Development of link failure problem fastest route recovery with support of Efficient Energy Check Point Route Recovery (E-CPRR) approach

[1]Dr.K. Hanumanthu Naik

[1]Assistant Professor(c),
[1]Department of Computer Applications,
[1]Yogi Vemana University, KADAPA, INDIA.

Abstract : Mobile Sensor Networks (MSNs) is a collection of sensing devices that can wirelessly communicate with each link among all the mobile nodes. In dynamic topology the nodes are free to move and frequently change their positions. Link failure is a major issue of the current wireless mobile sensor network due to node mobility, node energy loss or drain to battery power. The development of Energy Check Point Route Recovery Approach (E-CPRRA) for prevention of node failure in Mobile Sensor Networks. The E-CPRRA is used to detect the energy drain in a node, before the energy of that node is completely drained. The link failure node replaces using static sensor and dynamic sensor node. The sensor nodes are examined by considering energy drain rate and energy backup. This method reduces the energy consumption by detecting effective routes between the sources to destination. Dynamic sensor mechanism is used to find the nearest node whose energy level is high and has less links of a node. The Network Topology Management (NTM) helps to maintain the link between the nodes. The E-CPRR proposes a new routing approach to reduce the energy consumption and to enhance lifetime of the Mobile WSN. The experimental results of the E-CPRR work are compared with proposed and existing works such as Proposed AODV (PRO-AODV) routing. The E-CPRR generates valuable results through NS-2 simulation with several parameter metrics.

***Keywords* –MSN, E-CPRRA, NTM, PRO-AODV, NS-2.**

I. INTRODUCTION

A Mobile Sensor Network (MSN) is a network consist very large number of mobile sensor nodes to gain information from the environment and to communicate with each other sensor nodes. In this paper, the fast route recovery of link failure problem in MSN is done by using energy level computation and Energy Check Point Route Recovery (E-CPRR) approach.

Energy Check Point Route Recovery (E-CPRR) approach is used to detect the energy drain of a node, to replace that node before it is completely drained. This approach is to detect failure node and replaces by the nearest actor node. Reactive type of routing protocol refers to simultaneously selecting the best path between the source and the destination on demand basis. Route recovery process is based on actor node among all sensors nodes communicate in a mobile sensor network. While communication between all the sensor nodes, it consumes more energy than all other operations. The E-CPRR approach that focuses on the fast recovery of failure node is based on the minimum energy requirement during communication among all sensors. The functioning of mobile sensor node is of two types: Static sensor node, maintains the connection links to actor nodes and Dynamic sensor node replaces the node with the failed node after taking backup information.

The Energy Check Point Route Recovery (E-CPRR) approach proposes the steps which involve route discovery, failure node detection, and selection of node replacement process to effect the successful communication in mobile sensor network. Network Topology Management (NTM) technique helps to maintain the link between the nodes to detect when energy loss of a particular node. During node replacement time, there are possibilities for the direct link break between the nodes where NTM technique helps to maintain the links. This work focuses on design concepts of Energy Check Point Route Recovery approach with the help of architecture diagram and design of proposed work.

SENSOR NODES FOR ROUTE RECOVERY PROCESS

Energy Check Point Route Recovery (E-CPRR) Approach function is to find out the energy drain in an actor node, even before the energy of that particular node is completely drained. This check point route recovery approach supports two types of sensor nodes. They are as follows:

- Actuator/Actor node
- Mobile sensor node

Actor node

An actuator node is a sensor node, which is capable of performing sensor processing and gathering sensor information. The actor node is also called an actuator node. Every actor node has a special Internet Protocol (IP) addressing. The nodes communicate wirelessly after being deployed in a sensor network. It will periodically send messages to their neighbours in one hop counts. Missing messages can be used to detect the failure of actor nodes. Once a failure node is detected in the neighbourhood, then one-hop neighbour of failure node would be determined. The impact of the failed node is critical to network connectivity. The Energy CPRR Approach serves the shortest route of all nodes with the support of static and dynamic sensor nodes.

Mobile Sensor node

The mobile sensor node finds the following issues in a mobile sensor network. First it finds out delayed messages or missing messages and also detects the energy drain in a particular node. The functioning of mobile sensor node acquiring with two types of network IP addresses. They are as follows:

a. Static mobile sensor node
b. Dynamic mobile sensor node

Static mobile sensor node

The network IP address in a static configuration setup manually. The static sensor node IP address could not change automatically. The static sensor node monitors each and every actor node and if there is energy loss in any node then it intimate to the dynamic sensor node.

