

Development of An Eclipse Mapping Routine Using Python for Analysis of *Kepler* Data

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Abstract

An extensive development and implementation of the eclipse mapping method using Python and its relevant libraries is discussed. The code utilizes Scipy's minimize function along with its various solving methods such as Nelder-Mead, Conjugate Gradient (CG), and Sequential Least Squares Programming (SLSQP). These methods are used to solve the maximum entropy equation with a chi-squared constraint to the observed photometric light curve. These methods are first evaluated on two dimensional Gaussian test data with no chi-squared constraint, and then used to image the accretion disks of Cataclysmic Variables KIC 201325107, and SDSS J162520.9+120308.7, revealing their Gaussian structure. Moreover, the structure of the code, along with potential design flaws, other errors, and parameter effects on computational time are examined. Factors such as the variance within the Gaussian weighting algorithm, the resolution of the disk image, the number of points within the observed light curve data, and the constraint level of the algorithm can drastically effect the quality of the image. These factors are analyzed and discuss in Section (insert section number here). Furthermore, an alternative method to the constrained maximum entropy method is discussed. The above methods and parameters are then considered as a whole and conclusions are drawn regarding the steps for further research. Finally, the the code's GitHub repository is discussed for version control and open source development.