TLC analyzer: an inexpensive tool for analysis of astronomical images

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ABSTRACT

We herein discuss TLC analyzer software (freeware) as an inexpensive tool for the analysis of astronomical images. Interestingly, recently developed TLC analyzer software has been used by the chemist for the quantitative chromatographic analysis of organic compounds. The high accuracy measurement software utilities for analysis of astronomical images have been too expensive for most of the schools and the colleges. However, this is the beginner's spectrophotometer of its kind which makes elaboration even at pixel level of high resolution astronomical JPEG images. The TLC analyzer even has found to be more proficient with other image processing software such as ImageJ (public domain software), Spectra.

Introduction

High Resolution Astronomical Images and Scientific Exploration

Scientists incorporate the various telescopes, like Hubble in order to reveal the enigma of the astronomical space, wherein the ultimate outcomes of the observation are in the form of images, spectra and motion films. The data aquatinted by these telescope is then further digitalized and appear in front of us in the form of high-quality beautiful images. The high resolution images are easily available due to courtesy of the organization such as NASA, Hubble Space Telescope and European Southern Observatory [1]. The original data acquired by theses telescope contains huge information and requierd high end computation for analysis, such expensive facilities are oftenly not available at school and colleges [2]. The World Wide Web gives an access to high resolution astronomical images [3].

Figure 1 An example of a high resolution image that student could measure: the Hubble frisbee m82 cigar galaxy

The TLC-Analyzer software describe in this article was interestingly developed for the measurement of Thin Layer Chromatography plate photograph and hence after estimation of the concentration of the organic compound from it [4]. This software mainly analyzes the pointed pixel of the image into the RGB (Red, Green, Blue), Black and White density (a Densitogram).

This data then could be brought in MS-Excel for evaluation and manipulation. This indeed acts as apprentice spectrophotometer for the study of the images.

Features of TLC analyzer version 1.1

1. The TLC Analyzer Version 1.1 software can easily downloaded from [5] http://www.sciencebuddies.org/science-research-papers/tlc_analyzer.shtml
2. It is free for education and personal use.
3. Run on Windows PC or similar operating system commonly found on college and home computer.
4. This Metlab component has a simple and user-friendly interface.
5. Output of the measurement can be saved in the MS-Excel spreadsheet and hence very easy for mathematical manipulation.
6. The file with JPEG, JPG and BMP format can browse in the TLC Analyzer.
7. The Intensity of RGB at various pixels and eye dropper size can be studied.
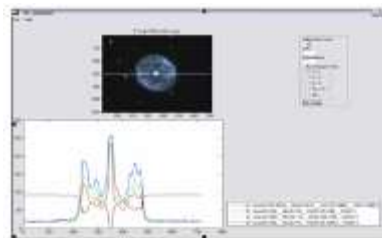8. A separate graph windows enables to study the details of the intensity of RBG vs Pixel.

Figure 2. Screen shot: Measuring the RGB value at 300 pixel with 1 x 1 eye Dropper size. The stright line at 300 pixel indicates the pixel selection on the computer screen
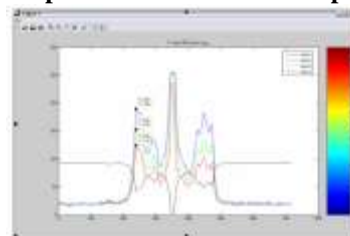

Figure 3: Screen Shot: Graph window viewing the measurement of maxima of RBG at 239 pixel on x axis

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Figure 4. Screen shot: RGB data exported in the spreadsheet
Technical note: how the tlc analyzer measures image

TCL Analyzer, a computer program scans the high resolution image and returns the RBG values for the said pixel. The image has array of rows and columns with "dots" called pixels and TLC Analyzer virtually move across these pixels, summarizing the RGB values to create a graph. Here eye dropper size signifies the slit width and ranges from 1x1 to 25x25, however this is applicable for averaging the pixels and less significant in the astronomical image analyzer where narrow slit width gives better results. TLC Analyzer not only creates graph for Red, Green and Blue but also Black and White image density (a Densitogram). Finally the results values are exported to spreadsheet.

