PERFORMANCE AND EVALUATION OF "UNDER WATER TARGET DETECTION" ROUTING PROTOCOL USING MATLAB 11

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Abstract

In this paper we were able to explore to under water routing protocols named VBF /DBR and Target detection technique called AIC. This research was conducted to find how good is the under water routing protocols to deliver its information to the monotoring station as fast as possible. Our effort has been to find detection rate & measure the efficency of system in terms of PDR & PLR.

Keywords- PDR ; PLR ; Sensor; Target ;

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1. INTRODUCTION

There are several promising technologies for detection of under water target each technologies has its own strength and weakness .In a recent to begin we are introduction the various posible ways the target can be detected in under water.The importance of various underwater routing protocols for reliable delivery of target information to the montroing station /sink.

Sensor networks represent a significant improvement over traditional sensors, which are deployed in two ways .Firstly Sensors can be positioned far from the actual phenomenon, i.e., something known by sense perception. In this approach, large sensors that use some complex techniques to distinguish the targets from environmental noise are required.Secondly Several sensors that perform only sensing can be deployed. The positions of the sensors and communications topology are carefully engineered .They transmit time series of the sensed phenomenon to the central nodes where computations are performed and data are fused.

A sensor network is composed of a large number of sensor nodes, which are densely deployed either inside the phenomenon or very close to it. The position of sensor nodes need not be engineered or pre-determined. This allows random deployment in inaccessible terrains or disaster relief operations. On the other hand, this also means that sensor network protocols and algorithms must possess self-organizing capabilities. Another unique feature of sensor networks is the cooperative effort of sensor nodes.

2. Major Challenges in the design of underwater wireless sensor networks for Target Detection

Major challenges in the design of underwater wireless networks are discussed below.

• The available bandwidth is severely limited in underwater communication.

• The underwater channel is severely impaired, especially due to multi-path and fading.

• Propagation delay in underwater is five orders of magnitude higher than in radio frequency (RF) terrestrial channels, and extremely variable.

• High bit error rates and temporary losses of connectivity (shadow zones) can be experienced, due to the extreme characteristics of the underwater channel.

• Underwater sensors are prone to failures because of fouling and corrosion.

3. Related Work:

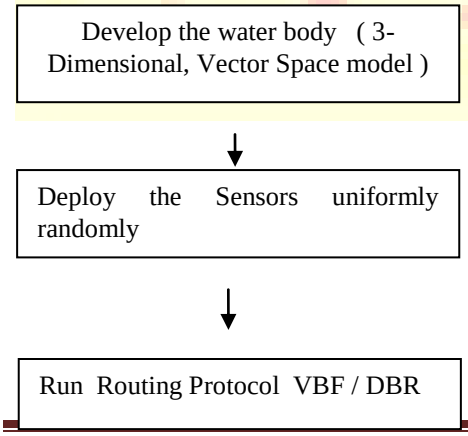
DBMR(Depth-Based Multi-hop Routing Protocol), a routing protocol only need the depth information. It improves the DBR and save much energy, while also reducing channel conflicts. Simulation results show that the algorithm has more efficiency.

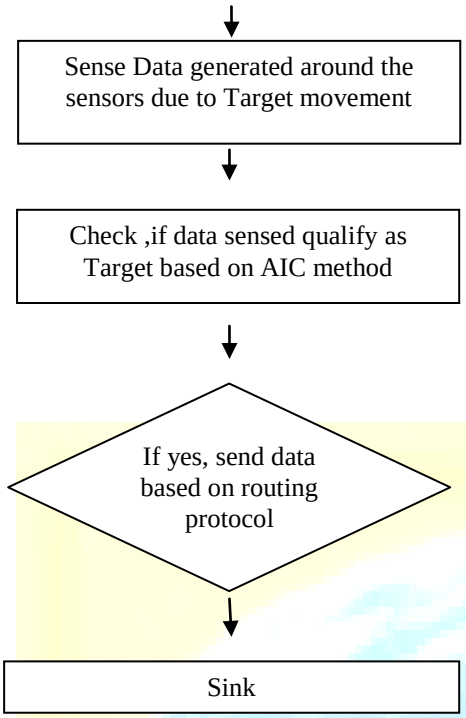
VBF is scalable, robust, and energy efficient. Packets carry routing related information and no state information is required at nodes. Thus, it is scalable in terms of network size. In VBF, only those nodes in the routing pipe are involved in data forwarding. Therefore, it is energy efficient. To improve the performance of VBF in sparse networks, we propose an enhanced version of VBF, hop by-hop vector-based forwarding protocol. HH-VBF adopts multiple forwarding vectors in the networks and, thus, improves the performance of VBF significantly in sparse networks.

