Design Paper on Routing protocol for underwater wireless sensor network

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Abstract:

Due to the huge demand in underwater wireless sensor applications it has attracted many of researchers to work in this area. One of the most important need for underwater wireless communication is that communication between devices with the help of sensor technology. For communication there is need of routing protocol. Now a day's number of routing protocols exist as per demand of the application. Each of these routing protocols have their own advantages and disadvantages. By considering this need so as to overcome the problem in our proposed system we have tried to design a new energy efficient , lifetime enhancing , QOS providing optimum routing protocol. This protocol is designed in such a way that so as to get less consumption of energy, maximum throughput, less delay in communication and achievement of maximum packet delivery ratio.

Keyword: routing protocol, energy efficiency, Network life, UWSN, PDR, Throughput

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Introduction:

Now a days no one field remains untouched by that of IOT. As we know due to climate change there is very risky to work in application areas of under water. So there is need of technology which can work without actual presence of human being. Keeping this in mind the various routing protocols are designed for communication between various devices which are working under water. For data transmission under water the points need to remember is that energy consumption, Network life, packet delivery ratio, throughput, quality of service etc. While at the time of communication most of the energy is used by nodes and every node in network has assigned less energy because of its cost. Like terrestrial network we cannot use radio waves for communication in underwater due to in infeasibility [1]. As per study there is need of such a routing protocol which improves the network life. Also it will provide a quality of service, maximized throughput, increased PDR ratio. Such a type of energy efficient, network life

increasing and assuring quality of service, IOT based routing protocol's design part is introduced in this paper.

Section II introduces about routing protocol literature survey. Proposed system design is described in section III with its architecture, hardware and software requirements. Paper ends with conclusion remarks of proposed system in section IV.

I. Literature Review:

Here in this section we are going to review few of the existing work carried out in the field of routing protocols for under water wireless sensor network.

Sr. No	Algorithm	Description	Limitation
1	AURP - Autonomous Underwater Vehicle AUV-aided Underwater Routing Protocol [2]	AUV as relay nodes with short range and huge value of data rate for transmissions in underwater channel has been proposed. Communicating between the underwater sensor nodes to the sink relies upon relay nodes which are analogous to AUV with controlled mobility.	However, the extra energy cost involved by AUV makes this protocol unsuitable for underwater sensor networks.
2	GEDAR: Geographic and opportunistic routing protocol with Depth Adjustment [3]	Local maximum routing recovery uses a network energy consumption model based on the communication range (nodes within the transmission range) and carrier sensing range (nodes that exclude the other nodes within the communication range), where the carrier sensing range was greater than the communication range. When a node has been struck with voids, it increases its communication range by adjusting its transmission power to overcome voids. Initially, each node tries to route towards a	The problem with this type of approach was increasing the communication range also increases the interference from other nodes.

		node with minimal hops and energy consumption.	
3	Optimal hop position-based minimum energy routing protocol [4]	Based on the forwarding criteria of depth, residual energy and optimal distance from the source. The source node provides flexibility in transmission power according to the destination so that the signal reaches with the same transmitted power.	Uses courier nodes which are similar to Autonomous Underwater Vehicle (AUV) and in turn increases the excess energy cost rather than focusing on internetworking with sensors.
4	WDFADDBR: Weighting depth and forwarding area division DBR routing protocol [5]	Here multi-sink architecture with anchor nodes, relay nodes and sink nodes has been discussed. The relative coordinates of nodes are being available based on the RSSI (received signal strength indicator). It uses the criteria of depth of the present forwarder and then anticipates depth of the adjoining hop of forwarding node with lower depth. Packet holding time has been calculated by weighting of the aggregate which is between 0 to 1 weight value and the depth difference of the two hop neighbour. Efficient use of energy consumption has been optimized by dividing the forwarding area which has been classified as primary forwarding area and auxiliary forwarding area using nodal density and channel state it avoids duplicate packet transmission.	The problem with this protocol imposed the design on RSSI which determines the relative distance between the node and any deviation will lead to communication void.
5	Energy efficient chain based	Complete network is divided into clusters. Each of this cluster is nothing but sub	To make use of fixed and mobile nodes ie. hybrid