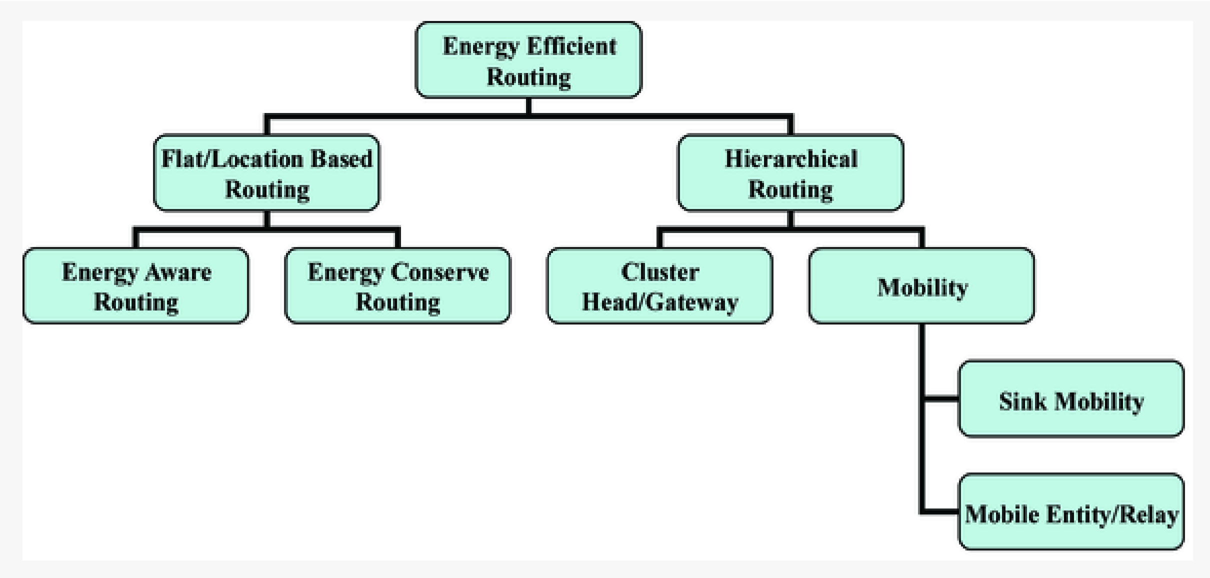
Dynamic mobile sensor node

The network IP address in a dynamic sensor node can change randomly distribution. The dynamic mobile sensor node finds the nearest node whose energy level is high and has the lowest number of links. The dynamic sensor node after receiving the information searches for a node which is nearest to the failure node and whose energy is high. The dynamic sensor node selects a node for replacement based on priority. A failure node will come back it position after gaining all its energy.

II. Survey on Energy Efficient Routing Protocols in Wireless Sensor Networks

This section comprises some of the related works in the area of energy efficient routing protocols in sensor network. The survey is performed by looking into: i) flat/location based routing and ii) hierarchical routing which is further classified into cluster head/gateway and mobility based routing as shown in Figure 1. Flat/location based routing looks into multi-hop routing by employing some energy aware mechanisms such as shortest path, energy aware path, alternate path or additional nodes. Hierarchical routing look into employing intermediate nodes as cluster heads, mobile entities, mobile relays, mobile agents (software or hardware) and gateways. The problems, suggestions and future works discussed in this paper helps in further research and enhancement of energy efficient routing.

Figure 1. Classification of energy efficient routing protocols



Flat/Location Based Routing Protocol

The flat/location based routing protocols discussed in this section mainly looks into using multihop routing. Multihop routing works by having nodes forwarding data from one node to another within the neighborhood. The closest node to the base station would eventually forward data to the base station. Researchers have been using this routing mechanism by exploiting energy efficient approaches. The section below discusses some of the mechanisms exploited. This routing protocol can be categorized into energy aware routing and energy conserve routing.

WEAR: A Balanced, Fault-Tolerant, Energy-Aware Routing Protocol for Wireless Sensor Networks

(Sha et al. 2005) suggests that in order to deploy sensor network in a larger scale, the routing protocol in WSN has to consider four important criteria: energy-efficiency, load balancing, fault-tolerance and scalability. This protocol uses greedy geographic forwarding to achieve scalability as only local information is needed for routing purposes. It is also considered energy efficient as only the shortest path is considered for routing purposes. Load balance is achieved by forwarding messages to sensors with high remaining energy, furthest to the hole and less important. The routing decision in this protocol is made based on the weighed heuristic value which is a combination of four factors described earlier: the distance to the destination, neighbor's sensor energy level, global location information and hole information of the local sensors. WEAR protocol has two different cases or ways on how it is operated. On the first case, it uses weight value to determine the next receiving node. When a sensor node receives a message, it would check whether it is the receiving node. If it is not, it would check the neighbor list to determine the next receiving node based on the smallest weight value. The process continues until the destination is reached. On the other hand the second case works by using two different modes: greedy mode and bypassing mode. The greedy mode works by forwarding the message to destination that is nearer to the destination than the current node. Then the receiving node forwards the message to the node having the smallest weight value. If no node is found closer to the destination, then the routing goes into bypassing mode. Through bypassing mode the routing is performed based on the right-hand rule in (Intanagonwiwat et al. 2000) by forwarding the message to the node that is closer to the destination than the current location where the bypassing mode resumes. This paper looks into the second alternative whereby it is more energy efficient and guaranteed delivery to the destination.

