Writing a Reproducible Paper using LaTeX and Madagascar

Jiubing Cheng & Yang Liu
Acknowledgement

Main Page

Madagascar is an open-source software package for multidimensional data analysis and reproducible computational experiments. Its mission is to provide

- a convenient and powerful environment
- a convenient technology transfer tool

for researchers working with digital image and data processing in geophysics and related fields. Technology developed using the Madagascar project management system is transferred in the form of recorded processing histories, which become "computational recipes" to be verified, exchanged, and modified by users of the system.

Features

Madagascar is a modern package. Started in 2003 and publicly released in 2006, it was developed almost entirely from scratch. Being a relatively new package, it follows modern software engineering practices such as module encapsulation and test-driven development. A rapid development of a project of this scope (more than 1,000 main programs and more than 5,000 tests) would not be possible without standing on the shoulders of giants and learning from the 30 years of previous experience in open packages such as SEPLib and Seismic Unix. We have borrowed and reimplemented functionality and ideas from these other packages.

Madagascar is a test-driven package. Test-driven development is not only an agile software programming practice but also a way of bringing scientific foundation to geophysical research that involves numerical experiments. Bringing reproducibility and peer review, the backbone of any real science, to the field of computational geophysics is the main motivation for Madagascar development. The package consists of two levels: low-level main programs (typically developed in the C programming language and working as data filters) and high-level processing flows (described using the Python programming language) that combine main programs and completely document data processing histories for testing and reproducibility. Experience shows that high-level programming is easily mastered even by beginning students who have no previous programming experience.

Madagascar is an open-source package. It is distributed under the standard GPL open-source license, which places no restriction on the usage and modification of the code. Moreover, access to modifying the source repository is not controlled by one organization but shared equally among different developers. This enables an open collaboration among different groups spread all over the world, in the true spirit of the open-source movement.

Madagascar uses a simple, flexible, and universal data format that can handle very large datasets but is not tied specifically to seismic data or data of any other particular kind. This "regularly sampled" format is borrowed from the traditional SEPLib. A universal data format allows us to share general-purpose data processing tools with scientists from other disciplines such as petroleum engineers working on large-scale reservoir simulations.

Latest News

Upcoming events:
Madagascar School in Shanghai July 10-11, 2017
SEG Working Workshop in Houston, August 9-12, 2017
Reproducible Paper:
Writing and publishing using \LaTeX and Madagascar

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Acknowledgement

SOFTWARE METAPAPER

Madagascar: open-source software project for multidimensional data analysis and reproducible computational experiments

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3 TGS, Houston, Texas, USA
4 College of Geo-exploration Science and Technology, Jilin University, Changchun, Jilin, China
5 BP, Houston, Texas, USA

The Madagascar software package is designed for analysis of large-scale multidimensional data, such as those occurring in exploration geophysics. Madagascar provides a framework for reproducible research. By “reproducible research” we refer to the discipline of attaching software codes and data to computational results reported in publications. The package contains a collection of (a) computational modules, (b) data-processing scripts, and (c) research papers. Madagascar is distributed on SourceForge under a GPL v2 license https://sourceforge.net/projects/rsf/. By October 2013, more than 70 people from different organizations around the world have contributed to the project, with increasing year-to-year activity. The Madagascar website is http://www.ahay.org/.

Keywords: reproducibility, data analysis, geophysics, seismology, Python
Agenda

- Background & Motivations

- How to use SEGTeX
  - Requirements
  - Implement steps
  - Rules
  - Some tips

- An Example in RSFSRC/book/tutorial/authors
Agenda

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The three branches of science

From Euclid’s reasoning and Galileo’s experiments, it took hundreds of years for the theoretical and experimental branches of science to develop standards for publication and peer review.

Computational science, rightly regarded as the third branch, can walk the same road much faster.

Jiubing Cheng & Yang Liu
What is science?
When does computational research become scientific?

“Science is the systematic enterprise of gathering knowledge about the universe and organizing and condensing that knowledge into testable laws and theories. The success and credibility of science are anchored in the willingness of scientists to independent testing and replication by other scientists. This requires the complete and open exchange of data, procedures and materials.” (See www.aps.org/policy/statements/99_6.cfm for more information.)

Jiubing Cheng & Yang Liu
The idea of a “replication by other scientists” in reference to computations is more commonly known as “reproducible research,” the term coined by Jon Claerbout, a geophysics professor at Stanford University.

