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发光学应用及交叉前沿

用于农田土壤监测的高光谱成像仪

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摘要： 土壤光谱分析技术具有分析速度快、成本低、无危险、无破坏、可同时反演多种成分等特点,基于高光谱成像技术可以快速获取土壤性质及其空间分布特征。本文针对农田土壤监测的需求,设计了一种无人机载高光谱成像仪,选择Offner凸光栅光谱成像系统实现了无谱线弯曲和无色畸变的设计结果。400~1 000 nm波长范围内的衍射效率为15%~30%,对地成像效果清晰,在3 km飞行高度可以获得覆盖宽度为0.6 km、地面分辨率为0.6 m的地物目标高光谱图像,可提供0.4~1.0 μm波长范围内120个谱段的高光谱图像,光谱数据准确、稳定。结果表明,该高光谱成像仪满足设计要求且可以快速获得高精度成像光谱信息,适合用于对农田土壤的监测。

关键词： 高光谱成像仪 农田土壤 监测

Hyperspectral Imager for Farmland Soil Monitoring

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Abstract: Soil spectral analysis technology has features of fast analysis speed, low cost, no risk, no damage, and it can inverse a variety of ingredients at the same time. Based on hyper-spectral imaging technology, we can quickly obtain soil properties and its spatial distribution characteristics. In this paper, we design a UAV hyper-spectral imager based on the demand of farmland soil monitoring. The Offner convex grating spectral imaging system was selected to achieve non-spectral line bending and colorless distortion design results. The diffraction efficiency is 15%~30% in the range of 400~1 000 nm wavelength. The ground imaging results are clear, it can obtain hyper-spectral images of ground target of covering a width of 0.6 km and ground resolution of 0.6 m at 3 km altitude. It provides 120 spectral bands of hyper-spectral images at the wavelength range of 0.4~1.0 μm. The spectral data are accurate and stable. The results show that this hyper-spectral imager meets the design requirements and can quickly obtain the high-precision imaging spectra of the agricultural soils, thus achieving the monitoring of farmland soil.

Keywords: hyperspectral imager farmland soil monitor

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