One of the main goals of WEAR is to eliminate holes and not to enlarge the hole. This can be achieved by identifying the hole and propagating the hole information to the sensors near the hole and then modifying the weight of sensors which may lead to different path. Hole information is calculated by using two processes which are hole identification and hole maintenance. Hole identification consists of hole locating, hole announcing and hole propagating. Hole identification is a process of identifying the hole using the three methods mentioned above. Hole locating would identify the hole and the information is propagated to the hole boundary nodes by hole announcing process and the information is further sent to sensor nodes within maximum hops by hole propagation process. One of advantage of this protocol is its energy efficient mechanism and guarantees delivery of data whilst avoiding routing holes.

GEAR: Geographical and Energy Aware Routing: A Recursive Data Dissemination Protocol for Wireless Sensor Networks

Like many other protocols, GEAR (Yu et al. 2001) generally focuses data centric approach where packets are forwarded to all the nodes within a target region and no location database is used for node to detect location identification. Besides that, all sensor nodes in GEAR are assumed to be static and nodes are aware of their current position. The protocol basically focuses on energy aware routing and a geographic based heuristics for neighbor selection. A recursive geographic forwarding technique is used for forwarding data. There are two phases used for forwarding packets to all nodes in the target region. The first approach is to forward packets to the target region in which a packet is always forwarded to a neighbor node which is the closest to the destination. When all nodes are further away from the destination, in which a hole exists, GEAR picks the best node which minimizes the cost value of this neighbor. The second approach is to disseminate the packet within the region by using recursive geographic forwarding approach for most of the cases. This protocols delivers more packets and handles routing hole efficiently.

Energy Aware Routing for Low Energy Ad Hoc Sensor Networks

(Shah &Rabaey, 2002) looks at survivability of low energy networks by maintaining a few alternative good paths for communication instead of identifying one single shortest path. The motivation for this approach is that, instead of using one single path for communication, the protocol would take different path at different times so that the energy at any single node is not depleted easily. It is also easier to respond to nodes moving in and out of network thus minimizing routing overhead. One of the potential problems with current sensor routing protocols is that, the lowest energy route is chosen for most communication. This may not be the best way to choose for network lifetime and at the same time energy depletion occurs along the nodes which lead to holes. The optimal path chosen in this approach tries to solve the problem mentioned above by ensuring the network degrades gracefully rather than causing partition in the network. In this protocol, multiple alternative paths are chosen between source and destination and each path is given a probabilistic value based on the energy metric value. Each time when a packet is sent from a source to a destination, several different paths are chosen based on the probabilistic value. In this case no single node would be used for the entire operation to ensure energy is not depleted easily. Due to the probabilistic nature of the protocol, different routes are evaluated continuously and probabilities are chosen accordingly. The protocol is categorized into three phases:

Setup phase where flooding occurs to find all the routes from source to destination and energy costs are indentified. Routing tables are built at this phase. The destination node would always initiate the connection by flooding the network towards the direction of the source node. The cost field is set to zero initially. Every intermediate node forwards the request to the neighboring node which is closer to the source rather than the destination node. Upon receiving the request, the energy metric of the neighbor that is sent the request is computed and added to the path cost. Paths that incur a very high cost would not be considered to be added into the forwarding table. A probabilistic value of each node is added into the forwarding table. The probabilistic value is inversely proportional to the cost value. In this case each node would have a number of nodes to which it can forward the packets. The average cost of reaching the destination is calculated by using the values in the forwarding table.

Communication phase where data is sent from a source to a destination is based on the probabilistic value and energy costs are identified at setup phase. Several different phases are used at this phase. Each of the nodes forwards data packets to a randomly chosen neighboring node from the forwarding table with the probability of the neighbor chosen is equal to the probability in the forwarding table. Route maintenance – flooding is performed infrequently to keep all the nodes and paths alive.

As compared to directed diffusion (Intanagonwiwat et al. 2000) routing protocol, this protocol shows that the traffic is spread over the network which results in a much 'cooler' network. The nodes in the center of the network consume energy for a longer period and the time lapse for energy conservation has increased. The average energy consumption per node has been reduced due to the low overhead of the protocol. Besides, energy differences between nodes have been reduced as well. The increase in network lifetime shows that this protocol takes a long time for the energy to be aware that network has failed as compared to directed diffusion. As a conclusion, this protocol is suitable for low energy and low bit rate networks and taking the lowest energy route is not necessarily the best solution for network lifetime. Thus, using the simple way of sending traffic through different routes using probabilistic forwarding may help in utilizing the resources more effectively and not adding much complexity at a node. The deployment of multiple paths instead of relying on single path allows energy at single node is not depleted easily.

