SurveySim User's Guide
version 1.0

Last updated: September 3, 2015

This User Guide contains the compilation and documentation instructions for the open-source version of the SurveySim code. Version 1.0 only works with OSX platforms. Users should refer to the Mac OSX notes before attempting the main compilation, as otherwise building the libraries will fail.

If any other bugs are found during the compilation process or in use, please post bug reports to the main github repository: github.com/nkurinsky/SurveySim

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1 Abstract

SurveySim is a new MCMC package tailored to constraining the evolution of the IR luminosity function. Unlike earlier similar studies, SurveySim is built to be very flexible and hence easily adaptable to a wide range of surveys (although in the current implementation, limited to the infrared 3-1000μm regime). The core of the code is a series of C++ modules, which perform the MCMC. However, all changeable aspects, including the luminosity funciton parameters, the SED template library and the observations themselves are external to this core and are fed to it via a Python-based user interface.

2 Installation

2.1 Obtaining SurveySim

SurveySim can be obtained via github (???) in the form of tar.gz file. If the current version is otherwise unavailable, please email [Sajina / Noah's email address] for a link to the source.

2.2 Compilation Procedure

The main compilation procedure for installations is as follows. Using bash while performing the installations is recommended for optimal results.

./configure
make
sudo make install

The following python packages are required for installation and must be set up prior to the main compilation procedure.

- pyfits

- astropy

- seaborn

- texlive

- pandas

Before attempting the main compilation procedure, GSL, CCFits and cfitsio must be installed and configured. Each of these libraries are contained within their corresponding folder lib_aux as tarballs. To extract each library, enter the lib_aux directory and run the command:

tar xzvf "filename.tar.gz"

Once you untar each libary, follow the procedure enumerated below in order to install them.

1. GSL: Enter the file, then type:

   ./configure
   make
   make check 2¿&1
   sudo make install

2. cfitsio: Enter the file, then type:

   ./configure –prefix=/usr/local
   make
   sudo make install

3. CCfits: Enter the file, then type:

   ./configure –with-cfitsion=/usr/local
   make
   sudo make install

Once each library has been successfully installed, run the main compilation procedure by entering the following three commands:

./configure
make
sudo make install

You should now be able to launch the SurveySimGUI graphical interface, as well as execute the SurveySim terminal command.

2.2.1   Important Notes for Mac Users

Make sure to install the XCode command line tools before attempting the main installation.

For OSX 10.9: enter the command "xcode-select –install"

For OSX 10.7: Use clang and clang++ to compile and link all three libraries, as the llvm compiler is very buggy and the gsl checks will fail. To do this, add the following two lines to your ./configure commands.

CC = clang
CXX = clang++

These are not necessary for the final program, but make check will fail in gsl if ./configure is not properly modified.

2.3   Troubleshooting

If the compilation fails, make sure the ColumnVectorData header file is correct; it may need to be updated from the CCFits site. ColumnVectorData.h is located in ../surveysim-1.0/lib_aux/CCfits.

3   Running SurveySim

Include the following line in a .bashrc file to add the SurveySim directory to your path.

export PATH=$PATH:.:/usr/local/surveysim-1.0

SurveySim can be accessed via two separate interfaces, the GUI or the command line. To execute the program via the command line, enter the following:

SurveySim modelfile sedfile obsfile [outfile] [-o output] [-v]

Providing modelfile and obsfile inputs allows the user to specify particular model and observation files. To execute SurveySim via the GUI, enter the following:

SurveySimGUI [-i modelfile]

Similar to the command-line interface, the GUI can also be launched with a desired model file by including the optional argument [-i modelfile] upon launch. The user will see the following GUI when launching SurveySimGUI. Each portion of the interface is explained in its corresponding subsection.
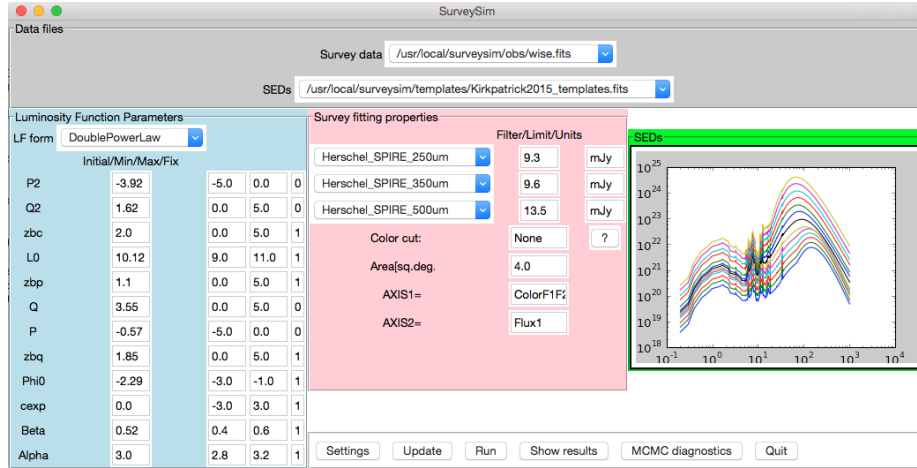
3.1   Data Files

The SurveySimGUI has two drop down menus, one for designating survey data and another for SED templates.
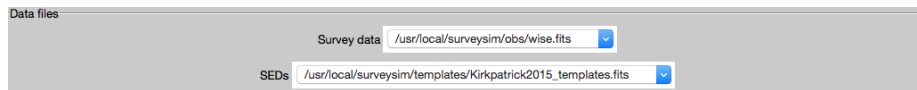
3.2 Luminosity Function Parameters

SurveySim provides the user with a host of free parameters with which to constrain and interact with the generated luminosity function. Furthermore, each parameter can be fixed or earmarked for MCMC fitting. When launching the GUI, users will notice a series of pre-loaded inputs. These have been pre-selected from the literature, however need not remain as they are.

- P2: High z density evolution

- Q2: High z luminosity evolution

- zbc: SED redshift evolution

- LO: Characteristic luminosity

- zbp: Low z density evolution cutoff

- Q : Low z luminosity evolution

- P : Low z density evolution

- zbq: Low z luminosity evolution cutoff

- PhiO: Characteristic density

- cexp: SED redshift evolution

- Beta: secondary slope

- Alpha: Primary slope

Luminosity Function Parameters				
LF form	DoublePowerLaw			
	Initial/Min/Max/Fix			
P2	-3.92	-5.0	0.0	0
Q2	1.62	0.0	5.0	0
zbc	2.0	0.0	5.0	1
L0	10.12	9.0	11.0	1
zbp	1.1	0.0	5.0	1
Q	3.55	0.0	5.0	0
P	-0.57	-5.0	0.0	0
zbq	1.85	0.0	5.0	1
Phi0	-2.29	-3.0	-1.0	1
cexp	0.0	-3.0	3.0	1
Beta	0.52	0.4	0.6	1
Alpha	3.0	2.8	3.2	1

The characteristic density and luminosity are parameterized according to redshift by the common method adopted in [Johnston et al. 2011] displayed below.

$$\Phi^*(z) = \Phi_0^*(1+z)^p$$

$$L^*(z) = L_0^*(1+z)^q$$

3.3 Survey Fitting Properties

3.4 SEDs

Survey fitting properties

Filter/Limit/Units

Herschel_SPIRE_250um	9.3	mJy
Herschel_SPIRE_350um	9.6	mJy
Herschel_SPIRE_500um	13.5	mJy

Color cut: None   ?

Area[sq.deg.   4.0

AXIS1=   ColorF1F2

AXIS2=   Flux1

SEDs