Soon after its inception in 2000, CiSE published a paper by Claerbout and his students on their experience with creating a reproducible research environment.

The open community Madagascar project (www.ahay.org) is currently extending this environment with modern tools such as Python-based Scons.

CiSE: Computating in Science & Engineering
The so-called “Claerbout’s principle”

- Reproducible research refers to the discipline of attaching software code and data to scientific publications, in order to enable independent verification and replication of computational experiments.
- The so-called “Claerbout’s principle” states that “An article about computational science in a scientific publication is not the scholarship itself, it is merely advertising of the scholarship. The actual scholarship is the complete software development environment and the complete set of instructions which generated the figures.”

References


Reproducible Research

Links and info about reproducible research

HOME BLOG HOW TO BIBLIOGRAPHY REPRODUCIBLE MATERIAL LINKS ABOUT EVENTS

Home

An article about computational science in a scientific publication is not the scholarship itself, it is merely advertising of the scholarship. The actual scholarship is the complete software development environment and the complete set of instructions which generated the figures.
—D. Donoho

Welcome on this site about reproducible research. This site is intended to gather a lot of information and useful links about reproducible research. As the authors mainly work in signal/image processing, that is also the main focus of this site. Follow the links in the text or in the menu to navigate through this site.

Overview

This site hosts a blog with a wide range of posts related to reproducibility. A description of how we make our research reproducible can be found on the How To page. We try to keep track of a bibliography of reproducible research-related articles. The Links page contains a large set of links about RR, tools, etc. And on the Reproducible Material page, you can find a set of links to code and data for papers in signal and image processing.

Motivation

After a colleague asked something about a paper you wrote, you spend a considerable amount of time finding back the right program files you used in that paper. Not to talk about the time to get back to the set of parameters used to produce that nice result.

Because this type of situations sounded all too familiar to many of us, we are now trying to make our research reproducible. Most of the ideas about reproducible research come from Jon Claerbout and his research group at Stanford University. We believe reproducible research can be helpful in many ways:
Jon Claerbout’s Story

• 1987: Sunview experience
  – Interactive programs are slavery
• 1992: LaTeX + cake
  – Rebuilding books by a single command

• Reproducible research at Stanford Exploration Project (SEP)
  – From CD-ROMs to WWW
  – From cake to GNU make
  – 2001 CiSE paper
The Madagascar Project

at the University of Texas at Austin started by Sergey Fomel and Paul Sava

• Started in 2006
• Open community
• Open source (GPL)
• Multidimensional data analysis
Madagascar: open-source software project for multidimensional data analysis and reproducible computational experiments

Sergey Fomel,1 Paul Sava,2 Ioan Vlad,3 Yang Liu,4 Vladimir Bashkardin,5

1 Jackson School of Geosciences, The University of Texas at Austin, Austin, Texas, USA
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How does Madagascar help for reproducible research

• Code attached to published results
• Continuous maintenance
• Previous results used for testing
  – Test-driven development
• Lessons from open-source
  – Intellectual property
  – Community

http://ahay.org
Madagascar supports the research pyramid

Three levels

- Building blocks in C
- Recipes in Python/SCons
- Papers in LaTeX + SCons

http://ahay.org

From Sergey Fomel
MADAGASCAR SOFTWARE PACKAGE OVERVIEW

- Building blocks in C
- Recipes in Python/SCons
- Papers in LaTeX + SCons

From Sergey Fomel and Gilles Hennenfent
Why use LaTeX

• MS-word--> LaTeX

  “I hope to die before I have to use Microsoft Word”
  – Donald Ervin Knuth

Reasons:
– 1) Focus on paper structure and content;
– 2) Better mathematic style;
– 3) More efficient (easy comments);
– 4) Better revision for long document;
– 5) Sole high-quality text software in Linux;
– 6) Compiling by command line.

• However, LaTeX is not perfect, either MS-word or LaTeX is just a tool, choose any of them you need.
Full Wave Modes Seismic Imaging with Multi-component Data in Anisotropic Media

Thesis Defence in Tongji University

Respondent: Chenlong Wang
Advisor: Jiubing Cheng
04, June 2017
Tongji University
Software for Reproducible Research

Madagascar: an open-source software package for multidimensional data analysis and reproducible computational experiments. Learn more at the Madagascar home page.

SEGTeX: a LaTeX package for geophysical publications. Learn more at http://www.reproducibility.org/wiki/SEGTeX.