Highly-Resilient, Energy-Efficient Multipath Routing in Wireless Sensor Networks

Earlier works that have been focusing on creating single path for dissemination of sensed data lead to a problem of flooding of data to a failed node. Such flooding effect can give impact on the lifetime of the network. So (Ganesan et al. 2001) proposes a multipath routing to increase the resilience of node failure in which, while a path is established between source and sink, an alternative path could be established to minimize the effect of flooding. There are two different multipath routing proposed in this protocol, disjoint multipath and braided multipath. The use of multipath routing allows energy utilization to be spread throughout the nodes that leads to load balancing. Moreover, duplicate delivery of data increases the accuracy of surveillance tracking. The actual reason for the use of multipath in this protocol is to identify alternative path between the source and the sink. Approach from these available paths, the best path (primary path) based on low latency, low loss etc. can be identified. And in situation where the primary path fails, the alternative path could replace the former. This eliminates the problem of flooding the network when the primary path fails. There are very rare occasions where both the primary and alternative paths fail at the same time.

III. Energy Check Point Route Recovery Approach(E-CPRRA)

The Mobile Sensor Network (MSN) sensing action on actor nodes and disconnection of link in a node must be considered. Static and Dynamic sensor nodes to develop alink failure problem in actor nodes with the help of the energy level of a sensor node. Let $A= \{A_1, A_2, \ldots\ldots\ldots\ldots, A_n\}$ be the set of actor nodes participating for the routing in a mobile sensor network. Let M_1 and M_2 be a pair of mobile nodes using sensors in A as a neighbour nodes.Data packets are to be routed from M_1 to M_2 through an optimally chosen set $A' \subset A$ of neighbour actor nodes by forming communication links.

Let E^i_{max} and E^j_{min} denote the maximum and minimum actor node energies at Actor $A_i$and A_j. Then the shortest route from m_1 to m_2 will be optimal if

$$E^{i}_{max} - E^{j}_{min} < \xi(\delta M_k) \qquad (3.1)$$

Where ξ zero or inversely proportional to energy nodes will favour the formation of routes through high-energy nodes. (δM) is the difference between theshortest routes from A_i to M_k.

Let the maximum energy of neighbour actor node route denote the one obtained by following the maximum energy nodes from m_1 to m_2 such that a route is formed. The maximum energy of neighbour actor node route will be optimal if

$$(\delta E) > \xi(l_d - l_s) \qquad (3.2)$$

Where (δE) is the difference in energies between the maximum and minimum of neighbour actor nodes of A_i.

The $l_d$and l_s are the lengths of the maximum energy and shortest routes from A_i, respectively.

Energy efficiency of a sensor node is there in maintaining a backup node and in creating a link between two or more sensor nodes.

3.1. Selection of node for replacement

The node which is selected for replacement should have high energy and should be nearest to the failure node. The selected node for replacement should have less links to remaining nodes. If the static node detects energy loss in a particular node then it informs the dynamic node that the particular node's energy is about to drain.The static node intimates the dynamic node through signals. The dynamic node, after receiving the information, searches for a node which is nearest to the failure node and whose energy is high. The dynamic node selects a node for replacement based on priority.

The dynamic node which is in mobility searches for a node which is nearest to the failure node. The dynamic node finds a node whose energy level is high and who has lesser links when compared to other nodes. When the dynamic node replaces the failure node with another node, that particular node takes all the backup from the failure node. The node which took backup will do all the functionalities of the failure node until the failure node has retained its energy. When the failure node has regained all its energy, it will come back to its position. The static node and the dynamic node are the main functionalities done with the help of Energy Check Point Route Recovery (E-CPRR) approach.

3.2. Network Topology Management Technique

The node replacement is done by Network Topology Management (NTM) technique. The Network Topology Management technique is helps to maintain the link between the nodes when energy loss is detected in a particular node. During the node replacement time, there are possibilities for the failure of direct links between nodes. In such cases the NTM technique to maintain the links between the nodes without affecting the packet transmission.

The network topology management techniqueis also be considered as failure management process. Network topology management must function as self-healing and serve as a failure handling service.

