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现代应用光学

红外三色被动测距

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摘要： 由于目标的红外辐射在大气中传输时其不同波长的辐射强度比值会随着传输距离的改变而发生变化,故波长的辐射强度比包含了目标的距离信息。基于上述原理,本文研究了利用比色方法依据空中目标的红外辐射对其进行测距的方法。推导了目标辐射强度色比与目标温度、辐射传输距离、大气消光系数之间的关系。在大气消光系数相对固定时,通过测量不同波长的辐射强度比值对目标进行了测距,推导出了红外三色比距离方程。根据大气辐射传输衰减计算模型,选择8.5、9.0、9.5 μm 3个波长作为色比波长,2 km处300 K黑体作为被测目标,画出了色比测距图。分析显示,图上作业得到的目标距离和温度与实际目标的距离和温度基本相符。另外,利用本方法通过一次测量即可获得目标的距离和温度。

关键词： 红外测距 被动测距 比色法 大气衰减

Infrared three-color passive ranging by colorimetric method

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Abstract: As the color ratio of radiation intensity of a target at different wavelengths will change along with the change of transmission distance, the color ratio of radiation intensity contains distance information. According the principle mentioned above, this paper proposed a scheme based on colorimetric method to range the target using its own infrared radiation. The relationship between the color ratio of radiation intensity for the target and its temperature, radiation transmission distance, atmosphere attenuation coefficient was deduced. By measuring the color ratio of radiation intensity at different wavelengths, the target was ranged when the atmosphere attenuation was certain and the infrared ranging equations of three-color ratio were deduced. According to a calculation model of radiation atmosphere transmission attenuation, three wavelengths of 8.5,9.0,9.5 μm were selected as color-ratio wavelengths, a 300 K blackbody 2 km away was used as a ranging target, and a color-ratio ranging figure was drawn. Analysis shows that the temperature and the distance of the target gotten from the figure are coincident with those of the target. Furthermore, it needs only once measurement to get the distance and temperature of the target by using this method.

Keywords: infrared ranging passive ranging colorimetric method atmosphere attenuation

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