For more information, please contact Sergey Fomel.
Telephone 512-475-9573. E-mail sergey.fomel@beg.utexas.edu.
LaTeX package for paper submission to GEOPHYSICS

A typesetting package is available to help authors prepare papers for GEOPHYSICS. The package consists of a set of macros prepared for LaTeX, a popular document preparation system. The SEG has developed several macros designed specifically for GEOPHYSICS and SEG Annual Meeting Expanded Abstracts.

Authors who use the LaTeX typesetting program to prepare their manuscripts can use the SEG macros (called SEGTeX) to format the text, equations, references, and appendices so that they conform to GEOPHYSICS guidelines for submission. If using BibTeX to create references, authors must run BibTeX before submitting the .tex file and read in or paste the resulting contents of the generated .bbl file within the bibliography section of the .tex file. All LaTeX submissions must include only one .tex file and a PDF of that file. You may send questions concerning LaTeX files to the SEGTeX mailing list.

To submit papers to GEOPHYSICS, follow the procedures described in the SEG Instructions to Authors. The manuscript will undergo the standard review process. Once all revisions and changes to the manuscript are made and the manuscript is accepted, LaTeX files will be converted to Microsoft Word documents for production.
SEGTeX is a LaTeX package for geophysical publications. It consists of

- LaTeX2e class files for Geophysics papers, SEG expanded abstracts, etc
- BibTeX style files seg.bst
- BibTeX cumulative bibliography of geophysical publications SEG.bib
- latex2html customizations
SEGTeX

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- LaTeX2e class files for Geophysics papers, SEG expanded abstracts, etc
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7. Communication
8. Reproducible papers
9. LaTeX references
10. News

### Downloading

Access SEGTeX through its SourceForge project by downloading the latest stable release.

Alternatively, access the current working version by either using Git and running

```
git clone https://github.com/SEGTeX/texmf
```

or using Subversion and running

```
svn co https://github.com/SEGTeX/texmf/trunk texmf
```

You can also browse the GitHub repository.
Installation

If your LaTeX installation is missing/incomplete, try installing TeX Live first.

To install, put the contents of the texmf folder where LaTeX can find it. Most systems recognize \texttt{$\texttt{HOME/texmf}$} as one of the default places. On MacOS X, it can be \texttt{$\texttt{HOME/Library/texmf}$}. You may need to run texhash to tell LaTeX about the new files. For more help on texmf, see “Private” installations of files.

Prerequisites

Some of the required additional LaTeX packages are:

- \texttt{natbib} support for (author/year) bibliography style of natural sciences

Download and Install SEGTKEX on Mac

```bash
cd \texttt{\texttt{HOME/Library}}

\texttt{\texttt{git clone https://github.com/SEGTKEX/txmf}}

\texttt{\texttt{sudo port install texlive-latex-extra}}
```

SEG expanded abstracts

SEGTKEX includes \texttt{segabs.cls} -- a LaTeX class for generating SEG expanded abstracts. Alternatively, you can download \texttt{segabs-2015} -- a packaged expanded abstract template.

To generate an expanded abstract without references, as required by SEG, use two LaTeX files: one for the abstract itself, and the other for separating pages without references. Examples are \texttt{segabs_example.ltx} and \texttt{segabs_final.ltx}.

```latex
\documentclass[article]
\usepackage[pdfpages]
\begin{document}
\includepdf[pages={1-4}]{segabs_example}
\end{document}
```

This solution only works with \texttt{pdflatex}.

Alternatively, you can separate pages using an external program.

- in Acrobat Pro, open the PDF file with references, select Document -> Pages -> Extract, and extract the reference page with the delete option (thanks to Norm Bleistien for the tip)
- Another useful program is \texttt{pdftk} (PDF toolkit)
Documentation

The tex/latex/seg directory contains several example files.

Use the manuscript style to submit papers to Geophysics.

- Manuscript style Geophysics paper geophysics_example
- Manuscript style Geophysics paper using endfloat geophysics_endfloat
- Publication style two-column Geophysics paper geophysics_twolumn
- SEG expanded abstract (with references) segabs_example
- SEG expanded abstract (without references) segabs_final
- Report style paper geophysics_paper
Agenda

- Background & Motivations

- How to use SEGTeX
  - Requirements
  - Implement steps
  - Rules
  - Some tips

- An Example in RSFSRC/book/tutorial/authors
Installation Requirements

1) Madagascar package
   download from: http://www.ahay.org/wiki/Download

2) LaTeX package
   download from: http://www.tug.org/texlive/

3) Text editor: emacs, gedit, vim, et al.