A sensor has $m_1$mobile neighbour nodes it can communicate with m2 mobile neighbour nodes. During node replacement time, the NTM operates some sensor nodes do not stop working and loss their link functionality. The network topology management will calculate the distance between m_1 and m_2 nodes communication coverage range (R). It will recalculate the distance threshold (d_{th}) and sensing radius(r) of m_1, m_2 mobile nodes, and then follow the replaced procedure to adjust their links using the following:

$$R_2 = R_1 . \frac{m_1+1}{m_2+1} \qquad (3.3)$$

$$d_{th2} = \sqrt{\frac{2}{\sqrt{3}}} R_2 = \sqrt{\frac{m_1+1}{m_2+1}} \, . d_{th1} \qquad (3.4)$$

$$r_2 = \frac{d_{th2}}{\sqrt{3}} = \sqrt{\frac{m_1+1}{m_2+1}} \, . r_1 \qquad (3.5)$$

where all subscripts "1" refer to the value before self- healing process starts, and the subscripts "2" refer to the new calculated value.The network topology management technique is structured by repositioning nodes from the various segments in order to re-establish connectivity. This process takes place continuously, due to the rush environment, limited energy and hardware resources in Mobile Sensor Network.

The design of the proposed work is done with initial set up of the route discovery method of sensor nodes, and calculates the energy level of static sensor nodes. Each actor node connects to all others nodes. The communication is possible between actor node and dynamic sensor nodes.

The functioning between actor, static and dynamic sensor nodes are denoted by flow lines. The functioning behaviour and specific flow of event with E-CPRR mechanisms represented in the following figure 2.

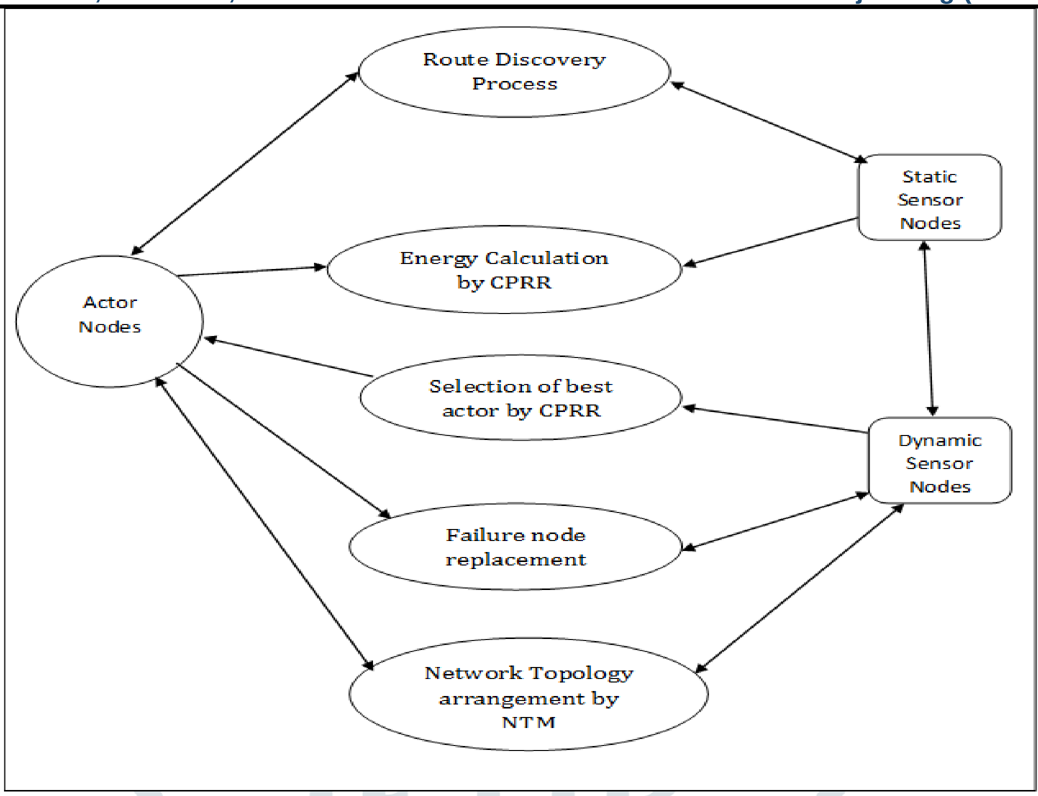


Figure 2: The functioning and design of the Energy CPRR Approach

IV. RESULTS AND DISCUSSION

In wireless sensor communication, a measurement of framework, and an analysis of data packets are developed to level the traces. This work paves a way for improving the route establishment process of mobile sensor networks through two different approaches based on energy level of sensor nodes. In this section, the most prominent experimental results of the E-CPRR is compared with the first method such Proposed Ad hoc On Demand Vector (PRO-AODV) mechanism. The Energy Check Point Route Recovery (E-CPRR) methodology is expected to produce better results, when compared with PRO-AODV mechanism.

4.1. Simulation Environment

The performance of the Energy CPRR result is evaluated. NS2 [12] is used for carrying out the simulation. The network simulator generates two types of files. First file is network animator (NAM) and second one is trace (result) file. 200 sensor nodes are distributed randomly over 500 x 500 m network region. The time taken for each simulation is 150 seconds.

