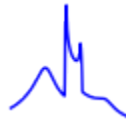**ulens binary light curve Manual**
(version 0.1, Jul 2011)

Introduction
This graphical program is a tool for studying light curve of the binary microlensing events, by changing the apparent projected trajectory of the source behind the lens and calculating the magnification along this trajectory.

What you see
Two main figures show:
- lens geometry: caustic (black) and critical curve (blue), and the source trajectory (dotted line with the red arrow). The center of mass is marked with the black cross and both masses are marked with black circles.
- theoretical light curve (blue line)

The screenshot of the program is attached at the end of this document.

On right there is a panel with the current values of the lens and event parameters. Editing those parameters in the text fields and pressing Enter will updates figures accordingly. Moving the source trajectory in the upper figure will update values in the fields.

The source trajectory is displayed as dotted gray line, the red part mark plotting limits for the light curve. Red arrow shows the direction of the source-lens relative motion.

The light curve is plotted in magnitudes (*18 - 2.5 log A*) or in magnification (*A*) depending on the state of the toggle button (*2.5logA or A*). The x axis unit is Einstein radius and the variable is *"tau"* which express the distance of the source along its trajectory from the closet approach to the center of mass of the lens, there *tau<0* before source closest approch and *tau>0* after.

Basic usage
1. Set the lens geometry: use text fields called *"s"* and *"q"*. Hit Enter to see the change on the figure.
2. Set the source radius - filled called *"rho"*.
3. Drag the source trajectory to the required position with the mouse (assuming the trajectory move tool is active) - hold the red arrow with the left mouse key to move it, and with the right mouse key to rotate. You can use also the input fields marked as: *"u0"* and *"alpha"*.
4. Adjust the light curve plotting limits by changing the length of the red arrow. Drag begining and end of the arrow with the mouse. You can achieve the same effect by tweaking fields called: *"tau_min"* and *"tau_max"*.
5. Hit *Update*. The light curve figure (bottom panel) should refresh.

Zooming and navigating figures

- *back button* - moves the figure view to the previous configuration
- *pan/zoom tool* - if this tool is activated you can move the figure (pan) with the left mouse button. While holding the right mouse button, moving over the figure upwards will zoom in and downwards will zoom out.
- *zoom to rectangle* - this tool will zoom in the figure to the selected rectangle (with the left mouse button) or zoom out (with the right mouse button).
- *trajectory moving tool* - this allows to move (left mouse button) and rotate (right mouse button) the source trajectory with the mouse. Hold the ends of the arrow to move the separately and change the light curve plot limits.
- *save image tool* - allows you to save the current view of the figure.
- *home tool* - brings the figure to the initial view.

Each of the two figures have its own tool bar and the states of the tools, which is on or off, is not shared between them.

Parameters description

lens geometry:
- *s* - separation between lens components (in Einstein radii)
- *q* - mass ratio (if *q<1* then the havier mass is on the left)

source properties:
- *rho* - source radius (in Einstein radii)

source trajectory:
- *u0* - distance of closest approach to the center of mass of the lens (in Einstein radii)
- *alpha* - angle of the lens-source relative proper motion measured counter-clockwise from the binary axis (in degrees)

light curve plotting limits:
- *tau_min* - place on the source trajectory the synthetic light curve is calculated from
- *tau_max* - place on the source trajectory the synthetic light curve is calculated to

"tau" measures the distance allong the sourc trajectory in Einstein radii. *tau=0* at closest approach to the center of mass

Other configuration

Update button - is used to update the light curve after all event parameters are set.

Stop button - will interrupt light curve calculation at any time.

2.5logA or A toggle button - changes mode of displaying the light curve from magnitudes to magnification.

line/points toggle button - toggle between two modes of light curve plotting: as discreet points or