4) Compiler: pdflatex

5) SEGTeX:
   download from: http://www.ahay.org/wiki/SEGTeX
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Implement steps

1) Ideas

2) Implement ideas in Madagascar and lock Figures (scons fig.lock)

scons lock

3) Write a paper text by SEGTeX rules

4) Insert Figures into paper by SEGTeX rules
### SCONS COMMANDS

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>scons</td>
<td>run an SConstruct</td>
</tr>
<tr>
<td>scons view</td>
<td>view the results from an SConstruct, run if necessary</td>
</tr>
<tr>
<td>scons lock</td>
<td>lock the results from an SConstruct</td>
</tr>
<tr>
<td>scons –c</td>
<td>clean the local directory, delete all files</td>
</tr>
<tr>
<td>pscons</td>
<td>parallel execution of an SConstruct</td>
</tr>
</tbody>
</table>

Jiubing Cheng & Yang Liu
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Some rules

Project folder

SConstruct

[1]

Example #1
folder

……

Example #n
folder

texname.tex

bibname.bib

SConstruct

[2]

Fig
folder

SConstruct

[2]

Fig
folder

See example: ~/RSFSRC/book/tongji/lrmode
Example in ~/RSFSRC/book/tongji/lrmode

[cjb@dell225 lrmode]$ ll
total 112
-rw-rw-r--. 1 cjb cjb 748 Apr 13 2015 abstract.tex
-rw-rw-r--. 1 cjb cjb 443 Apr 13 2015 acknowledge.tex
drwxrwxr-x. 2 cjb cjb 4096 Apr 14 2015 bptti2007
drwxrwxr-x. 2 cjb cjb 4096 Apr 14 2015 bptti2007.comparison
drwxrwxr-x. 2 cjb cjb 4096 Apr 14 2015 bptti2007.smth
-rw-rw-r--. 1 cjb cjb 1616 Apr 13 2015 conclusions.tex
-rw-rw-r--. 1 cjb cjb 4947 Apr 13 2015 decomposition.tex
-rw-rw-r--. 1 cjb cjb 14006 Apr 13 2015 examples.tex
drwxrwxr-x. 2 cjb cjb 4096 Apr 14 2015 hessvti
-rw-rw-r--. 1 cjb cjb 4572 Apr 13 2015 introduction.tex
-rw-rw-r--. 1 cjb cjb 9755 Apr 13 2015 lowrank.tex
-rw-rw-r--. 1 cjb cjb  729 Apr 13 2015 paper.tex
-rw-rw-r--. 1 cjb cjb  8578 Apr 13 2015 reference.bib
-rw-rw-r--. 1 cjb cjb  490 Apr 13 2015 SConstruct
-rw-rw-r--. 1 cjb cjb  7700 Apr 13 2015 theory.tex
drwxrwxr-x. 3 cjb cjb 4096 Jul  6 15:05 twolayer2dtti
drwxrwxr-x. 2 cjb cjb 4096 Aug 25 2016 twolayer3ddtti
drwxrwxr-x. 2 cjb cjb 4096 Apr 14 2015 twolayer3dvtti
[cjb@dell225 lrmode]$ ll
total 112
-rw-rw-r--. 1 cjb cjb  748 Apr 13 2015 abstract.tex
-rw-rw-r--. 1 cjb cjb  443 Apr 13 2015 acknowledge.tex
drwxrwxr-x. 2 cjb cjb  4096 Apr 14 2015 bptti2007
drwxrwxr-x. 2 cjb cjb  4096 Apr 14 2015 bptti2007.comparison
drwxrwxr-x. 2 cjb cjb  4096 Apr 14 2015 bptti2007.smth
-rw-rw-r--. 1 cjb cjb  1616 Apr 13 2015 conclusions.tex
-rw-rw-r--. 1 cjb cjb  4947 Apr 13 2015 decomposition.tex
-rw-rw-r--. 1 cjb cjb 14006 Apr 13 2015 examples.tex
drwxrwxr-x. 2 cjb cjb  4096 Apr 14 2015 hessvti
-rw-rw-r--. 1 cjb cjb  4572 Apr 13 2015 introduction.tex
-rw-rw-r--. 1 cjb cjb  9755 Apr 13 2015 lowrank.tex
-rw-rw-r--. 1 cjb cjb   729 Apr 13 2015 paper.tex
-rw-rw-r--. 1 cjb cjb  8578 Apr 13 2015 reference.bib
-rw-rw-r--. 1 cjb cjb   490 Apr 13 2015 SConstruct
drwxrwxr-x. 3 cjb cjb  4096 Jul  6 15:05 twolayer2dti
drwxrwxr-x. 2 cjb cjb  4096 Aug 25 2016 twolayer3dtti
drwxrwxr-x. 2 cjb cjb  4096 Apr 14 2015 twolayer3dvtti
Fast algorithms for elastic-wave-mode separation and vector decomposition using low-rank approximation for anisotropic media

