i.e, through distance and angle between the nodes such as Lateration, Multilateration, Angulation, Triangulation etc. [10].

This paper presents a study on different Location based protocol along with their advantages and drawbacks. A comparative study of different Location based protocols has also presented in the paper.

EXTENSIVE STUDY OF VARIOUS LOCATION BASED PROTOCOLS

Geographic adaptive fidelity (GAF)

Geographical adaptive fidelity is an energy aware routing protocol. It is based on energy consumption during the transmission and reception of data as well as during the idle time to maintain the level of fidelity. In GAF, the sensor field is divided into grid squares; each sensor uses its position information to associate with the other grids [8]. Nodes in the same grid are considered equivalent in terms of cost of packet routing [11]. The location information is provided by GPS or other location systems [8]. GAF consists of three stages. First, the route or the grid area has to be discovered, second, all the non-active nodes go to sleep and the active nodes indicate about their participating in routing in order to save the energy and finally the packet is transmitted to the destination. The sleeping or the inactive nodes adjust their sleeping time in order to maintain the routing fidelity. These nodes must wake up before the leaving time of the active nodes expires and one of them must become active [12].After the routing is over, all the nodes automatically go to sleep. GAF performs better than ad hoc routing protocol as far as latency and packet loss is concerned, thus enhances the lifetime of the network and save energy [9].

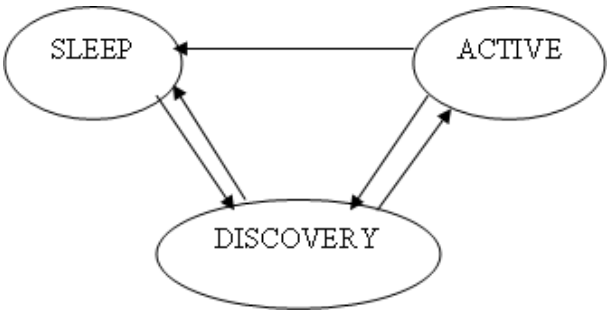

Fig. 1: State transition diagram

The [Fig. 1] represented the State Transition Diagram for GAF which consists of three states. Two states are the sleeping and active nodes. The third state is the discovery. In this state, a sensor exchange messages with other sensors within the same grid, i.e, it communicates with the other sensor nodes [8,11].

The GAF protocol turns off all the unnecessary nodes, which makes it energy efficient and it can be implemented for both mobile and non-mobile nodes. This protocol uses more number of nodes, hence it [Table 1], given below represents the various modifications in GAF protocols for better application.

Coordination of power saving with routing(SPAN)

Similar to GAF algorithm, SPAN technique also work on power conservation without compromising the capability, capacity or the connectivity of the nodes[18]. In this technique, a node is selected as a coordinator node from all the nodes in the network to participate in routing. Thus, it forms a backbone network which participates in actual routing, while the other nodes in the network turn off their radios to conserve energy[19]. To avoid congestion, the capacity and the backbone network formed by the awake nodes must be equal to the total capacity of the original network [20]. Load balancing is achieved by rotating the role of coordinator node among all the nodes in the network.

SPAN uses local information to know about neighboring nodes and elects the coordinators. Coordinators are elected in such a manner that every node is covered by its radio range. Unlike GAF, a node can be only in two states: coordinator and non-coordinator. A node participates in routing by considering two factors: the energy remaining in the node and the number of neighbors it can connect by using up its

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battery life. This ensures maximum connectivity is achieved with least possible number of active nodes, thus maintaining the longer lifetime of the network [19] and also confirms higher probability and a capacity preserving backbone. The nodes tend to consume approximately the same amount of energy. Using SPAN, the network lifetime is doubled without significant performance degradation [20].

