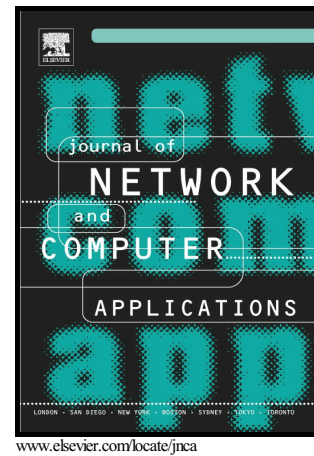


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Design of Optical-Acoustic Hybrid Underwater Wireless Sensor Network

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Abstract:

High-speed underwater wireless transmission technologies are urgently demanded to transmit three-dimensional high-resolution observation data timely in ocean exploration. Currently, underwater acoustic sensor networks have obtained high transmission distance, but with low data rate, high power consumption, high cost and damage to marine mammals. Meanwhile, underwater optical communications can achieve high data rate, but with difficult networking and short communication distance. This paper proposed a kind of novel Optical-Acoustic hybrid Underwater Wireless Sensor Network (OA-UWSN) which employed optical communication for high-speed transmission at close range and employed acoustic communication for transmitting control commands and node localization. OA-UWSN accomplished long-distance optical transmission through directional optical communication and multi-hop transmission mechanism. The problem of difficult networking in optical communication was solved by designing the whole space optical repeater. With the characteristics of directional optical transmission, the Space Division Multiple Access (SDMA) technology was employed in Data Link Layer (DLL) to improve the data transmission efficiency. A routing protocol based on reverse route search was designed to improve the network life cycle and adapt to network topology which changed frequently. The paper proposed a solution for wireless transmission of real-time video and images in marine exploration and provided new methods for high-speed transmission of marine information detection.

Keywords: Optical-acoustic; Hybrid; Underwater sensor networks; Encoding modulation; Space division multiplexing; Multiuser access

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