points connected with a straight lines

npoints fields - sets how many points will be calculated on the light curve within the defined limits of *tau*.
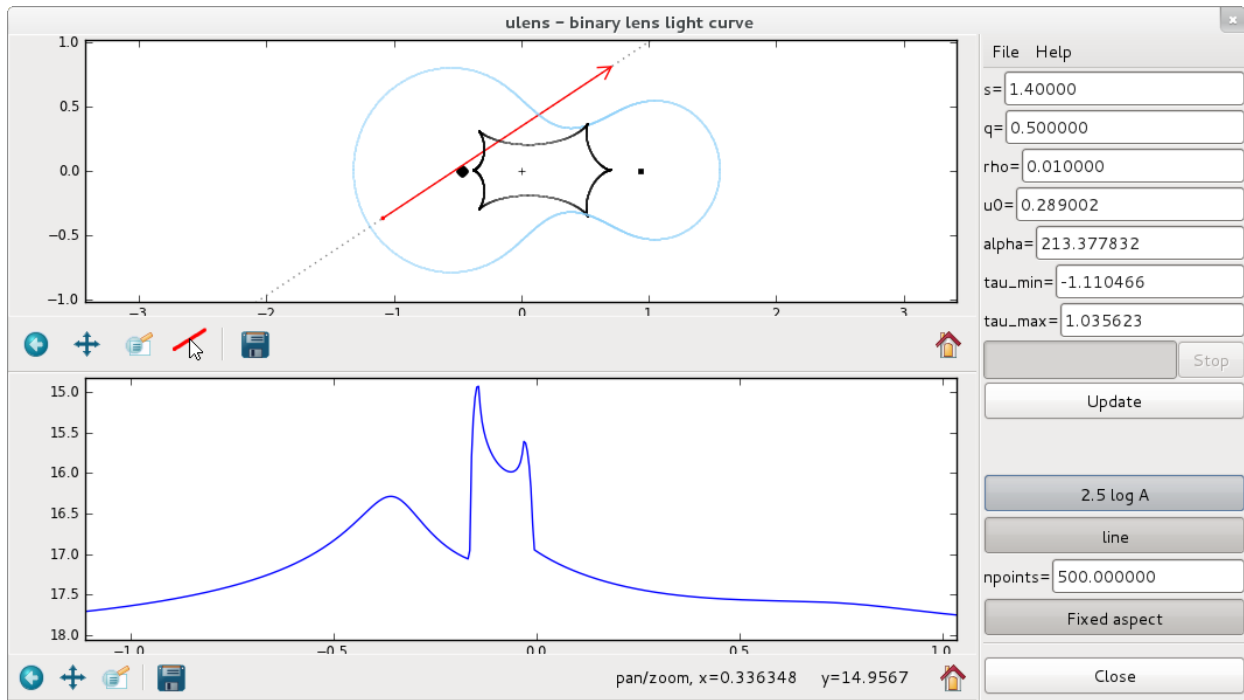
Fixed aspect button - toggles the aspect ratio modes of the upper figure: fixed aspect ratio forces that the same distance on x axis and on y axis will be displayed on the screen with the same length, regardless of the different zooming efforts.

Close button - exits the program

Screenshot of the program
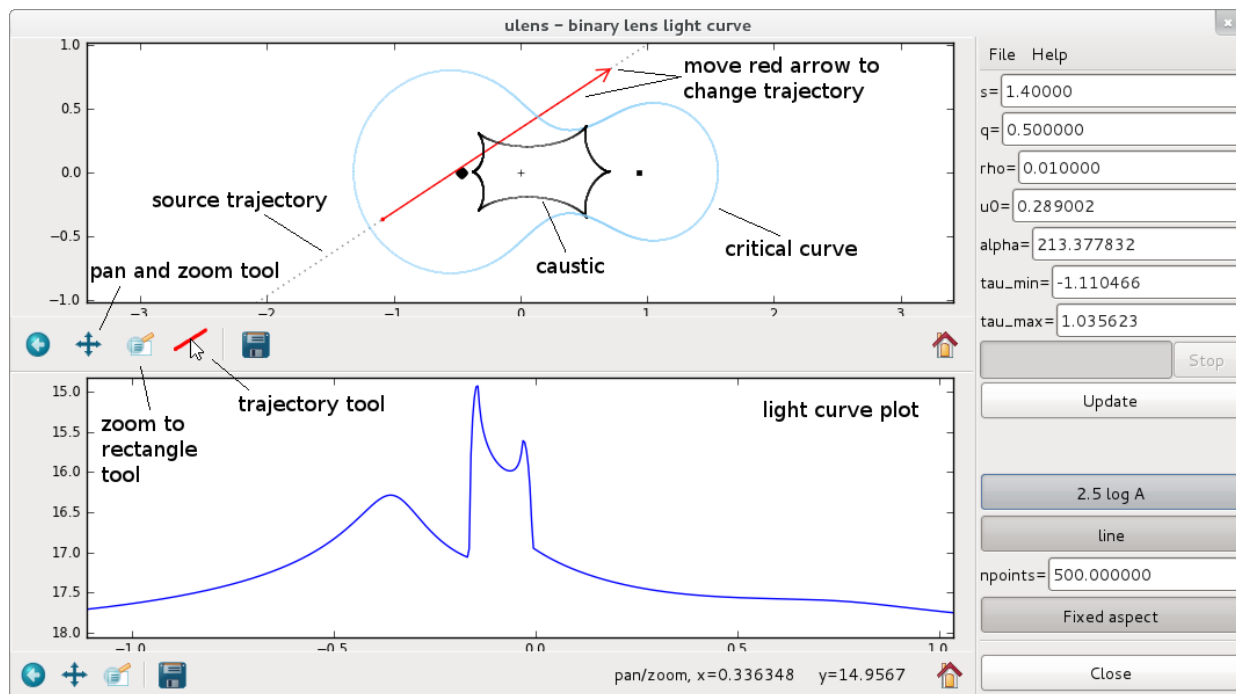
(screenshot with captions)

(raw screenshot)

Authors

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special thanks to Jin H. An for the finite source magnification calculation routine