DA-Sync: A Doppler-Assisted Time-Synchronization Scheme for Mobile Underwater Sensor Networks

ABSTRACT:

Time synchronization plays a critical role in distributed network systems. In this paper, we investigate the time synchronization problem in the context of underwater sensor networks (UWSNs). Although many time-synchronization protocols have been proposed for terrestrial wireless sensor networks, none of them can be directly applied to UWSNs. This is because most of these protocols do not consider long propagation delays and sensor node mobility, which are important attributes in UWSNs. In addition, UWSNs usually have high requirements in energy efficiency. To solve these new challenges, innovative time synchronization solutions are demanded. In this paper, we propose a pairwise, cross-layer, time-synchronization scheme for mobile underwater sensor networks, called DA-Sync. The scheme proposes a framework to estimate the doppler shift caused by mobility, more precisely through accounting the impact of the skew. To refine the relative velocity estimation, and consequently to enhance the synchronization accuracy, the Kalman filter is employed. Further, the clock skew and offset are calibrated by two runs of linear regression. Simulation results show that DA-Sync outperforms the existing synchronization schemes in both accuracy and energy efficiency.
EXISTING SYSTEM:

- Existing time-synchronization schemes use half of the round trip time to calculate one way propagation delay.

- Due to the node mobility, propagation delays on the way forth and back are not necessarily identical, especially when nodes move at high speed.

- This issue severely decreases the accuracy of most time synchronization approaches.

DISADVANTAGES OF EXISTING SYSTEM:

- Both accuracy and energy efficiency is less.

- Long propagation delay.
PROPOSED SYSTEM:

- In this paper, we propose a novel time-synchronization scheme, called DA-Sync, which is a fundamental cross-layer-designed time-synchronization protocol specific for mobile UWSNs.

- DA-Sync provides a fundamental method to synchronize two sensor nodes, i.e., an ordinary node and a reference node.

- The scheme proposes a framework to estimate the doppler shift caused by mobility, more precisely through accounting the impact of the skew.

ADVANTAGES OF PROPOSED SYSTEM:

- Different algorithms have different sync message (including request and response messages) packet sizes since they need to carry different amounts of information.

- High accuracy and high energy efficiency.

- Reduce the nondeterministic errors that are commonly encountered by time synchronization algorithms which rely on message exchanges.
SYSTEM ARCHITECTURE:

Parallel auto-correlators

- Window length $N_1$ to $|M|$
- Window length $N_i$ to $|M|$
- Window length $N_j$ to $|M|$
- $\max(|M|) \geq \Gamma_m$
System Requirements:

Hardware Requirements:

System : Pentium IV 2.4 GHz.

Hard Disk : 40 GB.

Floppy Drive : 1.44 Mb.

Monitor : 15 VGA Colour.

Mouse : Logitech.

Ram : 512 Mb.

Software Requirements:

Operating system : Windows 7.

Coding Language : C#.net, Asp.net

IDE : VisualStudio 2010