IJRRECS/March 2016/Volume-4/Issue-3/5297-5301 **ISSN 2321-5461**

INTERNATIONAL JOURNAL OF REVIEWS ON RECENT ELECTRONICS AND COMPUTER SCIENCE

CONSIDERATION OF PACKET TRANSMISSION METHODS FOR UNDERWATER NETWORKS

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ABSTRACT:

Due to challenges of underwater acoustic communications such, several algorithms of localization algorithms were introduced in literature. While great research was made on algorithms of underwater localization, little work was done on determining how anchors transmit their packets towards sensor nodes. Our work will consider joint problem of packet scheduling as well as self-localization in underwater acoustic sensor network by randomly distributed nodes. Regarding scheduling of packets, our goal is to reduce localization time, and for that consider methods of packet transmission such as collision-free scheme, as well as collision-tolerant scheme. In collision-free packet scheduling, time of packet transmission from every anchor develops in such a way that not one of sensor nodes experiences a collision. When packet duration is small, functioning area is huge, and regular possibility of packet-loss is not close towards zero, collision-tolerant system is found to need small localization time. Collision-tolerant scheme consumes more energy to comprise packet collisions, but it is revealed to offer improved localization accuracy and its implementation difficulty is low because anchors work separately.

Keywords: Underwater acoustic communications, Anchors, Sensor nodes, Packet scheduling, Self-localization, Collision-tolerant, Collision-free.

1. INTRODUCTION:

After introduction of autonomous underwater vehicles, developments that are made in computer systems have made a way in the direction of fully autonomous systems of underwater acoustic sensor networks. In several underwater applications, sensed information needs to label with time as well as location of their origin to present sense data. Hence, sensor nodes that search environment and collect data have to identify their position, makes localization an essential task for network. Contrary to underwater systems, sensor nodes within terrestrial wireless sensor networks are equipped by means of GPS module to find out location [1]. An underwater sensor node finds out its location by means of measuring time of flight to numerous anchors with identified positions, and performs multilateration. Other approaches might be used for self-localization and these might need packet transmission from anchors. Other than noise, several anchors, their relative position of sensor node, propagation losses as well as fading moreover have an effect on localization accuracy. Some of these parameters are adjusted to get better localization exactness, but others cannot [2][3]. We consider two classes of packet scheduling in support of self-localization in underwater acoustic sensor network, one based on collision-free design as well as another based on collision-tolerant design. Regarding scheduling of packets, our goal is to reduce localization time, and for that consider methods of packet transmission. In collision-free scheme transmitted packets will certainly not collide with each other at receiver. In the collision-tolerant scheme, collision possibility is controlled by means of packet transmission rate in such a means that each of the sensor nodes can obtain lots of error-free packets in support of self - localization.

2. METHODOLOGY:

When assuming packet loss as well as collisions, localization time is formulated for every scheme, and its least is obtained for a predetermined probability of efficient localization for every sensor node. A short localization time will permit for a more active network, and leads to an improved network efficiency regarding throughput. We consider collision-free scheme as well as collision-tolerant scheme for reduction of localization time. In our work we consider algorithms of packet scheduling algorithms that do not require a fusion centre. We make a consideration of two classes of packet scheduling in our work in support of self-localization in underwater acoustic sensor network, one based on collision-free design as well as another based on collision-tolerant design. While synchronization of anchors that are equipped by GPS is not hard, the projected algorithms works by synchronized anchors when there is an appeal from sensor node. Collision-tolerant methods effortlessness of execution due to the truth that anchors work separately of each other, and thus the method is spatially efficient, with no requirement for fusion centre. When packet duration is small, functioning area is huge, and regular possibility of packet-loss is not close towards zero, collision-tolerant system is found to need small localization time. Simultaneously its implementation difficulty is low to that of collision-free scheme, for the reason that in collision-tolerant scheme, anchors work separately. Collision-tolerant scheme consumes to some extent more energy to constitute packet collisions, but it is revealed to offer improved localization accuracy [4]. The collision-tolerant procedure needs less time for localization when compared to others for identical probability of successful localization.

