

Search for variable stars in the Kepler database

Daniel Nhlapo ([Email: Daniel.Nhlapo@nwu.ac.za](mailto:Daniel.Nhlapo@nwu.ac.za))

February 22, 2024

Abstract

In this project, existing photometric data will be used to search and classify variable stars. Fourier analysis technique will be applied to process time-series of several stars and resulting fourier spectra will be inspected for any outstanding peaks. Detected variable stars will then be classified accordingly based on their frequency/period. This will allow for determination of their physical properties like luminosities, absolute magnitudes and distances.

Introduction

The study of variability in stars is one of the oldest, yet active topic in stellar astrophysics. Variable stars provide an essential opportunity to apply the laws of physics and hence understand their dynamics. Stellar variability is vital because it provides information about the internal structure of the star. This project aims at searching for variable stars and study their variability behaviour, using available data from the Kepler database.

Special requirements

Some experience with the **Python** programming language would be nice.

Description

This project will use available data from the Kepler database. Extracted time-series will be processed using a Python-written code to produce frequency spectra. The obtained spectra, together with their respective time-series will be plotted to visually inspect for variabilities. This will allow for a determination of their variability periods and compare them with periods of known variable stars for classification purpose. Once their variability periods are known, a period-luminosity relation and distance modulus will be used to determine their physical parameters like luminosity, absolute magnitude and distance. Figure 1 shows an example of time-series (top) and a corresponding frequency spectrum and phase plot (bottom) obtained using the method to be applied on this project. More information on the Kepler database is found on this link: https://archive.stsci.edu/kepler/data_search/search.php

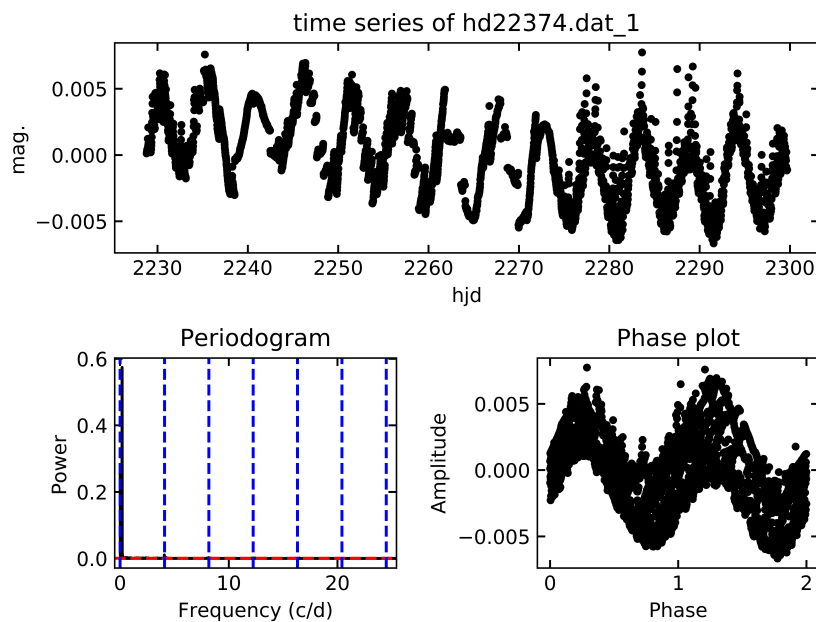


Figure 1: A figure showing time-series (top) and corresponding frequency spectrum and phase plot (bottom).