	routing protocol [6]	region. Here each of sub region consists of cluster head and relay nodes. Each of cluster head collects data and transmit that data to next higher level sub region. In higher sub region transmitted data is submitted to cluster coordinator. To forward data normal nodes cooperate with local sub regions relay nodes. To avoid the transmission of duplicate data packets cluster heads and relay nodes are allowed to store that data. Here communication is location free which is based on nodes hop count and confidence level.	network with various ML based algorithms for getting better performance.
6	EECOR protocol [7]	Data packets are forwarded to sinks on the surface. Based on forwarder local information, source node first determines the forwarding relay set. Then by considering probability of packet delivery and consumption ratio of energy there is selection of best relay is done. This selection is done by use of FLRS ie. Fuzzy logic based relay scheme. The lifetime of network can be improved. Due to collision occurrence in between the sensor nodes much of energy is wasted. So as to avoid this authors have introduced concept of timer to every forwarder. EECOR gives better performance related to consumption of energy, delivery ratio of packets, end to end delay and lifetime of network.	Selection of forwarding relay set is most important.
7	Balanced	The problem of inefficient and imbalanced	However the problems with

	Energy consumption based Adaptive Routing Protocol (BEAR) [8]	utilization of energy is solved with the use of this protocol. Here the network is logically divided into sectors like intra sector and inter sector for balancing consumption of energy. The functionality of BEAR protocol consists of mainly three phases: 1) Initialization 2) Construction of tree and 3) Transmission of data.	this are: (a) this protocol consider only two parameters such as residual energy and location of nodes while forming the tree, however the other parameters such as packet delivery probability and nodes degree not considered which may creates the data loss problem and unreliable communications. (b) The UWSNs are large-scale and may consist of 1000s of sensor nodes, the BEAR protocol may failed to achieve the efficiency for such networks due to their complex steps of data transmission.
8	Totally opportunistic routing algorithm (TORA) [9]	An anycast, geographical and totally opportunistic routing algorithm for UWSN called TORA proposed. This protocol is designed to avoid horizontal transmission, reduce end to end delay, overcome the problem of void nodes and maximize throughput and energy efficiency.	Enhancement in performance is possible.
9	SORP[10]	The void and trapped nodes are locally detected in the different area of network topology to be excluded during the routing phase using a passive participation	Performance in case of energy efficiency and reliability can be improved.

		approach. SORP also used a novel scheme to employ an adaptive forwarding area which can be resized and replaced according to the local density and placement of the candidate forwarding nodes to enhance the energy efficiency and reliability.	
10	CMSE2R[11]	There is need of such a protocol which increases the battery life and link communication in between communicating nodes for underwater WSNs. So CMSE2R is introduced which works in four phases like setting up network, forming cluster, multipath development , data forwarding by keeping in mind to get shortest path and link quality.	Shortest Path identification can be done with latest algorithm.

II. Proposed System:

Here in this section we will cover basic information about our proposed system describing information like problem statement, research objective and proposed system architecture along with systems hardware and software requirement for implementation purpose.

a. Problem Statement:

To alleviate the current research challenges of IoT based underwater WSNs, in this research work there is attempt to present the cost aware and energy efficient routing protocol. The novel energy balancing adaptive routing protocol proposes in this work which intelligently utilizes the energy of the nodes and ensures the network connectivity for a longer period of time. This method reduces as well as balances the energy consumption by utilizing the computed optimal number of zones.

b. Research Objectives:

The aim of this research is to propose novel routing protocol for small and large UWSNs with goal of achieving the energy efficiency with guaranteed QoS performance using the mechanism of optimal data forwarding algorithms by exploiting the optimization algorithms. They key research objectives are:

- To design the various IoT enabled UWSNs with and without sensors mobility with multiple surface sink nodes.
- To propose algorithm of data forwarding based on GA and PSO optimization algorithms individually using the sensor nodes local parameters for cost computation.
- To model, simulate, and evaluate the proposed algorithms with state-of-art methods.

c. Architecture of proposed System:

