Aqua-Sim: An NS-2 Based Simulator for Underwater Sensor Networks

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Motivation

A standard up-to-date simulation platform is needed to compare and evaluate different network designs, algorithms and protocols.

Other packet level network simulators fall short in UWSN:

- Standard radio signals instead of acoustic communications
- Lack of acoustic signal attenuation model
- Usually support two-dimensional network space

Aqua-Sim Design

- In parallel with CMU wireless extension
- Object Oriented Design: extensible and flexible
- Open Architecture: easily import new protocols

Fig. 1 Aqua-Sim is in parallel with CMU wireless package

Features of Aqua-Sim

- Discrete-event driven network simulator
- Supports 3D networks and mobile networks
- Simulates underwater acoustic channels with high fidelity
- Implement a complete protocol stack from physical layer to application layer
- Able to evolve independently
- Effectively simulates acoustic signal attenuation and underwater packet collisions
- Follows the object-oriented design of NS-2, easy to be extended
- Plenty of implemented protocols

Aqua3D – A 3D Visualizer for Aqua-Sim

NS-2’s animator, NAM, can only visualize two-dimensional planes, therefore, Aqua3D was developed to be Aqua-Sim’s animator.

Features of Aqua3D

- Intuitive and easy to use GUI
- Ability to customize the appearance of environment
- Speed and time adjustable
- Three-dimensional visualization
- Demonstrate network scenarios and events like transmissions, receptions, and collisions in an UWSN environment

Planned Work

Our future work will be enriching Aqua-Sim by designing and implementing more realistic and up-to-date modules.

- Trace driven channel model to better simulate the multi-path effect and attenuation
- User-defined interface for passive and active mobility patterns to better support mobile networks
- Multi-channel support due to current exploration of multi-channel MAC protocols
- Framework design for data centric routing

Aqua-Sim package is available at obinet. engr.uconn.edu. We plan to release Aqua-Sim 2.0 in the upcoming spring of 2014.