Table 1: Various modifications in GAF protocol

Authors Name	Protocol Name	Objective	Advantages	Challenges/Issues (if any)
Vaibhav Soni et. al. [13]	honeycom virtual Grid(GAF- HEX)	To keep hoop count as low as possible so as to reduce the number of active nodes participating in routing of data packets	Energy efficiency and increased network lifetime. Lesser packet delay	Cannot achieve optimum energy usage
PayalWali et. al. [14]	Energy Efficient Geographic Adaptive Fidelity (EEGAF)	1)To enhance the discovery Stage 2)Reduce Energy consumption 3)Enhance Network lifetime.	1)Improved execution and superior efficiency in terms of dead nodes 2)Balance energy and QoS matrices like throughput and routing overhead.	Requires More Memory
Kun Wag et. al. [15]	McTPGF (Two-Phase Greedy Forwarding)	1)Modify the routing metric of TPGF 2)To enhanced performance on the end-to- end delay	Improved performance on the aspect of end-to-end Delay	Hop count increases
Jitender Grover et. al. [16]	Optimized GAF	1)To improve the discovery phase and reduce the energy used by nodes 2)Increase the Network Lifetime	Simplicity, energy efficient, lesser number of dead nodes, increased data transmission, increased throughput and decreased network routing Overhead	requires more memory
Amandeep Kaur et. al. [17]	Improved Optimized GAF	Improving the network lifetime	Increased energy efficiency, lesser number of dead nodes	

In this protocol the network life time with span is twice better than without span. It also preserves network connectivity for relatively long time. The major drawback of this protocol is its limited scalability. Quality of service (QoS) is also poor for this protocol. [Table 2], represents the various modifications in SPAN protocols.

Table 2: Various modifications in SPAN protocol

Authors Name	Protocol Name	Objective	Advantages	Challenges/Issues (if any)
Benjie Chen et. al. [20]	Energy efficient SPAN	To present a power saving technique for multi-hop and ad hoc wireless network which reduces the energy consumption without significantly diminishing the capacity or connectivity of network.	1)It improves the lifetime of the system. 2) Save significant energy 3) Latency reduced	Density increases
T. Manimek alai et. al. [21]	RA-SPAN (rate adaptive sustainable physical activity in neighborhoods)	To integrate the power saving algorithm of SPAN with dynamic switching of data rates	1) Reduced latency 2) Improved throughput 3) Enhanced packet delivery ratio 4) Reduction in end to end delay	Overhead increases

A. W. Awan et. al. [22]	1)Static mobility model 2)Dynamic mobility model	actor-actor coordination with the help of an efficient event tracking algorithms to target all the sensors	Reliable and efficient Communication with low energy consumption	Cannot work with dynamic clustering
Parminde R Kaur et. al. [23]	Nearest neighbor Node clustering algorithm	To proposed an algorithm based on cluster topology for synchronizing clocks of Sensors	1)Consume less energy 2)Improve synchronization accuracy	
Sachin Sharma [24]	Speed Aware Modified Span	To modify coordinator withdrawal procedure and add average speed of node as a condition for withdrawing	1)Higher Throughput 2)Less packet Loss 3)Latency Reduces	More energy consumption per received packet

Trajectory based forwarding (TBF)

In this method of routing, the packet is routed along a predefined curve. TBF is based on two mechanisms: - source based routing and Cartesian forwarding. In source based routing, route is directed by the source without proper identification of the intermediate nodes and in Cartesian forwarding, decisions taken by each node is greedy and is not based upon the distance between the source and the destination. It uses position instead of routing tables, but defines a single forwarding policy along a straight line[9]. Thus, the intermediate nodes are relieved of using and preserving huge forwarding data tables [8]. In TBF, the nodes must aware of their location relative to a coordinate system. Since the packet overhead increases with the path length, this routing uses one single forwarding policy to determine the next hop position that is the closest to the trajectory fixed by the source sensor[8]. If the positions of the nodes are known, the packet is transmitted to the neighbor node which is geographically nearest to the preferred trajectory. If the destination node is known, the mechanism followed is Cartesian forwarding and the trajectory of packet might be a line [25].Since the names of the forwarding sensors are not included in the given source route, therefore, the maintenance of route in TBF is unaffected by sensor mobility [8].

As it can be visualized from [Fig. 2], discovery, flooding, multipath routing and ad-hoc routing are the major applications of TBF. The main advantage of TBF is its flexibility, i.e, it can work over various positioning systems. It can be considered as a layer between global, ad hoc and local positioning services, and network management services [25]. The reliability and management capability of the network enhances by using TBF protocol. It also helps to secure the network perimeter but this protocol is highly overloaded, which makes it more time consuming. The several modifications done by the researchers for making TBF protocol more efficient is represented in [Table 3].