Following figure (Fig. 1.) shows general architecture of proposed system. The sensor node with data to transmit is considered as the source node. The sensor node sense the periodic data in ocean and event rise to transmit the sensed data towards the surface sink node. The source sensor node initiates the process of forwarding path discovery by finding its neighbours nodes and broadcasting the request packet. All the sensor nodes discovered as neighbours of source will act as the particles in case optimization methods. With these source nodes the process starts with discovering neighbouring nodes which are called as particle initialisation. For selection of best relay node we will initially assume any one node as a best node which will be compared with remaining nodes which are assumed as next best node. Once the best node assumption is done for each of the remaining nodes are computed based on four different fitness criteria's like Remaining energy, Packet delivering probability, Distance to sink and Node degree. The node/particle having optimum value will be our next best node by comparing with existing assumed initial best node if it is not then previously assumed best node will be treated as best node and process will continue for remaining neighbouring nodes identification and selection as a best relay node. We will continue until we reach towards surface sink node or either we finish all the nodes from input set. Once we have reached from source to sink particle identification data transmission will start.

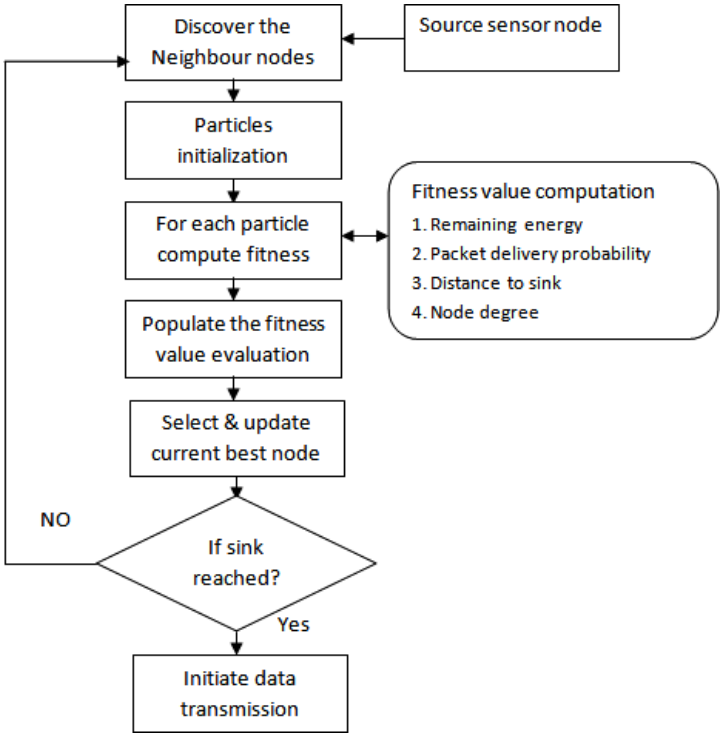

Fig.1. Architecture of Proposed System

Detailed implementation of such a routing protocol as per research objective is shown in Paper [12] which describes about hybrid approach of an EORO routing protocol.

d. Hardware and Software Requirements:

This section describes the hardware and software requirement for implementation purpose. Required software contains programming language as C or C++, operating system is Ubuntu, we can use VMware tool and for simulation NS2 simulator. Processor required will be Pentium 4.0 or higher along with storage space requirement of minimum 40 GB. Operating system might be 32-bit or 64-bit and RAM requirement will be of minimum 3GB.

III. Conclusion:

Due to increased use of underwater wireless sensor network in various aquatic applications there is need of energy efficient network with a good quality of service in communication. Here we have seen various existing routing protocol for UWSN. These protocols are getting more and

more better performances as compared to previous system. In today's era there is need to work on such a routing protocol which gives better performance and can be applicable for all situations. There can be use of new technologies like Machine learning algorithm, AI or IOT in the area of UWSNs for getting better performance. So as per this requirement proposed system introduced designing of such a type of network routing protocol for under water wireless sensor network. Thus we have seen design of such a energy efficient, IOT based routing protocol which is useful for enhancing the life of underwater wireless network.Proposed system described along with its architecture, hardware and software requirements. It ensures about quality of energy efficiency as compared to existing routing networks.

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