The simulation parameter values of each data packet size (512bits), support of AODV routing protocol and The simulation model of energy parameter values such as initial energy (100J), radio transmission power (35mW), receive power (40mW) and idle power (7mW) of sensors. The energy consumption for switching between awake and sleeping modes is negligible and thus not considered.

4.2. Performance metrics

The performance metrics employed in this work are route detection time, energy consumption by varying the number of nodes and the network lifetime analysis is made with time in a mobile sensor network. The results of the performance of E-CPRR mechanism is evaluated using NS-2 [76] and they are compared with those of PRO-AODV mechanism. The performance of quantitative parameter metrics results are described and after that the performances of metrics results are compared with the both two mechanisms such as E-CPRR, PRO-AODV for the simulation evaluation.

4.3. Simulation Evaluation

The performance of the proposed work is evaluated in NS2 simulation. The proposed work is simulated by using NS2 with 200 sensor nodes, which are distributed randomly configure over 500 x 500m network region. The performance of parameter metrics employed in this work such as energy consumption and route detection time. In simulation graphs, the analysis of first the proposed (PRO-AODV) and second proposed (E-CPRR) work are compared.

A. Energy Consumption with Respect to time

Energy consumption calculates the present energy of all nodes are subtracted from initial energy of all nodes. This calculates the total energy consumed by the node with respect to time.

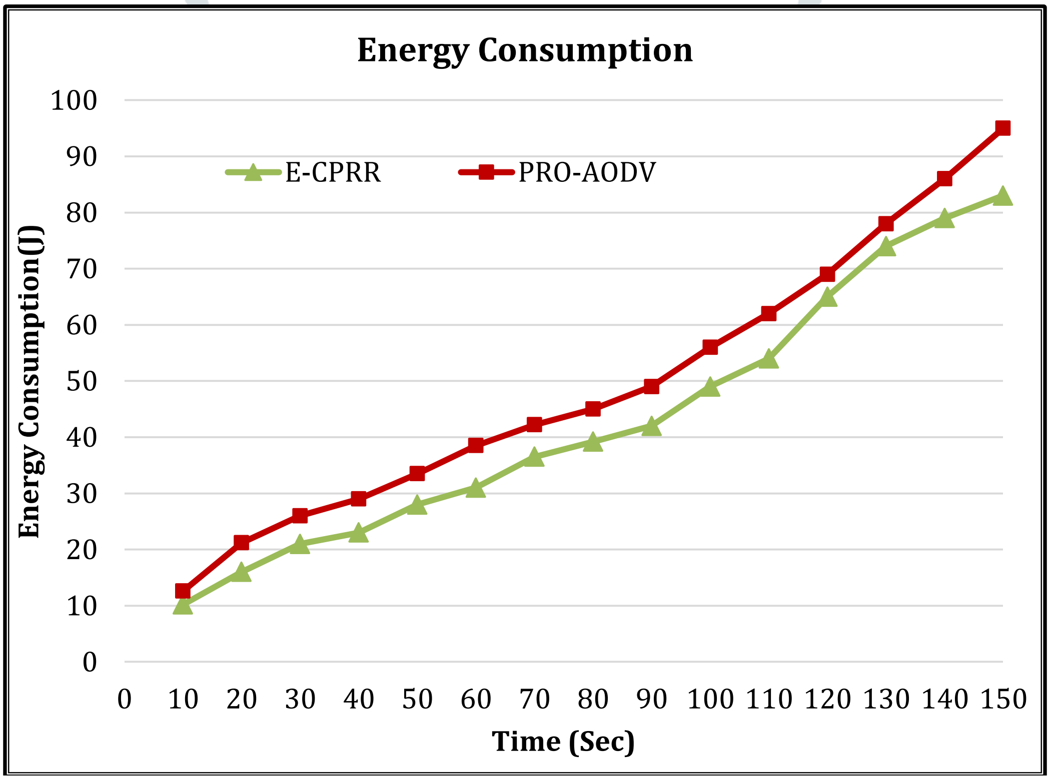
$$\text{Energy consumption} = \text{Initial Energy} - \text{Present Energy} \qquad (4.1)$$

In the following table 4.3, it is observed that the energy consumption of PRO-AODV, E-CPRR results are displayed with respect to the simulation time varies from 10 to 150 seconds.

Table 4.1:Energy Consumption Analysis

Simulation Time	Energy Consumption(J)	
	PRO-AODV	E-CPRR
10	12.6	10.2
20	21.2	16.0
30	26.0	21.0
40	29.0	23.0
50	33.5	28.0
60	38.5	31.0
70	42.2	36.5
80	45.0	39.2
90	49.0	42.0
100	56.0	49.0
110	62.0	54.0
120	69.0	65.0
130	78.0	74.0
140	86.0	79.0
150	95.0	83.0

In the following below figure , the simulation time is represented on x-axis where the energy consumption measured in joules is represented on y-axis.



