Underwater Time Delay Estimation with Maximum Length Sequence Signals and Rayleigh underwater modeling

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ABSTRACT

Electromagnetic waves cannot be able to travel in the deep ocean because of electromagnetic radiation absorption by water. In the deep ocean, acoustic signals are the primary communication system for the deep water living creatures and humans also. The objects can be identified using active sonar or passive sonar system. The estimation of the time delay between a signal and its echo received at a hydrophone has been proven to be a significant parameter. The time delay estimation is a primary step in source localization, source tracking, ocean bottom profiling. In traditionally impulse signal is used as the source signal in the process of estimating the time delay in the active sonar system.

In general, the underwater acoustic propagation model can be done by numerical models and statistical models. In this work, the signal strength of Maximum length sequence (MLS) signal and impulse signals are compared by using the Rayleigh underwater acoustic statistical model. And the time delay is estimated experimentally for the MLS signal in the water tank by using the generalized cross correlation method. This work recommends the MLS signal is better than the impulse signal in the estimation of time delay by using the Rayleigh underwater model.

Keywords: Underwater acoustics, SONAR, Rayleigh underwater model, MLS, TDE, Generalized cross correlation

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