Solutions for 10,000 eclipsing binaries of the bulge fields in OGLE II using DEBiL

Jonathan Devor

Harvard-Smithsonian Center for Astrophysics

jdevor@cfa.harvard.edu

http://cfa-www.harvard.edu/~jdevor/DEBiL.html

We have developed a pipeline for systematically identifying and analyzing eclipsing binaries within a large dataset of light curves. In it we have implemented a new method, whereby light curves are passed through a multi-tiered pipeline of increasingly sophisticated programs. After each pipeline tier, light curves that did not conform to a given criteria were filtered out of the pipeline, reducing the load on the following, more computationally intensive tiers. As the central component of the pipeline, we have created the fully automated Detached Eclipsing Binary Light curve fitter (DEBiL), which rapidly fits large numbers of light curves to a simple model. Using the results of DEBiL, light curves of interest can be flagged for follow-up analysis. As a test case, we analyzed the 218699 light curves within the bulge fields of the OGLE II survey and produced 10862 model fits. We expect this approach to become increasingly important as light curve datasets continue growing in both size and number.

Find the light curve period
(Periodogram)

Non-periodic:
non-variable stars,
novae, CVs, spotted stars,
microlensed stars, etc.

Simple/fast/automated eclipsing
binary model fitting (DEBiL)

Non-binary:
stars with stable spots,
pulsating stars, etc.

Accurate/slow/human-guided
eclipsing binary model
(WD, EBOP, etc.)

Selected eclipsing
binary systems

Color - Density

Mean Density [g/cm³] vs Corrected Color (V-I). Labels: M0, Main Sequence, A0, F0, G0, K0, B0, K0, Giant Branch, M0.

Radius - Radius

r_2 vs r_1. Labels: r_2 Roche limit, r_1 Roche limit, $r_1 + r_2 = 1$ Contact limit, $r_1 = r_2$.

Period - Eccentricity

Eccentricity vs Period [days].

Period - Color

Corrected Color (V-I) vs Period [days].

Color - Magnitude

Extinction corrected magnitude (I) vs Extinction corrected color (V-I). Labels: Primary components, Secondary components.