Energy Consumption with respect to Time

In the above figure, the energy consumption values of E-CPRR and PRO-AODV varies from 10.2 to 83 and 12.6 to 95 joules respectively. It is proved that the E-CPRR consumes the less energy when compared to PRO-AODV method. It is obvious that when energy consumption is less, the lifetime of network may be maximized.

The proposed approach of E-CPRR chooses the best route with maximum number of mobile sensor nodes. As the energy consumption is very less, the node can survive for a long time. When all nodes can survive for a long time, obviously the lifetime of a mobile sensor network is enhanced.

B. Route Detection Time with respect to Number of nodes

Route detection time is the time it takes to find an optimal route with respect to number of nodes.The formula is given the time at which the route is found is subtracted from the start time of route discovery.

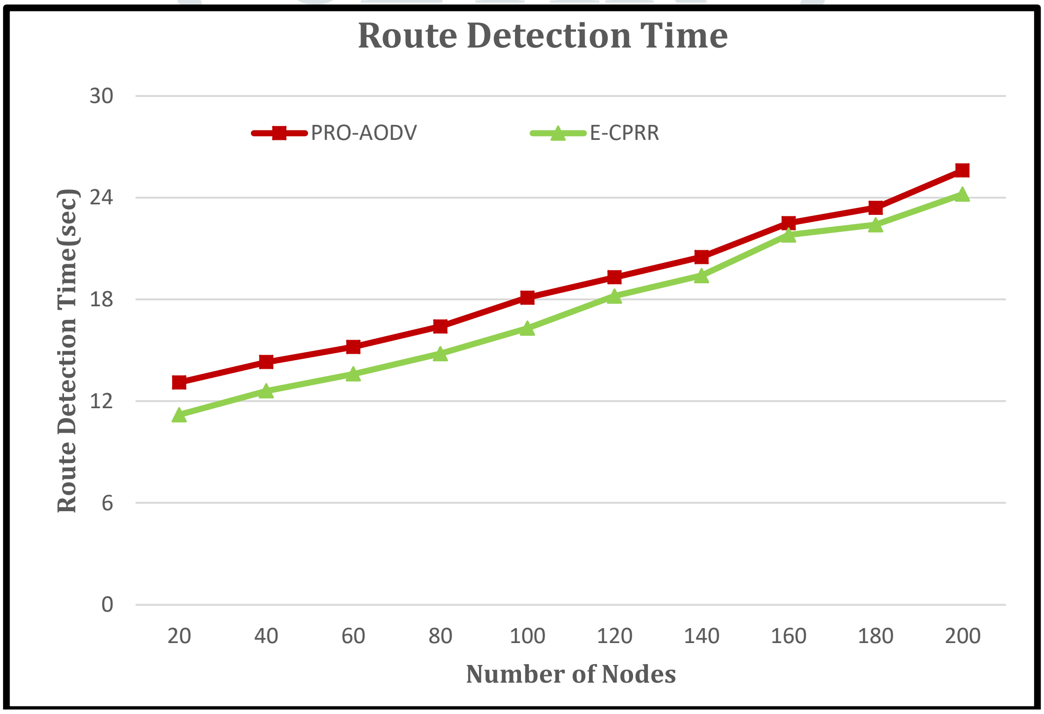
$$\text{Route Detection Time} = \text{Route Discovery Time} - \text{iniatial Time} \qquad (4.2)$$

Table 4.2. Route Detection Time Analysis

Number of Nodes	Route Detection Time (sec)	
	PRO-AODV	E-CPRR
20	13.1	11.2
40	14.3	12.6
60	15.2	13.6
80	16.4	14.8
100	18.1	16.3
120	19.3	18.2
140	20.5	19.4
160	22.5	21.8
180	23.4	22.4
200	25.6	24.2

From the table 4.2, as number of nodes is varied from 20 to 200 the route detection time is measured in seconds for E-CPRR and PRO-AODV. The results are tabulated.

In the following below figure, the number of nodes is represented on x-axis and the route detection time measured in seconds is represented on y-axis.



Route Detection Time with respect to Nodes

In the above figure, the E-CPRR frames the route in the least time (24.2) sec, whereas PRO-AODV frames the route is (25.6) sec. It is obvious that if the routes are detected in a streak, then the energy requirement is minimized.

