The Simple Spectrograph for DSLR camera.

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Abstract

The purpose of this study to construct a simple spectrograph by designing and setting up a spectrophotometer system to analyze and observed the spectral distribution of spectrograph with a reflective telescope. By combining the light through the lens and the refraction of light through the gating. The device is a wavelength spectrum. For the study the wavelength of the spectrum, we calibration the data with hydrogen tubes. For the results, DSLR camera can be used to capture the spectral images clearly and can be analyzed wavelengths from images and diffuse light spectrum from various sources.

Methods

1. Design and construct a simple spectrograph using the diffraction grating with 600 lines per millimeters.
2. The acrylic sheet is cut in accordance with the design (see in Fig.1 and 2). Assemble the acrylic sheet, grating and the lens together as shown in Fig.3.

Fig.1 The acrylic sheet.

Fig.2 The acrylic sheet and camera.

Fig.3 The acrylic sheet, grating and the lens.

Fig.4 The simple spectrograph with Dobsonian telescope.

3. Test the efficiency of the equipment and analyze the data.

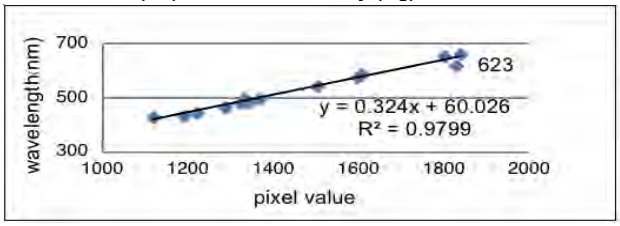
3.2 Use the equipment captures standard light source image of hydrogen(H_2) tubes, helium (He) tubes, and mercury (Hg) tubes to analysis wavelength calibration from Solar spectrum.

3.3 Using Iris software, standard spectrum was calibrated by measuring the pixel length of each color band. And then, calculate the wavelength of each color band to determine the standard wavelength of the equipment by Microsoft Office Excel.

3.4 Connect simple spectrograph with Dobsonian telescope, show in Fig.4, to observe the solar spectrum and analyze the image. The image of solar spectrum on June 14th, 2019 show in Fig.5, which the relationship between the wavelength and the intensity from observe by the equipment on June 14th, 2019 as shown in Graph 2.

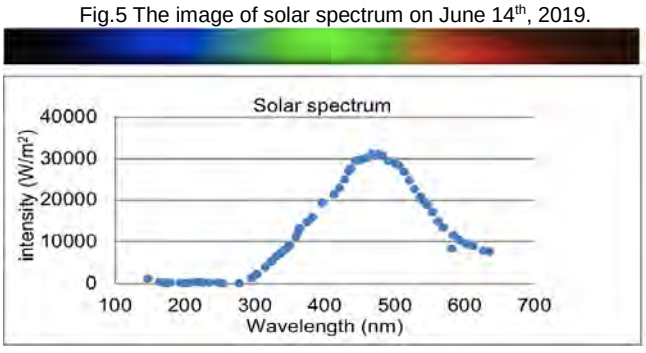
Results

Graph 1: shows the relationship between the wavelength and the pixel length of each color band of hydrogen(H_2) tubes, helium (He) tubes, and mercury (Hg) tubes.



From Graph 1, The equation of the experiment is y = 0.324x + 60.02.
When y is the wavelength, the unit is nm.
x is the pixel value

Fig.5 The image of solar spectrum on June 14th, 2019.



Graph 2: shows the relationship between the wavelength and the intensity from observe by the equipment on June 14th, 2019.

CONCLUSIONS

The study shows that, the relationship between the wavelength and pixel length of the simple spectrograph express as y = 0.324x + 60.02 which is a linear equation. The experiment also observed solar spectrum and collected the wavelength range around 434 – 656 nm. with the maximum radiation intensity occur at 476 nm which similar to theory. As the result, the simple spectrograph can be used for student to learn about relationship of wavelength, color band and black body radiation but not yet suitable to study a single of spectral line such as Hydrogen or Helium line. The experimenter hopes to continue study and adjust optical design to have more precise of simple spectrograph.

REFERENCE

Kamonrat Sithanu. (2559). The construction of a spectroscopy machine with a DSLR camera. Nong Bua Daeng Wittayalai School, Chaiyaphum.