The information theoretic criterion is applied with new penalty function in MAIC algorithm. MAIC method overcomes the drawback of AIC in inconsistent estimation for target number, and show significantly better detection perfonnance than MDL on low SNR. Simulation results and experiment data analysis show that MAIC method is practicable in multi-target detection.

4. Methodology :

In my research work we first develop a simulation of water body having length , breadth and depth. Let length(l) = 100 m , breadth(b) = 100 m , depth(d) = 100 m .Deploy the sensors uniformly & randomly using Mesh Topology . Here, the method of deploy sensor vary from time to time and any where in the water body . The number seneors to be deployed is increased or decreased in range between 200 to 800.After





deploy the sensors in water body run the protocol VBF(vector based forwarding) / DBR(depth based routing). In VBF, each packet carries the positions of the sender, the target and the forwarder (i.e., the node which forwards this packet). The forwarding path is specified by the routing vector from the sender to the target. Upon receiving a packet, a node computes its relative position to the forwarder by measuring its distance to the forwarder and the angle of arrival (AOA) of the signal. Recursively, all the nodes receiving the packet compute their positions. If a node determines that it is close to the routing vector enough (e.g., less than a predefined distance threshold), it puts its own computed position in the packet and continues forwarding the packet; otherwise, it simply discards the packet. Therefore, the forwarding path is virtually a routing \pipe from the source to the target: the sensor nodes inside this pipe are eligible for packet forwarding, and those outside the pipe do not forward.

In DBR, a data packet has a field that records the depth information of its recent forwarder and is updated at every hop. The basic idea of DBR is ,When a node receives a packet, it forwards the packet if its depth is smaller than that embedded in the packet. Otherwise, it discards the packet. Obviously, if there are multiple data sinks deployed at the water surface, as

in the multiple-sink under- water sensor architecture ,DBR can naturally take advantage of them. Packets reach any of the sinks are treated as successfully delivered to the final destination since these water-surface sinks can communicate with each other efficiently through radio channels, which have much higher bandwidths and much lower propagation delays.

The sensors sense the data generated or any noise produce in water body with help AIC(Akaike information criterion) method.If the sensed data qualify the targets according to AIC method.Then data send based on routing protocol to sink.If senseors sense data not qualify the targets according to AIC method then it discarded.

4.1 VBF

Start Simulation .For developing of VBF(vector based forwarding) a routing protocol for Target detection with Simulation techniques.Let N be the number of Nodes / Sensors.In this the range, the number of nodes from 200 to 800. Let Length(l) , Breadth(b) and Depth(d) of water body be 100*100*100.Let pk be the number of packets , ps be packet size , t be the time interval of packet size & ta be the pre defined delay for developing VBF protocol. In the simulation number of packet(pk) is 1, packet size(ps) is 2 , time interval for packet (t) is 30 ,predefined delay (ta) is 3.Let destination.x, destination.y, destination.z be the co-ordinates of sink. Destination.x is equal to length(l), destination.y is equal to breadth(b), destination.z is equal to depth(d).Let forward.x, forward.y, forward.z, be co-ordinates of forwarder node. Forward.x, forward.y, forward.z is set as 90*90*90.Let source.x, source.y, source.z, be co-ordinates of for data is to be sensed & finding routing path from source to destination.The value of source.x, source.y, source.z be set as 1.Let sensor.x,sensor.y ,sensor.z be a data structure to hold the co-ordinates of all sensors.Let ds be the Distance between source & destination.R be the transmission range is set to 20 meters.V0 be the velocity is set to 1500(We vary the mobility speed of each node from 0 m/sto 5 m/s) .The distance between source and destination is calculated as fixed and variable.To calculate the distance between source and destination, nodes calculate the cosθ & cosβ between them.

DF(Fixeddistance)=sqrt((destination.x-forwarding.X)^2+ (destination.y-forwarding.Y)^2+ (destination.z-forwarding.Z)^2);

dns(i)(Variabledistance) = sqrt((S(i).x- destination.x)^2+(S(i).y- destination.y)^2+(S(i).z-destination.z)^2) ;

CosTheta(i)=((d(i)^2+distanceDF^2-dns(i))/(2*d(i)* distanceDF));

CosBeta(i)=((distanceDSn(i)^2+distanceDS^2-dns(i)^2)/ (2*distanceDSn(i)*distanceDS)) ;

