Researchers propose new approach to enable high-spectral-efficiency noncoherent underwater acoustic communication

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The seafloor wireless observation network (SON) plays an important role in real-time ocean observation. The nodes connect with each other via the acoustic link.

The traditional noncoherent communication scheme adopts the combination of the convolutional code and multi-frequency shift keying (MFSK). However, the signal-to-noise ratio (SNR) threshold of reliable decoding using convolutional code under the fading channel is high and the spectral efficiency of MFSK is very low.

Researchers from the Institute of Acoustics of the Chinese Academy of Sciences (IACAS) proposed a high-spectral-effciency noncoherent underwater acoustic communication multi-carrier transmission scheme, which adopts the on-off keying (OOK) modulation.

The researchers adopted the OOK multi-carrier modulation to achieve high spectral efficiency and introduced accumulator convolutional code (ACC) to increase the correlation between the code word to reduce the error floor of the system.

It is difficult to determine the appropriate decision threshold for OOK demapping in underwater acoustic communication. To solve this problem, they proposed a low complexity iterative threshold estimation (ITE) algorithm at the receiving end.

They also designed and updated irregular recursive convolutional code (IrCC) according to channel statistics during the communication interval to match the codewords with the channel to reduce the SNR threshold required for reliable decoding.

Based on practical application scenario, they modeled underwater acoustic propagation and found the calculation relation among the heights of the wireless communication nodes, the communication distance, and the seafloor slope.

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