

Mesh Ad-Hoc Algorithms for Underwater Optical Sensor Networks

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This project involves the development of mesh ad-hoc networking algorithms that are suited for underwater wireless sensor networks (WSNs). Underwater WSNs are unique in that both connections between nodes and the nodes themselves can be easily lost without chance of recovery. This means that a very robust set of networking protocols will need to be developed that ensure the security of data gathered by the sensors and that operate at very low power, keeping the life of the network extended for as long as possible. The first part of this project entails developing the algorithms that accomplish the above outlined tasks, and the second part is translating the protocols into microprocessor code to be implemented on the underwater WSN nodes.

Introduction:

Traditional implementations of wireless sensor networks, such as those envisioned with regards to the Internet of Things (IoT), can be constructed in a number of topologies due to the relative availability of power and repairs. When implementing these same networks underwater, however, physical location becomes difficult to maintain, and thus a specific topology in which each node is identical becomes preferable.

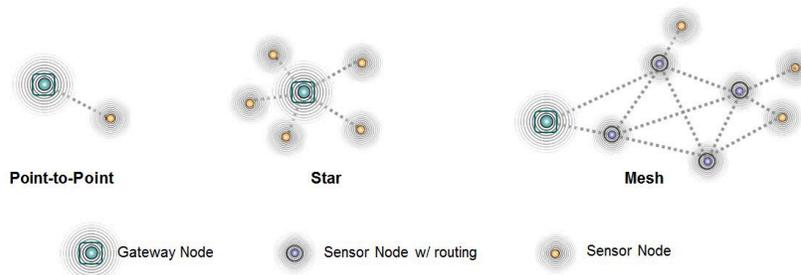
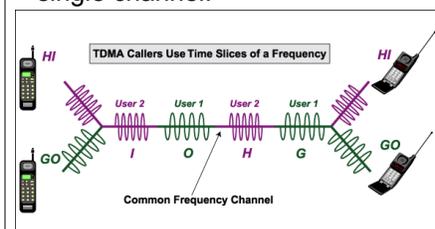


Fig. 1) These are a few examples of topologies for wireless sensor networks. Note that there are different types of nodes strategically placed to form the network. In an underwater application all nodes would ideally be identical.

Conceptualization of Network:

The type of network that to be developed will use a Time Division Multiple Access (TDMA) channel access method since there are many nodes that must share a single channel. Data will be packetized, addressed using headers, and propagated throughout the network by utilizing the repeater functionality of the nodes.

Fig. 2) How data from multiple sources can be shared on a single channel.



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Conclusion: The development of this network is very complex, and research done thus far has uncovered much further information that must be known, such as self-organization, dynamic routing and path recovery, and synchronization. These concepts must now be implemented in both simulation and real hardware.