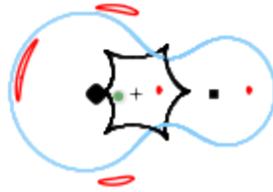


# ulens binary images Manual

(version 0.1, Jul 2011)



## Introduction

This graphical program is a tool for studying image configuration in the binary-lens microlensing, by changing the apparent projected position of the background source.

## What you see

The main figure shows the lens geometry: caustic (black) and critical curve (blue), and the source position (green circle) together with its images (red). The center of mass is marked with the black cross and both masses are marked with black circles.

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 source parameters. Editing those parameters in the text fields and pressing Enter will updates the figure accordingly. Moving the source position will update  $x$  and  $y$  values in the fields.

## 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 to the required position with the mouse (assuming the source moving tool is active). You can use also the input fields marked as: “ $x$ ” and “ $y$ ”.
4. Hit *Enter* key or *Update button* to update images.

## 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.

### Parameters description

lens geometry:

- $s$  - separation between lens components (in Einstein radii)
- $q$  - mass ratio (if  $q < 1$  then the heavier mass is on the left)

source properties:

- $\rho$  - source radius (in Einstein radii)
- $\Gamma$  - is the linear limb-darkening coefficient (it only has impact on magnification, not on the shape of the images). It is calculated from the standard  $u$  coefficient using Alfonso et al. 2000, S3.1 formula:  $u = 3 \Gamma / (\Gamma + 2)$

source position:

- $x$  - x coordinate (in Einstein radii)
- $y$  - y coordinate (in Einstein radii)

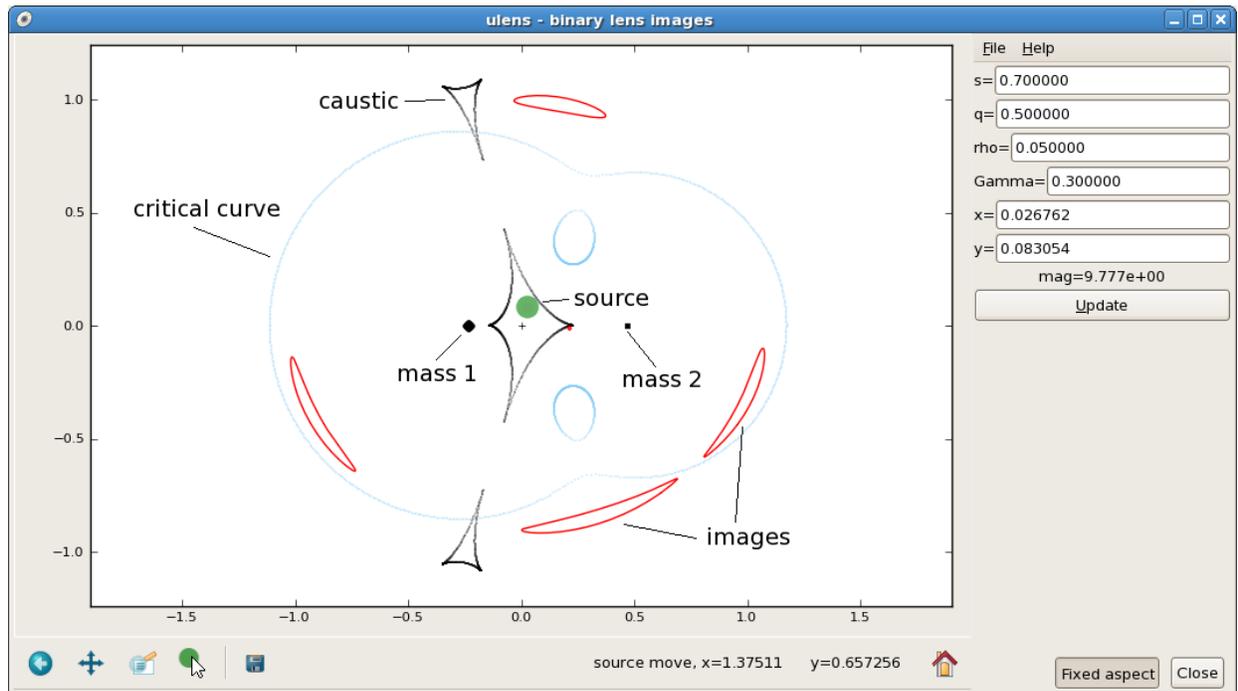
### Other configuration

*Update button* - is used to update the image configurations. *Enter* key in a text field also works.

*Fixed aspect button* - toggles the aspect ratio modes of the 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)

## Authors

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