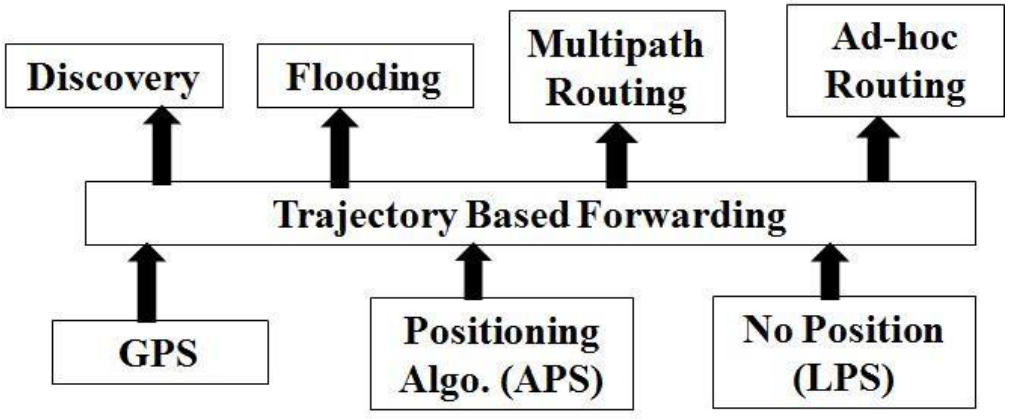

Fig. 2: TBF layer

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Table 3: Various modifications in TBF protocol

Authors Name	Protocol Name	Objective	Advantages	Challenges/Issues (if any)
DragosNiculescu et. al. [25]	TBF (trajectory based forwarding)	To introduce the method of LPS i.e, local positioning system for finding the location of nodes.	Very useful at the times when GPS is not available	Extra computation or communication is required
Chi-En Chan et. al. [26]	TFNP (trajectory based data forwarding with future neighbor prediction)	To extract the future neighbors and its characteristics for forwarding data so that the path would be created according to the sequence in which efficiency is high.	1)More efficient as Data forwarding 2)More accurate 3)Enhanced delivery performance	The server must has accurate trajectory information else there may be delay
Maocai Fu et. al. [27]	TMODF (trajectory based multi objective optimal data forwarding)	To develop a multi- objective optimal data forwarding methodology.	1) Delay reduction 2)Accuracy in data forwarding due to network disruptions and fast topological changes.	Cannot work under the multi object framework
JaehoonJeong et. al. [28]	TSF (trajectory based statistical forwarding)	To investigate the efficient utilization of packet destination vehicle trajectories	It creates an efficient infrastructure which reduces or minimizes the delay in delivery of packets.	Cannot account the partial deployment of stationary nodes

Geographic and energy aware routing(GEAR)

GEAR is an energy efficient protocol which has proposed for routing queries to target regions in a sensor field. The nodes are equipped with the specific hardware such as GPS unit so that the current position is identified by them. The sensors are also aware of their residual energy as well as the location and the residual energy of the neighbors. It uses energy aware mechanism, based on geographical information to select sensors for routing the packets [6]. The packets are spread within the target region towards destination, instead of a particular node, using recursive geographic forwarding scheme. In this scheme, once the packet reaches the target region, the packet is divided among all the nodes. This causes flooding in the target region. So to avoid flooding, the packets send to recursively small sub divisions [29].

The main objective is to limit the region so that the consumption of energy is reduced and improved the network lifetime [30]. It also increases the connectivity of the nodes by dividing the whole region into partitions or subdivisions [29]. The main disadvantage with this protocol is its limited mobility and scalability. [Table 4], shows the various modifications in GEAR protocols.

