论文

基于循环相关的LFM脉冲雷达宽带回波Doppler和多径时延的联合估计

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摘要

基于循环相关特性，该文提出了针对线性调频(LFM)脉冲雷达宽带回波Doppler和多径时延联合估计的方法。该方法首先利用雷达回波的循环相关变换，通过多径分量的能量累积估计Doppler频移尺度参数，然后结合发射信号的先验信息构造降阶函数，将回波信号降为多个单频信号，最后利用零频率截面循环谱能够将时间上有重叠的多径回波信号在该截面上分开且分辨率加倍的特性，估计出各多径分量的时延值。该方法只需要一个脉冲信号即可完成Doppler和多径时延的联合估计，对低信噪比噪声有较强的容忍性，能抑制各径相关交叉项的影响，并且具有较高的多径时延估计分辨率。文中给出了计算机仿真实验，仿真结果表明了该算法的有效性。

关键词　循环相关　循环谱　线性调频信号　多径　参数估计

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Joint Estimation of Doppler and Multipath Time Delay of Wideband Echoes for LFM Pulse Radar Based on Cyclic Correlation

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Abstract

A new method based on cyclic-correlation character for estimating the Doppler and multipath time delay of the wideband echoes for LFM pulse radar by only one pulse signal is presented. First, the Doppler is estimated by energy cumulation of multipath component based on cyclic-correlation transform. Then, an order-reduced signal is reconstructed combining the Doppler with the prior knowledge of the transmitted signal, and the echoes signal is converted to many single-frequency signals. Finally, the multipath time delay is obtained by zero-frequency section cyclic-spectrum where the overlapping echoes can be separated and the resolution is doubled. The method is adapted for low SNR noise, can restrain the affection of the cross-items, and has a high time-delay estimation resolution. Some computer simulations are given in this paper and the results show that the new method is valid.

Key words　Cyclic-correlation　Cyclic spectrum　LFM signal　Multipath　Parameter estimation

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