C. Energy Drain Rate

The draining rate of energy for different sensor nodes like actor, static and dynamic nodes are calculated. The draining rate of energy in particular node is calculated by using

$$E_{DR} = \frac{E_{initial} - E_{ramain}}{(Tc - Tp)} \qquad (4.3)$$

Whereas, E_{DR} is Energy Draining Rate

$E_{initial}$is Initial energy of Particular node

E_{remain} is Remaining energy of Particular node

Tc − current time

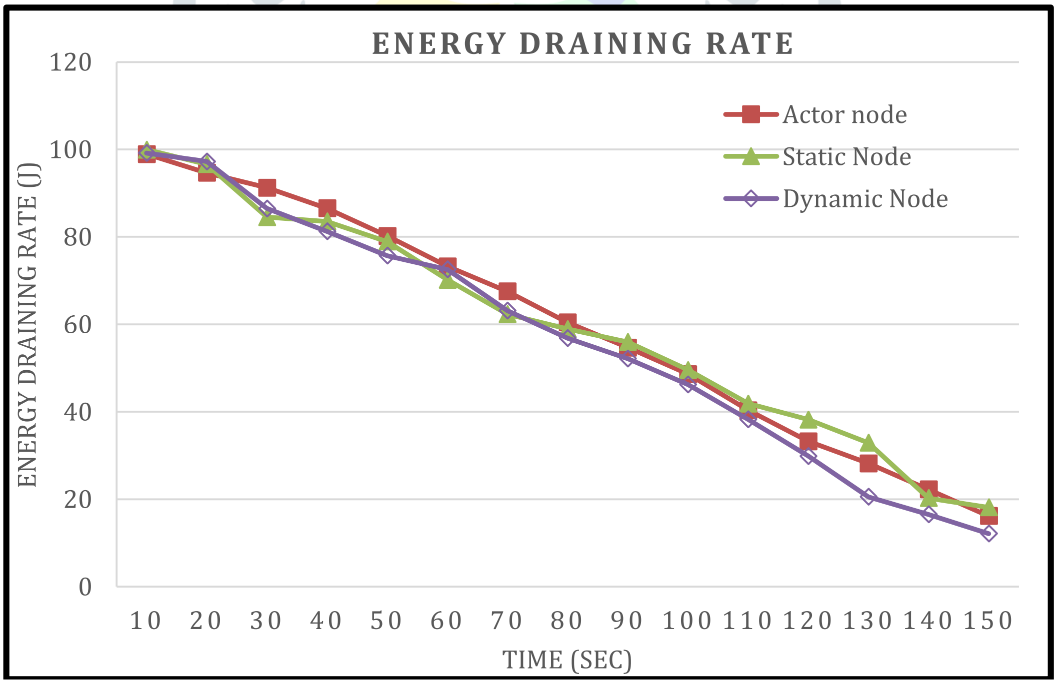
Tp - previous time

Table 4.3: Energy Draining Rate of all sensor nodes

Simulation Time (sec)	Energy Drain Rate(J)		
	Actor node	Static Node	Dynamic Node
10	98.91	99.95	99.19
20	94.65	96.61	97.23
30	91.23	84.52	86.49
40	86.53	83.52	81.24
50	80.2	78.93	75.68
60	73.25	70.19	72.54
70	67.52	62.32	63.12
80	60.4	58.92	56.82
90	54.68	55.96	52.14
100	48.59	49.56	46.23
110	40.32	41.86	38.25
120	33.25	38.21	29.86
130	28.19	32.89	20.54
140	22.21	20.26	16.52
150	16.14	18.12	12.14

In the above table 4.3, it is noticed that all the three sensor nodes have 100 joules of energy to begin with. The draining rate of energy is counted in joules. Energy draining rate of all sensor nodes decreases as the time increases and the drain rate of actor and static nodes decreases slowly when compared to the dynamic node decreasing the energy at faster rate.

In the following below figure, the simulation time is represented on x-axis varies from 10 to 150 sec. The energy draining rate of all sensor nodes is measured in joules is represented on y-axis.



Energy Draining Rate of all sensor nodes

In the above figure, it is observed that the draining rate of energy in all the sensor nodes increases as time increases. Among the three sensor nodes, the dynamic sensor node drains energy at faster rate.

The proposed work reduces the energy consumption by detecting effective routes between the source and destination. When effective routes are framed, the data or packets can be forwarded without any overhead. The communication overhead is directly proportional to the energy requirement. Thus, the transmission is made fast and the energy is effectively utilized. The proposed approach E-CPRR chooses the best route with maximum number of mobile sensor nodes.

The simulated results show that the E-CPRR Approach can reduce the energy consumption effectively, and also decreases route detection time for overall performance, when compare to PRO-AODV mechanism.

V. CONCLUSION

The main emphasis of this paper is the design of Energy Check Point Route Recovery (E-CPRR) Approach to detect failure node and replaces the nearest actor node. The E-CPRR Approach proposes the steps which involve route discovery, failure node detection, and selection of node replacement for sensor node and communication links in a mobile sensor network. Network Topology Management (NTM) technique helps to maintain the links between the nodes. The proposed E-CPRR is to improve the route establishment process, also reduce link failure problem and design for prevention of a node failure in Mobile Sensor Networks. The performance of E-CPRR approach measured by performance metrics such as energy consumption, route detection time and energy drain rate. The experimental results are compared with the PRO-AODV mechanism and comparative study is represented with graphical analysis.

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