Evolution of LITpro

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Outline

• Current status
• Objectives of the evolution
• Actions in progress
  – Fitters
  – Users functions
• Next actions
  – read the OIFITS2 format
LITpro proposes to the user:

- one fitter (Levenberg Marquardt with trust regions and bounds on the parameters)
  up-to-now the most efficient for seeking local minima

- a search of global minimum by gridding parameters
  "Plot chi2 with fit"
Search of global minimum by gridding parameters
Search of global minimum by gridding parameters

ex: binary of the 2004 Interferometric Imaging Beauty Contest

$$\text{Plot Chi2 for } x2, y2 \text{ with fit of the flux_weights}$$

$$\text{Plot sniffer map for } x2, y2 :$$

n REDUCED CHI2 MINIMA:

\[
\chi^2 @ \begin{array}{c}
x2, y2 \\
\text{flux_weight1, flux_weight2}
\end{array} \mid \begin{array}{c}
\text{coordinates} \\
\text{fitted parameters}
\end{array}
\]

n fixed by default in the GUI (up-to-now)

==> "Plot sniffer map" will disappear from the GUI
Current status

LITpro proposes to the user:

- one fitter (Levenberg Marquardt with trust regions and bounds on the parameters)
  up-to-now the most efficient for seeking local minima

- a search of global minimum by gridding parameters
  "Plot chi2 with fit"

- one estimation of the error bars (from $\chi^2$ curvature)

- a library of combinable object models
  easy to expand
lpb_punct() - Single point (Dirac function)
lpb_background() - Background
lpb_disk() - Uniform disk with normalized total flux
lpb_disk_polar() - Uniform disk with normalized total flux
lpb_nonorm_disk() - Not normalized uniform disk
lpb_circle() - Circle
lpb_gaussian() - Gaussian
lpb_ring() - Uniform ring
lpb_gaussian_ring() - Gaussian ring
lpb_square() - Uniform square
lpb_modulated_circle() - Gaussian ring
lpb_elong_disk() - Ellipse (elongated disk)
lpb_nonorm_elong_disk() - Not normalized ellipse (elongated disk)
lpb_elong_gaussian() - Elongated Gaussian
lpb_elong_ring() - Ellongated ring
lpb_elong_limb_power() - Ellipse (elongated disk)
lpb_flatten_disk() - Ellipse (flattened disk)
lpb_nonorm_flatten_disk() - Not normalized ellipse (flattened disk)
lpb_flatten_gaussian() - Flattened Gaussian
lpb_flatten_ring() - Flattened ring
lpb_stretched_disk() - Stretched Gaussian
lpb_stretched_gaussian() - Stretched Gaussian
lpb_stretched_gaussian_ring() - Stretched Gaussian Ring
lpb_stretched_modulated_circle() - Stretched modulated circle
lpb_stretched_modulated_gaussian_ring() - Stretched modulated gaussian ring
lpb_limb_power() - Limb-darkened disk with power law
lpb_limb_linear() - Limb-darkened disk with linear law
lpb_limb_quadratic() - Limb-darkened disk with quadratic law
lpb_limb_sqrt() - Limb-darkened disk with square root law
lpb_limb_nonlinear_Claret() - Limb-darkened disk with the new non-linear law of Claret (2000)
lpb_blackbody() - Weight with relative flux of black-body
lpb_background_BB() - Background with black-body emission
lpb_punct_BB() - Single point (Dirac function) with black body emission
lpb_disk_BB() - Uniform disk with black body emission
lpb_elong_disk_BB() - Elongated disk with black body emission
lpb_stretched_disk_BB() - Stretched disk with black body emission
lpb_gaussian_BB() - Uniform disk with black body emission
lpb_stretched_gaussian_BB() - Stretched Gaussian with blackbody

present model functions : a lot!
LITpro proposes to the user:

- one fitter (Levenberg Marquardt with trust regions and bounds on the parameters) up-to-now the most efficient for seeking local minima

- a search of global minimum by gridding parameters "Plot chi2 with fit"

- one estimation of the error bars (from $\chi^2$ curvature)

- a library of combinable object models easy to expand
Objectives of the evolution

LITpro will allow the user to:

/Fitters:
  – use other fitters (global and local)
  – use different estimators of the error bars
    \( \chi^2 \) curvature, resampling, MCMC, ...

