研究论文

一种多光谱热成像系统作用距离的预测方法

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摘要：

提出了一种利用三角方向鉴别(TOD)性能模型预测具有分布式融合结构的多光谱热成像系统作用距离的方法．针对大气对不同波段目标辐射特性的衰减作用造成各波段目标表观温差不一致和融合策略对系统性能产生影响的问题，将大气透过率计算过程和具体融合算法引入到系统的TOD性能模型中，实现了目标固有温差与模型计算的系统温差阈值的直接比较．在满足这两种温差相等的条件下，根据不同鉴别等级下的TOD获取准则，建立了以靶标角空间频率和传输距离为变量的多元方程组，通过求解完成了对系统作用距离的预测．计算结果与仿真图像得到的测试结果进行了比较，验证了该方法能够有效预测多光谱成像系统的作用距离．

关键词： 多光谱 热成像系统 作用距离 三角方向鉴别 性能模型

Method for predicting the operating range of multispectral thermal imaging systems

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Abstract:

A method for predicting the operating range of multispectral thermal imaging systems with a distributed fusion architecture is proposed by utilizing the Triangle Orientation Discrimination (TOD) performance model. Specifically, by considering the facts that the apparent target/background differential temperatures in different wavebands are inconsistent because of the effect of atmospheric attenuation on the radiation of a target and that a fusion rule has an impact on the performance of the system, the calculation process of atmospheric transmittance and the concrete fusion rule are introduced into the TOD performance model of the system. And the direct comparison between the inherent target/background differential temperature and a TOD threshold is made. According to the TOD criteria for different discrimination levels, the relations of the reciprocal angular subtense of a triangle pattern and the range of the system to a triangle pattern are achieved when these two values are equal and the target acquisition ranges are obtained by solving these equations. The validation by the experimental results and simulation images suggests that this approach can predict the operating range of multispectral thermal imaging systems efficiently.

Keywords: multispectral thermal imaging systems operating range triangle orientation discrimination performance model

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