How to make a simple spectroscope by DSLR

Kamonrat Sitthinu ; kamonrat17583@gmail.com
Nongbuadaengvittaya School, Nongbuadaeng, Chaiyaphum, Thailand. 36210
Adviser : Jukgrit Wongvittayanan ; jukgritwong@gmail.com

Abstract

This study aims to produce the Digital Single-Lens Reflex (DSLR) spectroscopy by installing the DSLR Optical Spectrum Analyzer to examine spectrums' wavelengths and intensity distributions from various light sources. Regarding the principles of light diffraction through the grating and the use of DSLR lens system to speculate the spectrum on CMOS sensor for picture recording, Mercury tube (Hg) and Halogen one were used as the standard light sources as they both have stable wavelengths. It was found that the DSLR camera were quite appropriate for spectrum images collection. The spectrum images could later be used for examining the wavelengths and intensity distribution of several spectrums from different light sources using the IRIS program.

Introduction

The DSLR spectroscopy will be consequently produced to find out whether it can take photos of sky objects or not. For convenience, the researcher aims to find the proper photographing technique and the DSLR camera installation, also to search for any techniques to analyze spectrum's wavelengths using standard light as its sources. Doing this, diffraction grating with 1,200 lines per millimeters. After that, the photos were analyzed with researchers' own make-up number for spectrum wavelengths comparison**.** The researchers later examined the spectrum's wavelengths and characteristics of light diffraction using simple and affordable materials.

Research and Methodology

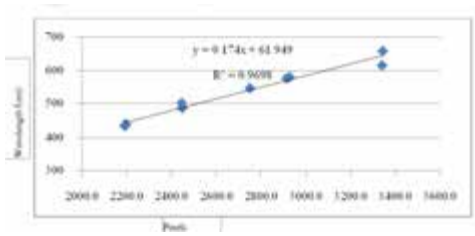
1. Material preparation

2. Proficiency calibration and Data analyzing
   The pictures showing two standard wavelengths of Hydrogen tube (H_2) and Mercury tube (Hg) as they were later analyzed for any relation between the wavelengths and Pixel Pitches

Photo spectrum of Hydrogen tube (H_2)

Photo spectrum of Mercury tube (Hg)

A Graph showing the relation between wavelengths and Pixel Pitches of Hydrogen and Mercury Tube

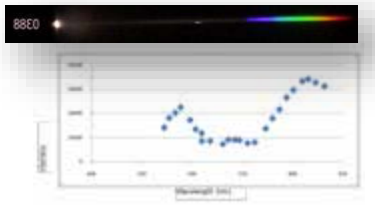


The linear equation; $y = 0.174x+61.949$

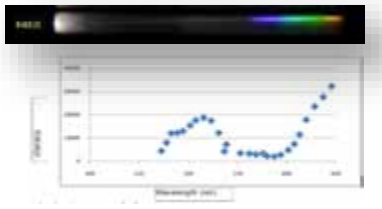
Whereas y = Wavelength (nm)
x = Pixel Pitch
R^2 = 0.9698

Results and Discussions

1. Photos of moonlight Spectrum



2. Photos of sunlight spectrums



Conclusion

The researcher designed the DSLR Spectroscopy to analyze the spectrum of both Hydrogen tube (H_2) and mercury tube (Hg) for wavelengths. Doing this, the Iris program were used to find the Pixel Pitch and Intensity. The researcher later used the Microsoft Office Excel to make the relation equation between wavelength and Pixel Pitch with the error of 1.95%. The wavelength ranges are between 443 and 643 nm. By analyzing the moonlight and sunlight spectrums, it was found that their wavelengths and intensity values are closely related

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Reference:

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