When we start with VBF if the total enery is not negative,then a) Calculate the angles between for all sources & for each sensor.b) Calculate the angles between for all source & for each node.c) Find cos θ = ((d(i)^2+distanceDF^2-dns(i))/(2*d(i)*distanceDF))d) Find cos β =((distanceDSn(i)^2 + distanceDS^2- dns(i)^2)/(2*distanceDSn(i)* distanceDS))

e) Calculate the angles between for all sensor & for each destination.f) Calculate alpha for each iterationg) For each iteration calculate value of P(p is the projection of A to the routingvector)=distance between distance source*cosβ

p(i)=distanceDSn(i)*CosBeta(i)Alpha(desirableness factor, of a node A) = (p(i)/W)+((R-d(i)*CosTheta(i))/R)

h) find min (alpha) choose next source – x,y,z

According to above step the sensor sense the Target base.The Targets are detected using AIC method.Then the detected Targets are send to sink in form of packets. The source sends data packets at the rate of 2 packets per second. The data packet size is 76 bytes and control packet is 32 bytes.The total time to live for packet is less than threshhold value , the packet receive otherwise packet drop. The total simulation time is 200 seconds. Stop Simulation .

4.2 DBR

Start Simulation .For developing of Depth Based Routing for Target detection with Simulation techniques.Let N be the number of Nodes / Sensors.In this the range, the number of nodes from 200 to 800. Let Length(l) , Breadth(b) and Depth(d) of water body be 100*100*100.Let pk be the number of packets , ps be packet size , t be the time interval of packet size & ta be the pre defined delay for developing DBR protocol.Let destination.x, destination.y, destination.z be the co-ordinates of sink.Let forward.x, forward.y, forward.z, be co-ordinates of forwarder. Forward.x, forward.y, forward.z is set as 90*90*90.Let source.x, source.y, source.z, be co-ordinates of first node for data is to be sensed & finding routing path

from source to destination.Let sensor.x ,sensor.y ,sensor.z be a data structure to hold the co-ordinates of all sensors.Let ds be the Distance between source & destination.R be the transmission range is set to 20 meters.V0 be the velocity is set to 1500. When we start with DBR if the total enery is not negative,then

a) Calculate the depth of source.

b) Calculate the distance between source & sensor.

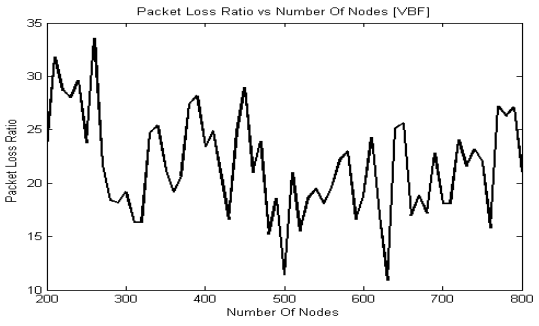
c) Distance between sensor & sink.

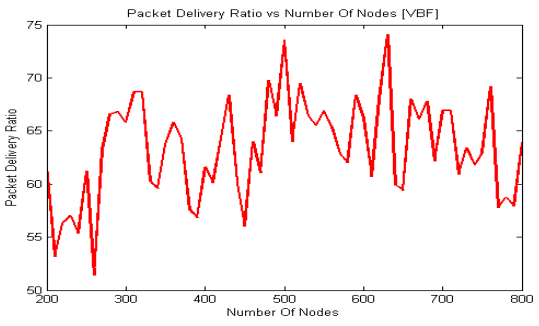
d) Distance between b(source & sensor)and forwarding node.

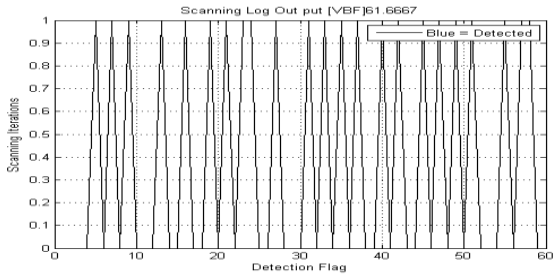
After that a) If distance is between Transmission range.b) If depth is with depth threshhold.c) If depth is non negative(not below the sea bed).If the arbitrary data arives the sensor start sensing.After that find the routing path through which data sensed is send to destination.Then the detected Targets are send to sink in form of packets. The source sends data packets at the rate of 2 packets per second. The data packet size is 76 bytes and control packet is 32 bytes. The total time to live for packet is less than threshhold value , the packet receive otherwise packet drop.Stop Simulation .