3. AN OVERVIEW OF PROPOSED SYTEM:

In numerous underwater applications, sensed information requires labelling with time as well as location of their origin to present sense data. Thus, sensor nodes have to recognize their position makes localization a necessary task for network. We consider underwater networks consisting of R sensor nodes and T anchors. The anchor index will initiate from 1 and each anchor within network will encapsulates its location, time of packet transmission, as well as predetermined training sequence for flight estimation time [5]. The obtained localization packet is broadcast towards network on the basis of a specified protocol. Anchors as well as sensor nodes are provided with half-duplex acoustic modems. We imagine a single-hop system in which the entire nodes are within the communication range. The signal strength which is received is a function of transmission distance thus; possibility of packet loss is function of distance among any pair of nodes within the network. We imagine a single-hop underwater sensor networks in which anchors are equipped by means of half-duplex acoustic modems, and broadcasts their packets on the basis of two scheduling classes such as collision-free scheme and collision-tolerant scheme. In collision-free packet scheduling, time of packet transmission from every anchor develops in such a way that not one of sensor nodes experiences a collision. In this scheme transmitted packets will certainly not collide with each other at receiver. Collision-tolerant algorithms control likelihood of collision to make sure successful localization by means of a pre-specified reliability. In this scheme, collision possibility is controlled by means of packet transmission rate in such a means that each of the sensor nodes can obtain lots of error-free packets in support of self -localization. Collision-tolerant system is found to need small localization time when packet duration is small, functioning area is huge, and regular possibility of packet-loss is not close towards zero. This scheme consumes more energy to constitute packet collisions, but it is revealed to offer improved localization accuracy. We introduce a simple Gauss-Newton based localization algorithm for these methods and obtain their Cramér-Rao lower bounds. The performance of two classes of algorithms regarding time required for localization was revealed to be based on circumstances. When ratio of packet length to highest propagation delay is low, as it is the situation with localization, and average possibility of packet-loss is not close towards zero. The collision-tolerant procedure needs less time for localization when compared to collision-free one for identical probability of successful localization. Except for average energy which is consumed by anchors, collision-tolerant methods have numerous advantages and among them the most important one is its effortlessness of execution due to the truth that anchors work separately of each other, and thus the method is spatially efficient, with no requirement for fusion centre [6]. Its localization precision is always improved than collision free method because of several receptions of needed packets from anchors and hence these features make the method of collision-tolerant localization interesting from realistic implementation point of view.

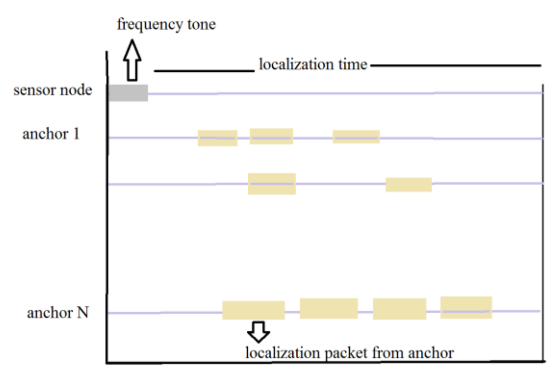

Fig1: An overview of packet transmission in collision-tolerant system

4. CONCLUSION:

Recent underwater networks handle numerous tasks in an automatic means. To enable applications the sensor nodes assess a variety of environmental parameters, set them into data packets, and exchange packets by other sensor nodes. Collision-free scheme, as well as collision-tolerant scheme are considered for reducing localization time regarding scheduling of packets. During imagination of packet loss as well as collisions, localization time is formulated for every scheme, and its least is obtained for a predetermined probability of efficient localization for every sensor node. A small localization time will permit for a more active network, and leads to an improved network efficiency regarding throughput. In our work we consider algorithms of packet scheduling algorithms that do not require a fusion centre. Collision-tolerant system utilizes more energy to constitute packet collisions, but it is revealed to offer improved localization accuracy. This system is found to need small localization time when packet duration is small, functioning area is huge, and regular possibility of packet-loss is not close towards zero. Its performance difficulty is low to that of collision-free scheme, as in collision-tolerant scheme, anchors work separately. These algorithms control likelihood of collision to make sure successful localization by means of a pre-specified reliability. It requires less time for localization when compared to collision-free one for identical probability of successful localization. In the methods of collision-free packet scheduling, time of packet transmission from every anchor develops in such a way that not one of sensor nodes experiences a collision.

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