

Numerical Analysis for Computer Scientists
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Project #2

Finding the line strength of stars for an
astronomer

Erik Westrup, <ada09ewe@student.lu.se>

1 Introduction and Problem Background

This project is about solving real-world problems with their accompanied complexities and ambiguities. The best method must be determined and its limitations and possible errors must be known. In this project intensity of light from stars will be studied. Stars produces a continuous curve of light over a range of frequencies called the *spectrum* for that star. It can be measured in *relative intensity* ($\frac{W}{m^2 \times Hz}$) as a function of the frequency (Hz) which is defined as the spectrum. What is interesting is that the surrounding gases of a star will either absorb (cold gas) or emit (warm) light which is visible at discrete fixed frequencies in the spectrum as *spectral lines*. By identifying these spectral lines the components of the star can be found.

In this project a measured continuous spectrum for a star is given which contains six spectral lines evenly divided in absorption lines and emissions lines. The task for this project is to find the total intensity for each of these spectral lines called the *line strength* measured in $\frac{M}{m^2}$. This is achieved by finding the area under the curve at the peak-frequencies i.e. integrating the relative intensity over these frequencies.

2 Numerical Considerations

3 Results & Analysis

4 Lessons Learned

From this project several theoretical understandings are gained.

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5 Acknowledgments

References

- [1] T. Sauer, "Numerical analysis," pp. 91,93, 2006. First edition.

Appendix

A Program listings

Here the *MATLAB*[®] functions and scripts used to achieve the results above are listed.

A.1 Scripts

The following scrips are the drivers for producing the results found in this report.

src/project2.m

```
1 clc % Clear command screen.  
2 format long % Format of floating point numbers.  
3 close all % Close all figures.  
4 fprintf(1, '—>Project #2.\n');  
5 clear all
```

A.2 Functions

The following functions implements the algorithms and the rest serves as helper functions to these algorithms and the scripts. To distinguish these from other *MATLAB*[®]-functions in the global namespace these reside in a own package called *pr2*.

[1]