Table 4: Various modifications in GEAR protocol

Authors Name	Protocol Name	Objective	Advantages	Challenges /Issues (if any)
Bo Tang et. al. [31]	Centralized clustering geographic energy aware routing (GEAR- CC)	Balancing the energy consumption among all nodes in the scope of the global network and find the best route based on global information of the network	Greater energy efficiency and increased network Lifetime	Tradeoff between energy cost and node's residual power
M.A. Koulali et. al. [32]	QoS-Geographic energy aware routing	QoS routing issue is considered taking into account constraint to bandwidth and delay	1)Avoid to link with scarce bandwidth 2)Improved packet delivery Ratio	Lesser sensor mobility
Guodong Wang et. al. [33]	Energy Aware Geographic Routing algorithm (EGR)	1)Balance the energy consumption during perimeter routing 2)Improved the lifetime of the network	Increased Network lifetime and data delivery Rate	It has been assumed that a the nodes are of two-Dimensional type and all of them are aware of their Position through some type of position mechanism

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Mohamed Younis et. al. [34]		network clustering and assigns a less- energy- constrained gateway node that acts as a centralized network manager	Good performance in terms of Network lifetime, throughput and end-to-end Delay	Mobility, network clustering approaches, inter-cluster interaction, operations, and handling of sensor or Gateway failure.
rinda Gupta et. al. [35]	Improved version of the Energy Aware Distributed unequal Clustering Protocol (EADUC)	To improve the working of EADUC,by electing cluster heads considering number of nodes in the neighborhood in addition to the location of base station and residual energy	Increased Network lifetime and effective energy Balancing	

Bounded Voronoi Greedy Forwarding(BVGF)

BVGF is also a localized protocol algorithm which makes greedy decisions based on multi hop neighbor localization. BVGF chooses the next hop neighbor which is nearest to the destination among all the nodes. If two or more nodes are at the same distance from the destination, the source node randomly chooses any one node to be the next hop [18]. This algorithm is based on the concept of Voronoi diagram [Fig. 3]. In Voronoi diagram, the sensor nodes are aware of their geographical positions. In this routing, a packet is forwarded by sensors to their neighbor through the shortest distance from the destination. Sensors, whose Voronoi regions are traversed by the segment line joining source and destination, are selected to act as the next hops. In this protocol, every sensor is allowed only one next hop for forwarding its data, thus the propagation path between source and sink is always involved the same chain of next hope. Due to this identical selection, sensors are severely suffered from battery power depletion. Hence energy consumption is more and considered as one of the demerits of BVGF protocols [8]. The [Table 5] below represents the several modifications in BVGF protocols.

Geographic Random Forwarding(GeRaF)

GeRaF was presented by Zorzi and Rao. In this protocol the root node collect data from outlying nodes directly through a spanning tree. Here the sensor acts like a relay which is not known a priori by a sender and uses geographic routing. The message forwarded by the sender has no surety that it will always be able to reach to the destination node i.e. sink, hence GeRaF is known as best-effort forwarding [40].

GeRaF is a combination of two algorithms, one of them is geographical routing algorithm whereas the other is an awake- sleep scheduling algorithm, due to which sensors are not required to keep track of the locations of their neighbors and their awake-sleep schedules. A source sensor when senses the data, which is to be forwarded to the sink, it first assured that the channel is not preoccupied to prevent the collisions. For the definite period of time if the sensor remains unoccupied, a request-to-send (RTS) message is broadcasted by the source sensor to all of its active neighbors. The message includes location of both the source and the sink. After the RTS message is received by active neighboring sensor, based on locations of itself and the sink, they determine their priorities. The source sensor waits for a CTS (clear to send) message from one of the highest priority region. If no CTS message is received by the source then the highest priority region is considered to be empty. Hence, it sends out another RTS polling sensors in the second highest priority region. This series of action continues till the CTS message is received by the sensor. When the relay sensor found the source, sends its data packet to the selected relay sensor, which replied back with an acknowledgement frame (ACK).The relay sensor will act in the similar manner as the source sensor in order to find the second relay sensor. This process is repeated till the sink receives the sensed data packet emerged by the source sensor.