Proficiency of tlc analyzer with combination with image Processing software
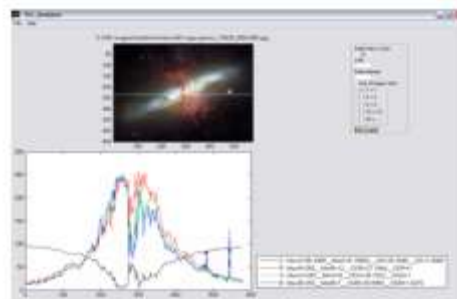
TLC analyzer with imagej

ImageJ is one of the sophisticated image processing software freely available on the web [6]. Out of many of its valuable feature, the finding maxima in the high resolution image could be more obliging. The results of this test at various noise tolerance levels would help TLC Analyzer to reach at pixel of our interest. The colour, wavelength and the RGB values have been co-related by the Dan Burton [7]. Important software is freely available for such study is the 'Spectra' [8]; this software elaborates one-to-one relation with wavelength, colour and RGB.
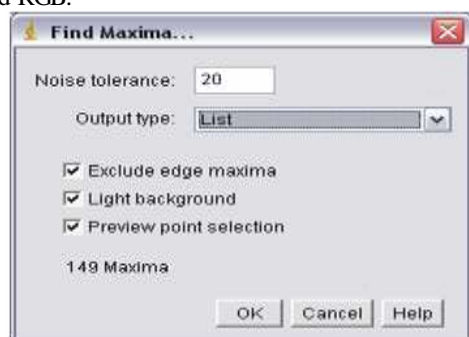
Figure 5. Screen shot: The menu in ImageJ for the evaluation of maxima in the figure 1

Figure 6 Screen shot: The results in text for maxima in the figure 1

Figure 7. Screen shot: The analysis of the image (figure 1) by TLC Analyzer for maxima (depicted by ImageJ)

Results and discussion

ImageJ software empowers the TLC Analyzer for the analysis of high resolution astronomical images. From the above table the RGB values evaluated by the Spectra and TLC Analyzer are very close. This gives coherence with the wavelength and the RGB relation by comparative study of these softwares. The outcome form the TLC Analyzer would enable the researcher to follow the astronomical images with monochrome (i. e. Red, Green, Blue) for the study. The Black and White image density (a Densitogram) can also be studied from the results of TLC Analyzer, however the RGB result values obtained from the TLC Analyzer need the more mathematical treatment to draw conclusion for this analysis. In this regard the analysis and computation of the sequential images will be more fruitful.

Conclusion

This study demonstrates the proficiency of TLC Analyzer as an inexpensive tool for the analysis of the astronomical images. Although in comparison with the similar software it cannot take the place of excel, it is good alternative for the beginner as well as for those who could not afford more costly software for the same.

References

1. Bears, R. A. 2004, "Resources to Enliven the Teaching of Astronomy to Upper Secondary Students," *School Science Review*, 85(313), 115.

2. Bears, R. A. 2006, "The design and development of simple spreadsheet-based tool that enables students to make measurement on astronomical images", *Astronomy Education Review*, 1(5).

3. http://apod.nasa.gov/apod/astropix.html [homepage on internet]. United State: A service of: ASD at NASA/ GSFC &: Michigan Technical University. [updated 2006 April 25; cited 2011 August 1] Available from: http://apod.nasa.gov/apod/lib/aptree.html

4. Hess AVI. Digitally Enhanced Thin-Layer Chromatography: An Inexpensive New Technique for Qualitative and Quantitative Analysis. Journal of Chemical Education. 2007; 84(5): 842.

5. http://www.sciencebuddies.org [homepage on internet]. United State: [updated 2007 January 7; cited 2011 July 30] Available form: http://www.sciencebuddies.org/science-research-papers/tlc_analyzer.shtml

6. http://rsbweb.nih.gov/ij/download.html [homepage on internet]. United State: National institute of Neurological

Disorder and Stroke [updated 2011 January 25; cited 2011 July 15] Available form: http://rsbweb.nih.gov/ij/download.html

7. http://www.midnightkite.com [homepage on internet]. United State: [updated 2011 January 14; cited 2011 July 11] Available form: http://www.midnightkite.com/color.html

8. http://www.efg2.com/ [homepage on internet]. United State: [updated 2006 July 31; cited 2011 July 9] Available form: http://www.efg2.com/Lab/ScienceAndEngineering/Spectra.htm