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Spectrometric study of stars using ACCIMT telescope

The spectrum is a vital data in the study of stellar objects. A few dark or bright lines are powerful enough to find out remarkable characteristics of a stellar object. Although spectrometric studies are used extensively by astronomers in other countries, the work describe in this paper presents the result of first such attempt of spectrometric study on astronomy made in Sri Lanka.

A methodology was developed to use the 45 cm GOTO reflecting telescope and its spectrograph of Arthur C. Clarke Institute of Modern Technology (ACCIMT) for stellar spectra studies. The dark lines of the absorption spectrum indicate the missing wavelengths due to the elements and chemical compounds in the stars. In order to find out these elements the spectrum was calibrated for wavelengths. For the calibration, the emission lines of Hollow Cathode lamp were used as reference lines and the wavelengths of these lines were found using the intensity wavelength distribution of the Hollow Cathode lamp. The CCDOPS computer software was used to identify the pixel points of the reference lines. The distribution of wavelengths against pixel points shows a linear relationship. By knowing the pixel point of any absorption line it is then convenient to find the wavelength of that particular absorption line.

The technique developed was tested on the solar spectrum. Initially the solar spectrum was obtained and analyzed it through the entire visible range. The wavelength of each and every absorption line was calculated according to the above method and matched with the line spectra of elements to identify the elements responsible for individual lines. The lines of Hydrogen and Iron are found to be prominent. Lines due to Ca, Mg, Sr, Ni, and Si were also detected. In order to obtain the solar temperature, the black body radiation curve was used. For this purpose the entire solar spectrum was recorded under the uniform light condition. The intensity distribution of entire solar spectrum was taken by means of the software IRAF (Image Reduction and Analysis Facility) and the black body radiation curve is plotted with the correction for Quantum Efficiency of CCD camera. The intensity distributions of two other stars are also presented.

The elements identified in the sun using the spectrograph at the ACCIMT observatory are similar to those recorded at the Mount Wilson Observatory. Therefore the methodology used here can be adapted for future spectral observation of stellar objects at the ACCIMT astronomical observatory.