信号处理 2010, 26(11) 1657-1662 DOI: ISSN: 1003-0530 CN: 11-2406/TN

算法研究

一种基于几何推理的匹配抗箔条质心干扰新方法

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摘要：

为降低箔条干扰对末制导雷达导引头跟踪和打击目标的影响，提出一种基于几何推理的匹配抗箔条质心干扰新算法。依据由大量箔条偶极子组成的箔条云其RCS、散布方程、空间分布及运动速度的时变性在高分辨距离像上表现为散射点数目、回波幅度及相对位置的不稳定性，而目标的各个散射点相对位置在一定视角范围内基本不变。该算法从相邻两幅经运动补偿后的距离像中分别提取出所有可能的散射中心，把它们当作点模式，利用一种适用于Euclid变换下不完全匹配情形并可求得最多一致对应点对的几何推理算法，得到最佳匹配团，其中所含的点模式即为提取到的目标散射点，进而获取目标几何中心的真实位置。此外，通过目标几何中心在两幅距离像间的平动距离，实时估计出目标速度，用于对下一幅距离像的运动补偿并预测目标下一时刻的位置。在测速方面，该算法克服了传统相关法在箔条干扰情况下失效的局限性。最后通过Monte Carlo仿真实验，验证了算法的有效性。

关键词： 高分辨距离像；几何推理匹配；抗箔条干扰

A Novel Anti-chaff-jamming Method Based on Geometrical Inference Matching Algorithm

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Abstract:

For reducing the negative influence of chaff on the ture target’s track and attack of the terminal guidance radar seeker, a novel anti-chaff-jamming method based on geometrical inference matching algorithm is proposed. As the chaff cloud is made up with amount of dipoles, whose RCS, disperse equation and speed varies as the function of time, so it is unstable for the high resolution range profile (HRRP) of chaff cloud, which shows as the number, scattering amplitude and relative position of different scattering centers are time-varying; but the relative position of scattering center originated from targets stays constant when the incident beam varies within a small range. In the algrithm, all possible scattering centers extracted from two consecutive HRRPs after motion compensation are regarded as point patterns, then a geometrical inference matching algorithm that can work under partially matching problem with Euclid transformation, is used to form the optimum matching group which has the maximum number of consistent correlative points. The point patterns in the optimum matching group are the target scattering centers, therefore the geometrical center can be calculated from the scattering centers. In addition, the translation distance of the target between two consecutive HRRPs can be used to estimate the target velocity, which is used to compensate the next HRRP and forecast the target position of next time. For velocity measurement, the presented algorithm overcomes the limitation that the conventional algorithm can not work effectively when the chaff jamming exists in the scenario. At the end, this new anti-chaff jamming method is validated by Monte Carlo simulations.

Keywords: High Resolution Range Profile Geometrical Consequence Matching Anti-chaff jamming

收稿日期 2010-03-17 修回日期 2010-07-23 网络版发布日期 2010-11-25

DOI:

基金项目:

航空科学基金(20070188012)和武器装备预研基金（9140A01060809KG0105）项目支持

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