World Academy of Science, Engineering and Technology
International Journal of Cognitive and Language Sciences
Vol:16, No:07, 2022

Linear Frequency Modulation Signal Perception Based on Wavelet Transform and Time-Frequency Technology

Authors : Xingcai Wang

Abstract : Linear frequency modulation signals are a common modulation method for low intercept probability radar signals, a spread-spectrum modulation technique that does not require pseudo-random coding sequences and has been widely used in radar and sonar technology due to its large time-frequency product. In order to improve the perception of LFM signals in a low SNR environment, this study proposes a time-frequency analysis method for LFM signals based on segmentation denoising, wavelet transform denoising, and Choi-Williams Distribution. The results show that the method has good performance and feasibility under low SNR conditions and can exhibit clear time-frequency characteristics of the LFM signal at a SNR of -21dB. Finally, combined with deep learning, GoogLeNet is used as the training network and the time-frequency image as the training sample, which achieves a good signal detection probability. The detection probability is greater than 90% when the SNR is greater than -18dB, and the overall detection probability is better than other detection network models.

Keywords : linear frequency modulation signal, Choi-Williams distribution, segmentation denoising, wavelet transform denoising, time-frequency analysis, deep learning
Conference Title : ICSLP 2022 : International Conference on Speech and Language Processing
Conference Location : Stockholm, Sweden
Conference Dates : July 12-13, 2022