[打印本页]　[关闭]

航天电子技术

基于Fuzzy-ART神经网络的红外弱小目标检测

陈炳文1， 王文伟1， 秦前清2

1. 武汉大学电子信息学院， 湖北 武汉 430079；
2. 武汉大学测绘遥感信息工程国家重点实验室， 湖北 武汉 430079

摘要：

针对现有背景抑制算法未能有效抑制背景而导致目标检测率低的问题，提出了一种基于模糊自适应共振理论（fuzzy adaptive resonance theory, Fuzzy ART）神经网络的弱小目标检测算法。首先，采用Fuzzy ART神经网络结合Robinson 警戒环技术，建立自适应局部空间背景模型，并以此分析像素点的背景模糊隶属度来抑制背景杂波；然后依据目标与残留背景杂波的空间特征采用模板均差法来突显目标，并提出基于行列模糊聚类的自适应分割算法来提取候选目标；最后结合目标的运动连续性进行多帧轨迹关联从而检测出真实目标。理论分析与实验结果表明，该算法能随背景的局部情况来自适应调节空间背景模型，从而自适应抑制背景杂波、突显目标，能有效提高信噪比，检测出弱小目标。

关键词：
模式识别　弱小目标检测　模糊自适应共振理论神经网络　Robinson 警戒环　自适应分割

Infrared dim target detection based on Fuzzy-ART neural network

CHEN Bing wen1， WANG Wen wei1， QIN Qian qing2

1. School of Electronic Information, Wuhan University， Wuhan 430079, China；
2. State Key Laboratory for Information Engineering in Surveying, Mapping and Remote Sensing, Wuhan University， Wuhan 430079, China

Abstract:

n order to solve the problem that the current approaches cannot suppress the background clutters effectively and result in a poor detection performance, a novel infrared dim target detection approach based on fuzzy adaptive resonance theory (Fuzzy-ART) neural network is presented. Firstly, the Fuzzy-ART neural network is combined with Robinson guard to build the adaptive local spatial background models. With these models, the background clutters are suppressed according to the degree of fuzzy match between pixels and models. Then a difference algorithm based on template average is utilized to highlight the targets according to the spatial features of targets and residual background clutters. The proposed adaptive segmentation algorithm based on fuzzy cluster of rows and columns is next used to detect the candidate targets. Finally, the true targets are further detected by the multi frame trajectory related algorithm based on the consistency of target motion. Theoretical analysis and experimental results show that the proposed approach can adjust the spatial background models adaptively according to the condition of local background, and eliminate the background clutters and highlight the targets effectively. It is capable of improving the signal-to-noise ratio and detecting the targets effectively.

Keywords: pattern recognition　dim target detection　fuzzy adaptive resonance theory (Fuzzy-ART) neural network　Robinson guard　adaptive segmentation

通讯作者：

作者简介：
作者Email:

参考文献：

本刊中的类似文章

1. 陈炳文，王文伟，秦前清·基于Fuzzy-ART神经网络的红外弱小目标检测[J]. 系统工程与电子技术, 0,(): 857-863