Cheng & Fomel

Anisotropic wave mode separation

TCCS-7

Jiubing Cheng, Tongji University, and Sergey Fomel, Bureau of Economic Geology, The University of Texas at Austin

maketitle

input{abstract}

input{introduction}

input{theory}

input{lowrank}

input{examples}

input{conclusions}

input{acknowledge}

bibliographystyle{seg}

bibliography{reference}
Vim SConstruct

From rsf.tex import *

End(use='amsmath, listings',
    color='vp-hess epsilon-hess delta-hess Polxp Polzp Errpolxp
Errpolzp Decompxp Decompzp Decompxzp Errdecxp Errdecxzp Errdecxp
epsil del the Errpolxp1 Errpolzp1 Errpolzp2 Errpolxp2 Errdecxp1
Errdeczp1 Errdecxzp1 Errdecxp2 Errdecxzp2 Polxp1 Polzp1
Polxp2 Polzp2 Decompxp1 Decomzp1 Decompxzp1 Decompxzp2 Decompxzp2',
    hires='Elasticx Elasticz ElasticSepP ElasticSepSV ElasticPx
ElasticPz ElasticSVx ElasticSVz')
Some rules:

If (paper name is “paper.tex” )

```python
from rsf.tex import *
End(use='listings')
```

Default is SEP report, change by lclass

else (“texname.tex”)

```python
from rsf.tex import *
Paper('texname',lclass='geophysics', options='manuscript',use='listings')
End()
```

Change to Geophysics peer-review mode
Commonly-used paper class

Paper('texname', lclass='geophysics', options='manuscript', use='listings')

1) SEP report  
   no need lclass and options

2) Geophysics  
   lclass='geophysics', options='manuscript'

3) Geophysical Prospecting  
   lclass='geophysics', options='manuscript,a4paper'

4) SEG abstract  
   lclass='segabs'

5) EAGE abstract  
   lclass='name', options='11pt'

Need edit name.cls  
See template “texmf/tex/latex/cwp/adam2009.cls”

Revised mode:  
options='manuscript, revised'
(2) texname.tex (for Geophysics paper)

\title{paper title}

\address{\footnotemark[1] address1 \footnotemark[2] address2 \footnotemark[3] address3}
\author{Name1\footnotemark[1], Name2\footnotemark[2], and Name3\footnotemark[3]}
\footer{GEO-2015-XXXX}
\lefthead{Surname1 etc.}
\righthead{short title}
\maketitle

\begin{abstract}
Write paper abstract here …
\end{abstract}
The paper starts from old idea \cite{refname1}. \cite{refname2} also improve it. ...

The theory is shown as follows ... 
\begin{equation} \label{eq:eq1} \mathbf{C} = \frac {\mathbf{A}}{b} \;, \end{equation}

Refer to equation~\ref{eq:eq1}.
section{section name, e.g., Synthetic examples}
The paper has several synthetic tests…

\inputdir{example#1 folder name}
  \multiplot{2}{fig1,fig2}{width=0.5\textwidth}{figure1 name (a)

  and figure2 name (b).}

One can also refer to different figures, e.g.,
Figure~\ref{fig:fig1,fig2}a …

section{section name, e.g., Field data tests}
The method is also used to deal with field data
(Figure~\ref{fig:fig3}).

\inputdir{example#2 folder name}
  \plot{fig3}{width=0.75\textwidth}{figure3 name.}
(2) texname.tex (for Geophysics paper)

\section{Conclusion}
Write conclusion here…

\section{Acknowledgments}
Should thank anyone for useful help…

\appendix
\section{Appendix: name}
Write the content of appendix here…

\bibliographystyle{seg}
\bibliography{SEG,bibname}
Annotated paper

Make revision available:

Use $\texttt{\new{new contents}}$ and $\texttt{\old{old contents}}$ to indicate “revised contents” and “replaced contents” corresponding to SConstruct[1] “options='revised' ”

Tricks:

Equations, citation commands, etc don't work inside $\old{}$.