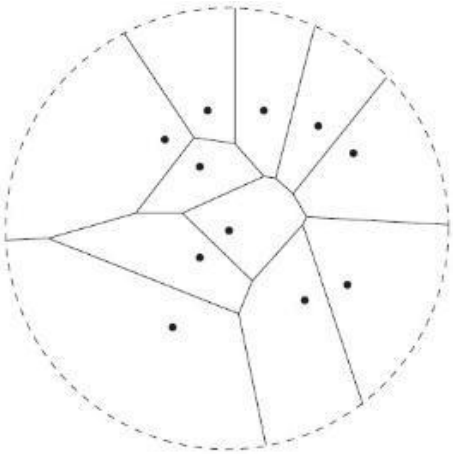

Fig. 3: A Voronoi diagram of 11 points in the Euclidean plane

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Table 5: Various modifications in BVGF protocol

Author's Name	Protocol Name	Objective	Advantages	Challenges/Issues (if any)
Xiaoqing Li et. al. [36]	GRTR	To proposes a geo casting routing based target region(GRTR) to make match road topology in VANET	1)Enhance success rate 2)Reduce flooding	Cannot work effectively inside the region
Habib M. Ammari et. al. [37]	Energy-Aware-Voronoi-diagram-based data forwarding (EVEN)	To propose a sensor deployment strategy based on energy heterogeneity so that all the sensors drain their energy simultaneously	3) Improvement in the network lifetime	Cannot work in three-dimensional WSNs
Kuan Zhang et. al. [38]	VSLP	To enhance the efficiency of packet forwarding and shield the receiver's position	1) Improved the packet delivery ratio 2) Reduce the average packet delay	
Ivan Stojmenovic et. al. [39]	VD-GREEDY and CH-MFR	To propose an algorithm, which forwarded the message to exactly those selected neighbors which may be the best choices for destination	1)Flooding ratio reduces 2)Success rate improved	Cannot efficiently manage the inside region

The main advantage of this protocol is to consume less energy due to its association with awake- asleep schedules of nodes. The sensors are also virtually stateless and don't create the multi hop overhead. On the other hand, it requires more time to achieved efficient output and the involvement of user. [Table 6], below shows the modifications in GeRaF protocols.

Table 6: Various modifications in GeRaF protocol

Author's Name	Protocol Name	Objective	Advantages	Challenges/Issues (if any)
Bin Zhao et. al. [41]	Harbinger	To proposes and analyzes a new cross- layer protocol for ad hoc and sensor networks that unifies the concepts of Geographic Random Forwarding (GeRaF)	1)The nodes in HARBINGER combine transmissions thereby achieving an additional time-diversity benefit. 2)Almost same delay and energy efficiency is achieved by lower density of active nodes	
ZurinaMohd Hanapi et. al. [42]	Dynamic windows implicit geographic forwarding (DWSIGF)	To analysis the impact of black hole and Sybil attacks on the DWSIGF	1)Provide superior protection against black hole/selective forwarding and Sybil attacks 2)high packet delivery ratio	Not much effective, when there is no attack
Andrea Odorizzi et. al. [43]	M-GERAF	To propose a novel data dissemination protocol form multi sink wireless sensor networks	1)Fixed overhead 2)The amount of transmission and the sensor density are uncorrelated	Not effective, when node is mobile
G.Pradeebaa et. al. [44]	Energy saving via opportunistic routing (ENS_OR) and geographic random forwarding algorithm (GeRaF)	1)To reduce the energy during routing 2)To enhance the network lifetime	Reduction in used energy and increase the network lifetime	

Liping Wang et. al. [45]	Cooperative-Random Progress Forwarding (C-RPF) and Cooperative-Nearest with Forward Progress (C-NFP).	To propose a cooperative geographic routing (cGeorouting)for wireless mesh networks	1)Achieved higher average transport capacity 2)Gain enhancement with transmitted SNR	Cannot evaluate the effect of interference

Minimum Energy Communication Network(MECN)

MECN i.e. minimum energy communication network is a location-based protocol. It uses mobile sensors to find and maintain a path which consumes less amount of energy so that the communication network could work efficiently. It takes minimum power from the sensor to the sink node and makes minimum power topology for each other [30].

This protocol transfers the packets of data in two stages. An enclosure graph is made which contains local computation in the nodes and optimal link in terms of energy in the first stage. In the second stage data is transferred using minimum energy with the help of a link which is generated using Bellmen Ford Shortest Path Algorithm [9]. As it is a self- reconfiguring protocol, therefore it suffers from a severe problem of battery depletion in static network [8].

This protocol uses less number of nodes and maintains high connectivity. The major advantage is its self-reconfiguring ability, thus this protocol adapts with the node failure. However it cannot be implemented for mobile nodes and due to the requirement of large sub-network, it is complex in structure.