/Model functions:
  – build its own model
  – \( \rightarrow \) public and sharable library of user models (website)
Actions in progress

• / Fitters
  – implementation of fitters as "pluggins": operational

  – pluggin "genetic algorithm" implemented (global fitter)
    tests under way (by Hervé)

  – other fitters ready to be implemented
    Neadler-Mead (local fitter)
    "gutsyfit" (global fitter) (Michel)

  – use different estimators of the error bars: to be done
Actions in progress

• / Users functions
  
  – to replace the present functions by an algebra combining
    • a set of basic model functions
    with
    • a set of operators (transforms & filters)
**Actions in progress**

**user functions**

---

**basic functions**

punct  
disk  
gaussian  
...

**transforms**

---

elong  
flatten  
stretch  
rotate

**operators**

blackbody  
shift  
...  
polar  
...  
function(\lambda)

**filters**

---

ex: lpb_stretched_gaussian_BB()

---

--> the user may compose any model easily  
and also write its own function

**func UserFunc** (coordinates, parameters)
  
  coordinates = ufreq, vfreq, wavelength, bandwidth, MJD,...
  
  parameters = x, y, flux_weight, diameter, temperature,...
Actions in progress

- coding under way
- ---> "new" GUI with new functionalities
Shared User Model Area

Introduction

Introduction TBD for the usermodels that LITpro can play with.

Search

Description

Browse

Browse all models

Help

Read documentation about custom user models (how does it work, available utility functions...)

TODO:

1. add code for every models : author link, date of publication
2. handle tags to classify models
3. provide rss feeds for all/models/comments
4. fix xml output of a model (limit to one if name parameter is given)
5. handle login (to avoid anonymous help edit )
6. send a model to LITpro through samp
7. force the user to provide all information: shortdesc, help (may be done onto the GUI side)
8. sort model lists by name, author, date
9. accept user comments for the models
10. handle versions to follow code updates
11. enhance new model registration process for the handling of user affiliation (show to check and propose to get one if empty...)
12. add a credit page for the web repository (existd/bootstrap...)

Last models:

- custom3 : Dummy short desc on 2013-07-11 by Guillaume Mella
- binary : binary on 2013-07-11 by Isabelle Tallon-Bosc

Last comments:

- TODO
binary model

Short description

binary

Description

binary puncts

Code

```plaintext
binary(ufreq, vfreq, wavelength, bandwidth, flux_weight, x, y, flux_ratio, rho, PA) {
q = flux_weight/(1.+flux_ratio);
xy2 = lp_rho_PA_to_xy(rho, PA);
return lpb_punct(ufreq, vfreq, q, x, y) + lpb_punct(ufreq, vfreq, q*flux_ratio, x+xy2(1), y+xy2(2));
}
```

Comments

Please login to enter comments

Model Info

Submitted: 2013-07-11
Version: 1
Author: Isabelle Talon-Bosc (CRAL)
Tags:
Status: 
Comments: 0
UID: d7f8a169-7fa8-4600-b9fe-bd93abe9e61eb
Actions in progress

• coding under way

• --> "new" GUI with new functionalities

• link with an interactive web page, where users:
  – find help
  – see the codes of existing model functions
  – may contribute to the library (sharing his model, commenting others)
Next actions

• Read OIFITS2 format

  – read *OI_SPECTRUM*
    (LITpro already fits SED and visibilities simultaneously)

  – adapt the model of data with the instrument (identified by keywords *INSTRUME/INSMODE*)

  ex.: prototypic work on the VEGA differential visibilities (*OI_VIS*) on PCygni
       (POLCA project)

![Graphs showing VEGA differential visibilities without and with a model of the instrument]
Conclusions

• This evolution = our priority
  – fitters & user functions in 2017
  – OIFITS2 later on

• it will be tested by the "beta-testers" of the group
  (JB LeBouquin *IPAG*, A. Domiciano, N. Nardetto, M. Vannier *OCA*)
  and others welcome!

  Do not hesitate to tell us your needs