1) Enclose citations in $\texttt{\mbox{}}$:

   Instead of $\texttt{\old{wrong citation \cite{wrong}}}$, use $\texttt{\old{wrong citation \mbox{\cite{wrong}}}}$. 
2) Enclose equations in \parbox or minipage

\begin{minipage}{\textwidth}
\begin{equation}
2 \times 2 = 5
\end{equation}
\end{minipage}

or

\begin{parbox}{\textwidth}
\begin{equation}
2 \times 2 = 5
\end{equation}
\end{parbox}
(3) bibname.bib

@book{Claerbout92,
  author = {J[on] F[] Claerbout},
  publisher = {Blackwell Scientific Publications},
  title = {{Earth Soundings Analysis: Processing Versus Inversion}},
  year = {1992}
}

@inproceedings{Curry04,
  author = {W[illiam] Curry},
  title = {Interpolation with multi-shifted-scale prediction-error filters},
  booktitle = {74th Annual International Meeting},
  year = {2004},
  publisher = {SEG, Expanded Abstracts},
  pages = {2005-2008}
}

Check “texmf/bibtex/bib/seg/SEG.bib” before you start to type the references.
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- Motivations

- How to use SEGTeX
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- An Example in RSFSRC/book/tutorial/authors
Some tips

1) Label parameter:

2) Figure color:
Some tips

3) Insert hand drawing:
   (a) XFig
   (b) MS-PowerPoint ->
   \{ Adobe Illustrator -> EPS/PDF file
   Adobe Acrobat Professional -> EPS/PDF file \}

4) Control figure color and resolution:

   Paper('name',lclass='geophysics', options='manuscript',
   use='listings', hires='fig1 fig2 fig3', color='fig4 fig5 fig6')

5) Insert only grey figures in LaTeX (SConstruct [1]):
   from rsf.tex import *
   import os
   os.environ['PSTEXPENOPTS'] = 'color=n'
   End(use='amsmath,hyperref',options='manuscript')
Standing on the shoulders of giants

Modify/add your own data tests, generate your own papers ...

Following existed papers is the best way to learn.
Reproducible Documents

Contents [hide]

1 Basic Earth Imaging
2 Center for Wave Phenomena
3 China University of Petroleum
4 Hansung University
5 Image Estimation by Example
6 Madagascar Datasets
7 ICP-Ecopetrol
8 Jilin University
9 Madagascar Documentation
10 Politecnico di Milano

Madagascar Documentation

- Madagascar tutorial: Field data processing by Maurice the Aye-Aye
- Seismic Imaging Tutorial: "exploding reflector" modeling/migration by Paul Sava
- A brief introduction to Madagascar by Jeff Godwin
- Madagascar tutorial by Maurice the Aye-Aye
- Guide to Madagascar programs by Sergey Fomel
- Revisiting SEP tour with RSF and SCons by Sergey Fomel
- Guide to RSF API by Sergey Fomel
- Guide to programming using RSF by Paul Sava
- Reproducible computational experiments using SCons by Sergey Fomel and Gilles Hennenfent
Madagascar Documentation

- Madagascar tutorial: Field data processing by Maurice the Aye-Aye
- Seismic Imaging Tutorial: "exploding reflector" modeling/migration by Paul Sava
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- Guide to RSF API by Sergey Fomel
- Guide to programming using RSF by Paul Sava
- Reproducible computational experiments using SCons by Sergey Fomel and Gilles Hennenfent

