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短文与研究通讯

基于OMP的宽带线性调频脉冲压缩雷达信号的压缩感知研究

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摘要：

压缩感知技术可以用来实现对宽带信号的欠采样快速处理。宽带线性调频脉冲压缩雷达能够有效解决雷达探测距离和距离分辨力的矛盾，在探测领域得到了广泛应用，为实现对宽带线性调频脉冲压缩雷达信号的快速欠采样接收处理，本文首先开展了信号稀疏分解与重构算法研究，通过对贪婪算法、凸松弛类算法、组合类算法三大算法进行对比分析，选用了运行速度快且重构精度高的正交匹配追踪（OMP）算法针对宽带线性调频脉冲压缩雷达信号进行压缩感知仿真分析。仿真结果表明：在较高信噪比条件下，OMP算法完全能够实现对宽带线性调频脉冲压缩雷达信号的欠采样和信号重构，从而实现了对宽带雷达信号的欠采样处理，为处理超宽带雷达信号提供了很好的理论指导。

关键词： 交匹配追踪；非合作；宽带脉冲压缩雷达信号；压缩感知；信号重构

Compressive Sensing Research of Wideband Linear Frequency Modulation Pulse Compression Radar Signal by Orthogonal Matching Pursuit Algorithm

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Abstract:

Compressive sensing technology is used to realize fast sub-Nyquist sampling process of wideband signal, wideband LFM pulse compress radar can resolved conflict between radar range and radar range discrimination effectively and is applied in the detecting field. The research of signal sparse decomposition and reconstruction algorithm are carried out firstly for the fast sub-Nyquist sampling process of wideband LFM pulse compress radar signal. OMP algorithm which has some characteristics such as rapid operating rate and high reconstructive precision is picked up among greedy algorithm, protruding relaxation algorithm and combination algorithm. Then OMP algorithm is carried out in the compressive sensing simulation analysis of wideband LFM pulse compress radar signal. It is showed by simulated conclusion that OMP algorithm can be used to complete sub-Nyquist sampling and reconstruction of wideband LFM pulse compress radar signal under higher SNR condition, which will offer better theoretical guidance for the processing problem of super wideband radar signal.

Keywords: orthogonal matching pursuit non-cooperation signal of wideband pulse compress radar compressive sensing signal reconstruction

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