Small Minimum Energy Communication Network (SMECN)

SMECN protocol was proposed against MECN, in an improved form. In this protocol a minimal graph is characterized with respect to the minimum energy property [8].This property shows a minimum energy efficient path between any pair of sensors, associated with a network. This energy efficient path consumes less energy, as compared to all other possible pairs between the selected sensors. In SMECN protocol, every sensor uses some initial power to broadcast a neighbor discovery message, through which sensor discover their immediate neighbors. Later the information is updated with the usage of power. The immediate neighbors of a given sensor are computed analytically and checked whether the sensors who replied belong to the subset or not. After that the information is communicated to the closest neighbor [46].

The energy consume by this protocol is less as compared to the MECN. Also it required less number of nodes due to the formation of small sub networks for working. Highly connected network and low maintenance cost are the other major benefits with this protocol. As any node in the network can transfer data to the other node, this protocol acknowledges all the possible obstacles in between any pair of node, which introduced more load upon the algorithm. [Table 7] summarize the modifications in MECN and SMECN protocols.

Table 7: Various modifications in MECN and SMECN protocols

Author's Name	Protocol Name	Objective	Advantages	Challenges/Issues (if any)
Ossama Younis et. al. [47]	HEED	To propose a novel distributed clustering approach for long-lived ad hoc sensor networks.	Prolongs network lifetime and the clusters it produces exhibit several appealing characteristics.	Only provided algorithms can work for building a two-level hierarchy
Chuan-Chi Weng et. al. [48]	MTEC	To reduce energy consumption and prolongs network lifetime in user-centric wireless networks.	1)Lower energy consumption 2)Higher network lifetime	Unavailability of a dynamically adjust MAC layer protocol and across-layer protocol to improve network throughput and energy consumption.
W. Chee-Wah Tan et. al. [49]	PMAR	To propose an on-demand routing protocol for choosing a route based on reduction in node battery power and total transmission power to reach the destination	1)Able to restrict control packet flooding during route discovery and pre-empt link breakages because of node mobility. 2)Enhanced network lifetime, number of data packets carried and reduce delay in mobile networks.	the speed and heading direction is not too accurate

Shusuke Takatsu et. al. [50]	Zigzag	To introduce a self-optimizing routing protocol Zigzag in virtual grid networks, which can transform any given inter-cell path to a shortest (or minimum-hop) one by repeatedly applying local updates on the path.	Only on local information are required to update the routers	
D. P. Dahnil et. al. [51]	Clustering protocols	To propose a clustering algorithm that considers node degree to form clusters	1)Minimum energy consumption 2)maintain intercluster connectivity	Not able to find the number of connected nodes in cluster heads

CONCLUSION

To monitor and control industrial equipments at emergency situation, network needs to be designed with optimized routing protocols to deliver the packets in unfavorable conditions through wireless sensor networks. Though introduction of sensors in network helps to create a reliable network but it has opened numerous challenges such as battery depletion, delays etc. Several innovative aspects are needed to be taken care off to establish an advance and efficient wireless and mobile electronic communication through wireless sensor network. From the several protocols of wireless sensor network, Location based protocol proven themselves as an energy efficient protocol, which in turns enhanced the network life time. These protocols work on the basis of position information and find their applications in a number of areas such as industry, home, military, automotive and commerce. In the above discussion, the usages, features and challenges of the several Location based protocol are addressed with their progressive advancement. A comparative analysis has also done with these various Location based protocols in terms of different characteristics shown in [Table 8].

Table 8: Comparison between all the protocols

	Mobility	Power Management	Network Lifetime	Scalability	Query Based	Multipath	Data Aggregation	Overhead
GAF	Limited	Limited	Good	Limited	No	No	No	Moderate
GEAR	Limited	Limited	Good	Limited	No	No	No	Moderate
MECN	Low	Low	Good	Low	No	No	No	High
SMECN	Low	Low	Good	Low	No	No	No	High
SPAN	Low	Limited	Good	Limited	No	No	Yes	High
TBF	Moderate	Limited	Good	Moderate	No	Yes	No	High
GeRaF	Low	Low	Good	Good	No	No	No	Limited
BVGF	Low	Limited	Good	Good	No	No	No	High

CONFLICT OF INTEREST
None

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None

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