Texas Consortium for Computational Seismology

- Random noise attenuation based on a selective hybrid approach using FX empirical mode decomposition by Yangkang Chen, Shuwei Gan, Tingting Liu, Jiayuan Yuan, Yizhou Zhang, and Zhaoyu Jin. Journal of Geophysics and Engineering, 10.1017/2017
- Stratigraphic coordinates, a coordinate system tailored to seismic interpretation by Parvaneh Karimi and Sergey Fomel. Geophysical Prospecting, 63, 1245-1256, (2015)
- A robust approach to time-to-depth conversion and interval velocity estimation from time migration in the presence of lateral velocity variations by Saeed Li and Sergey Fomel. Geophysical Prospecting, 63, 315-337, (2015)
- Local skewness attribute as a seismic phase detector by Sergey Fomel and Mirko van der Baan. Interpretation, 2, S49-S56, (2014)
Useful examples in “RSFSRC/book”

```
[cjb@dell225 RSFSRC]$ ls
admin  configure  pens
api    COPYING.txt plot
AUTHORS.txt env.csh README.txt
book   env.sh scons
build  framework SConstruct
CITATION.txt include su
config.log INSTALL.txt system
config.py Makefile trip
config.py pyc Makefile.in user
config.py.download.version NEWS.txt VERSION.txt
config.py.from.99.225.mada

[cjb@dell225 book]$ ls
bei    data    geo391    icp    Recipes    slim    trip
chen   gallery geostats jlu    rsf        swag    tutorial
cup    gee      gpgn658  milano SConstruct tccs   uwa
cwp    geo384w  hansung  osu    sep        tongji  xjtlu
```
Useful examples in “RSFSRC/book”

```
[cjb@dell225 book]$ ls
bei data geo391 icp Recipes slim trip
tutorial
chen gallery geostats jlu rsf swag
ccp gee gpgn658 milano SConstruct tccs uwa
cwp geo384w hansung osu sep tongji xjtu

/home/cjb/RSFSRC/book/tutorial/authors
[cjb@dell225 authors]$ ls
cwp geophys paper.log paper.tex slides
data handout paper.ltx README thesis
demobib.bib intro.tex paper.out SConstruct
eage paper.aux _paper.pdf seg
```
Agenda

- Motivations

- How to use SEGTeX
  - Requirements
  - Implement steps
  - Rules
  - Some tips

- An Example in RSFSRC/book/tutorial/authors
An Example in
RSFSRC/book/tutorial/authors

```
/home/cjb/RSFSRC/book/tutorial/authors
[cjb@dell225 authors]$ ls
  cwp  data  demobib.bib  eage
  geophys  handout  intro.tex
  paper.log  paper.ltx  paper.out  paper.aux  paper.pdf
  paper.tex  README  SConstruct  seg
  slides  thesis
```
Starting from scratch is a bad idea!

1) mkdir project_name
   (e.g., mkdir mytest)
2) cd mytest
3) cp tex, bib, and Sconstruct[1] ./
   (e.g., cp ~/RSFSRC/book/tutorial/authors/geophys/*.tex .)
   (e.g., cp ~/RSFSRC/book/tutorial/authors/*.bib .)
   (e.g., cp ~/RSFSRC/book/tutorial/authors/geophys/Sconstruct .)
4) Try to produce the paper using “scons”

   SConstruct <=> scons

   Makefile <=> make
from rsf.tex import *

# These arguments build the actual Geophysics paper.
Paper('geophys',
    lclass='geophysics',
    options='twocolumn,twoside',
    use='times,natbib,amsmath,graphicx,color,amssymb,'
    amsbsy,lineno,ulem,setspace')

# These arguments build the manuscript to send for review.
# Paper('geophys',
#    lclass='geophysics',
#    options='manuscript',
#    use='times,natbib,amsmath,graphicx,color,amssymb,'
#    amsbsy,lineno,ulem,se#tspacet,rotating',
#    include=r''
#    \linenumber*[1]
#    '"
# End(use='color')
[cjb@dell225 geophys]$ scons
scons: Reading SConscript files ...
Xlib: extension "RANDR" missing on display "localhost:11.0".
scons: done reading SConscript files.

scons: warning: Support for pre-2.7.0 Python version (2.6.6) is deprecated.
   If this will cause hardship, contact scons-dev@scons.org
File "/home/cjb/RSF/bin/scons", line 199, in <module>
scons: Building targets ...
dummy(["dummy.tex"], [])
latify(["geophys.ltx"], ["geophys.tex"])
scons: *** [geophys.aux] Implicit dependency `data/Fig/noise.pdf' not found, needed by target `geophys.pdf'.
scons: building terminated because of errors.

scons -c
1) mkdir project_name
   (e.g., mkdir mytest)
2) cd mytest
3) cp tex, bib, and Sconstruct[1] ./
   (e.g., cp ~/RSFSRC/book/tutorial/authors/geophys/* .)
   (e.g., cp ~/RSFSRC/book/tutorial/authors/*.bib .)
   (e.g., cp ~/RSFSRC/book/tutorial/authors/geophys/Sconstruct .)
4) mkdir example_name
   (e.g., mkdir example1)
5) cd example1
6) cp existed_example .
   (e.g., cp ~/RSFSRC/book/tutorial/authors/data/* .)

