

一种小波包分解的FX结构全频带ANC系统

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摘要 针对传统有源降噪系统在噪声与信号混合的复杂环境中无法有效工作的问题, 设计了一种应用于舰艇艏端被动声纳平台的本艇自噪声有源抵消系统, 从而提高声纳的作用距离. 该系统采用基于小波包分解的FX结构, 小波包这种正交变换方法降低了各分量之间的相关性, 改善了参考输入矩阵的特征值分布, 而其滤波器组的工作方式可以对不同频段的噪声任意细分, 分别抵消, 具有多子带系统的效果. 通过与LMS算法相结合, 使系统具备了灵活的全频带时频多分辨能力和较快的收敛速度. 利用真实海试数据仿真试验, 在较小的信号失真度状态下, 取得了约12.2dB的全频带降噪量, 进一步表明系统在复杂水下噪声场中的优势. 该种结构提升了系统的噪声控制能力, 具有较高的实用价值.

关键词 [声学](#) [自适应有源噪声抵消](#) [小波](#) [Filtered-XLMS](#) [自噪声](#)

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Whole-band ANC system with the FX structure based on wavelet packet decomposition

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Abstract

The traditional Active Noise (ANC) system does not work effectively in the environment where the noise is mixed with the useful signal. An active noise cancellation system applied on the passive sonar platform of warships is designed to solve the problem said above, which can enhance the role range of the passive sonar. This ANC system uses an FX structure based on wavelet packet decomposition. Because of the orthogonal characteristics of wavelet packet decomposition, the correlation between every two weights is reduced, and the distribution of reference-input matrix's eigenvalues is also improved. The working method of the system's filter-group ensures that the noise in different frequency bands can be distinguished and cancelled respectively. So the system has the effect that is the same as that of the multi-frequency-band system. Combined with the LMS algorithm, this system has the flexible whole-band distinguish ability in both the time-domain and the frequency domain and a faster convergence rate. Simulations are done based on practical sea-trial data. In the condition of smaller distortion of signals, a 12.2dB noise reduction is achieved over the whole-band. It is indicated that the system designed in this paper has advantages in the complex underwater noise field. This system enhances the noise controlling capability. So it has a high practical value.

Key words [acoustic](#) [adaptive active noise cancellation](#) [wavelet](#) [Filtered-XLMS](#) [self-noise](#)

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