5 .Results and Conclusion :

It is evident from graph in both cases of VBF & DBR. When our sensor sense data , a data packet aggregation happens the signal is modulated to be send in a form of packet to destination that is digitization of signal (Target detection) happens and we have a buffer to send accross to the monotoring station .There are some observation from VBF.



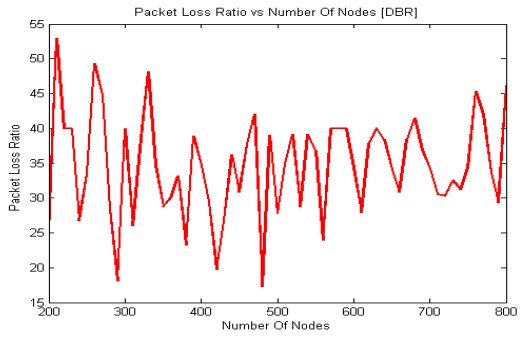


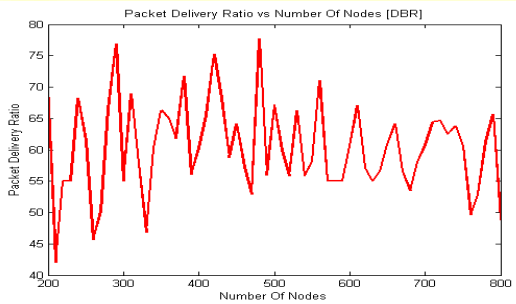


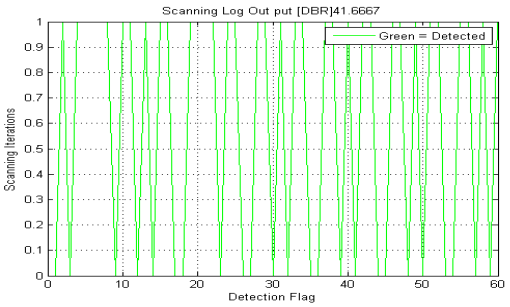
1.When the no. of nodes are less. The packet delivery ratio is quite high , which means the routing path are easily found & value of minimum alpha help in avoiding lots of collosions , therefore the packet reaches destination. In this case we see the angles also help us to find routing comformalatiy.There fore packet delivery ratio is high.

2. In this slot, it is also evident that from the VBF graph have also sudden drop of PDR(Packet delivery ratio) when ever there is increase in number of sensors & the cubic area remain same. The node density is increased & minimum alpha factor & various angles create situation where routing path is not easily possible.There fore the drop in packet delivery & increase in packet drop ratio.

3**.** Whenever there is increase in no. of nodes in VBF there is valley & peaks are formed after every increase of 40-50 nodes but there is over all increase in PDR till we reach nodes were **200** where the steapness of valley & peaks less and graph takes shape of an uneven platue.







4. A similar behaviour is seen in DBR but intially the peaks & valleys are more steaper than VBF & proportionally it is performing better than VBF due knowledge of depth in the cubic area of water body of routig protocol of DBR.

5. The detection of target is independent analysis apart from the routing performance analysis.The scaning interval for detection is 60 seconds faced on which scaning log is generated.The green line graph show the target detected as per each scan. It is evident the average detection rate is directly proportinal to noise sensed by the sensor based on AIC calculation .The average detection rate has been calculated by counting the number of times the scoring happened.There is the number of times we tries to detect & it was able to find abnormal noise (high SNR) above the threshhold valueof SNR which means the Target detected.We have found in our various simulation session that the average target detection rate is close to 62 % using poision distribution (uniform ditribution) of message arrival rate (high SNR rate).

Conclusion

In our current research we have picked up two standard protocols ,VBF (Vector based forwarding) & DBR (Depth based routing) for doing research, till date the target detection algorithm have been studied seperately from routing protocols & routing protocols have not been applied to a particular application like Target detection, identifing water level etc. based on which the data sensed (Target detected) needs to be send to monotroing station. So, we have simulated in our current research that if data is sensed it needs to be send to the destination / sink / monotroing station with some routing protocols.The Target detection technique which we have view is based on AIC and SNR levels once this data is sensed / Target detected.This information is aggregated in packet form & send to monotroing station using VBF /DBR protocols.There

fore, studing the packet delivery ratio & number of Target detected are the main result of our research

Future Scope :-

1) Our research can be carried forward in number of ways in which other under water protocols can be studied and more Target detection techniques can be studied with these protocols. How ever, in our current research we have only focused on identifying how many Targets were detected & have not calculated the true postive rate and false postive rate for Target detection.
2) The other routing parametre like latency etc have not been identified which are also important. There fore, future study should also focused on these because the Target information should reach in nano second to the monotoring station.

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