/home/cjb/RSFSRC/book/tutorial/authors/geophys/example
[cjb@dell225 example]$ ls -l
total 4
-rw-rw-r--. 1 cjb cjb 417 Jul 7 17:19 SConstruct
7) Run the program or example using "scons"

    scons

    or

    scons –c

    scons lock

/home/cjb/RSFSRC/book/tutorial/authors/geophys/example
[cjb@dell225 example]$ ls -l
total 28
drwxrwxr-x. 2 cjb cjb 4096 Jul 7 17:19 Fig
-rw-rw-r--. 1 cjb cjb 923 Jul 7 17:19 fourier-imag.rsf
-rw-rw-r--. 1 cjb cjb 923 Jul 7 17:19 fourier-real.rsf
-rw-rw-r--. 1 cjb cjb 755 Jul 7 17:19 fourier.rsf
-rw-rw-r--. 1 cjb cjb 491 Jul 7 17:19 noise.rsf
-rw-rw-r--. 1 cjb cjb 417 Jul 7 17:19 SConstruct
-rw-rw-r--. 1 cjb cjb 1106 Jul 7 17:19 spectra.rsf

[cjb@dell225 example]$ ls -l Fig/
total 8
-rw-rw-r--. 1 cjb cjb 1570 Jul 7 17:25 noise.vpl
-rw-rw-r--. 1 cjb cjb 1150 Jul 7 17:25 spectra.vpl
8) Produce a paper using "scons"

vim geophys.tex

\begin{figure}
\begin{center}
\includegraphics[width=0.45\textwidth]{data/Fig/noise}
\includegraphics[width=0.45\textwidth]{example/Fig/noise}
\caption{The signal.}
\label{Fig:noise}
\end{center}
\end{figure}

Change the folder name

\begin{verbatim}
/home/cjb/RSFSRC/book/tutorial/authors/geophys
[cjb@dell225 geophys]$ ls -l
total 136
-rw-rw-r--- 1 cjb cjb  260 Jul  7 17:36 dummy.tex
drwxrwxr-x. 3 cjb cjb 4096 Jul  7 17:25 example
-rw-rw-r--- 1 cjb cjb  4113 Jul  7 17:36 example.html
-rw-rw-r--- 1 cjb cjb  1463 Jul  7 17:36 geophys.aux
-rw-rw-r--- 1 cjb cjb   61 Jul  7 17:36 geophys.bbl
-rw-rw-r--- 1 cjb cjb  1255 Jul  7 17:36 geophys.blg
-rw-rw-r--- 1 cjb cjb 15210 Jul  7 17:36 geophys.log
-rw-rw-r--- 1 cjb cjb  6260 Jul  7 17:36 geophys.ltx
-rw-rw-r--- 1 cjb cjb  72812 Jul  7 17:36 geophys.pdf
-rw-rw-r--- 1 cjb cjb   5907 Jul  7 17:30 geophys.tex
-rw-rw-r--- 1 cjb cjb    539 Apr 13 2015 SConstruct
\end{verbatim}
9) Display the paper using "scons"

```
gv geophys.pdf
```
or
```
evince geophys.pdf
```

Why no reference?

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**INTRODUCTION**


**THEORY**


**DEMONSTRATION**

Here's a short demo of how to use some common features inside of the provided \texttt{leX} classes. Equations:

\[
\nabla^2 u - \frac{\partial^2 u}{\partial t^2} = 0
\]

Here is how we use equations: 1. Here is how we can make citations (????). Or we can cite inline as in 2.

We can also make figures using our Madagascar plots. There are two ways to do so, 1 - using built-in macros and 2 - using the default \texttt{leX}\texttt{macros}.

The first way:

**RESULTS**

Sed vitae elit neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Phasellus rhoncus, augue in vehicula, egestas et, elit neque tempor diam, eget eu luptatum nisl odio sit amet risue. Vestibulum ante ipsum primis in faucibus
10) Complete the reference using
   cp ~/RSFSRC/book/tutorial/authors/* .bib ./
   scons --c

11) Produce the paper again

12) Extend or change the example, change to “seg” for SEG abstract
Thanks for your attention