SpiceyPy

A Python Wrapper for SPICE

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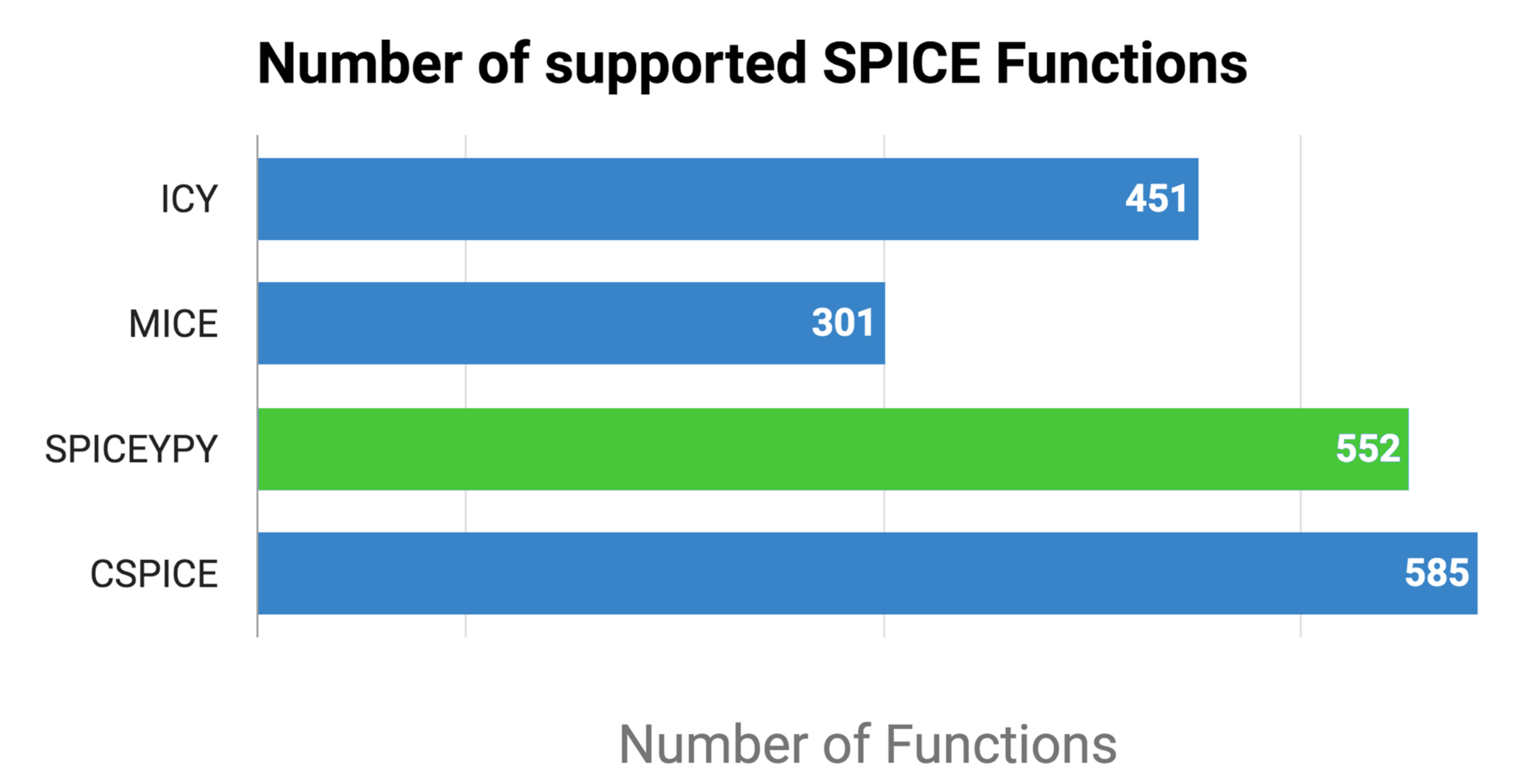
Sections

1. What Is SpiceyPy?
2. How did I make it?
3. Goals and Impact.

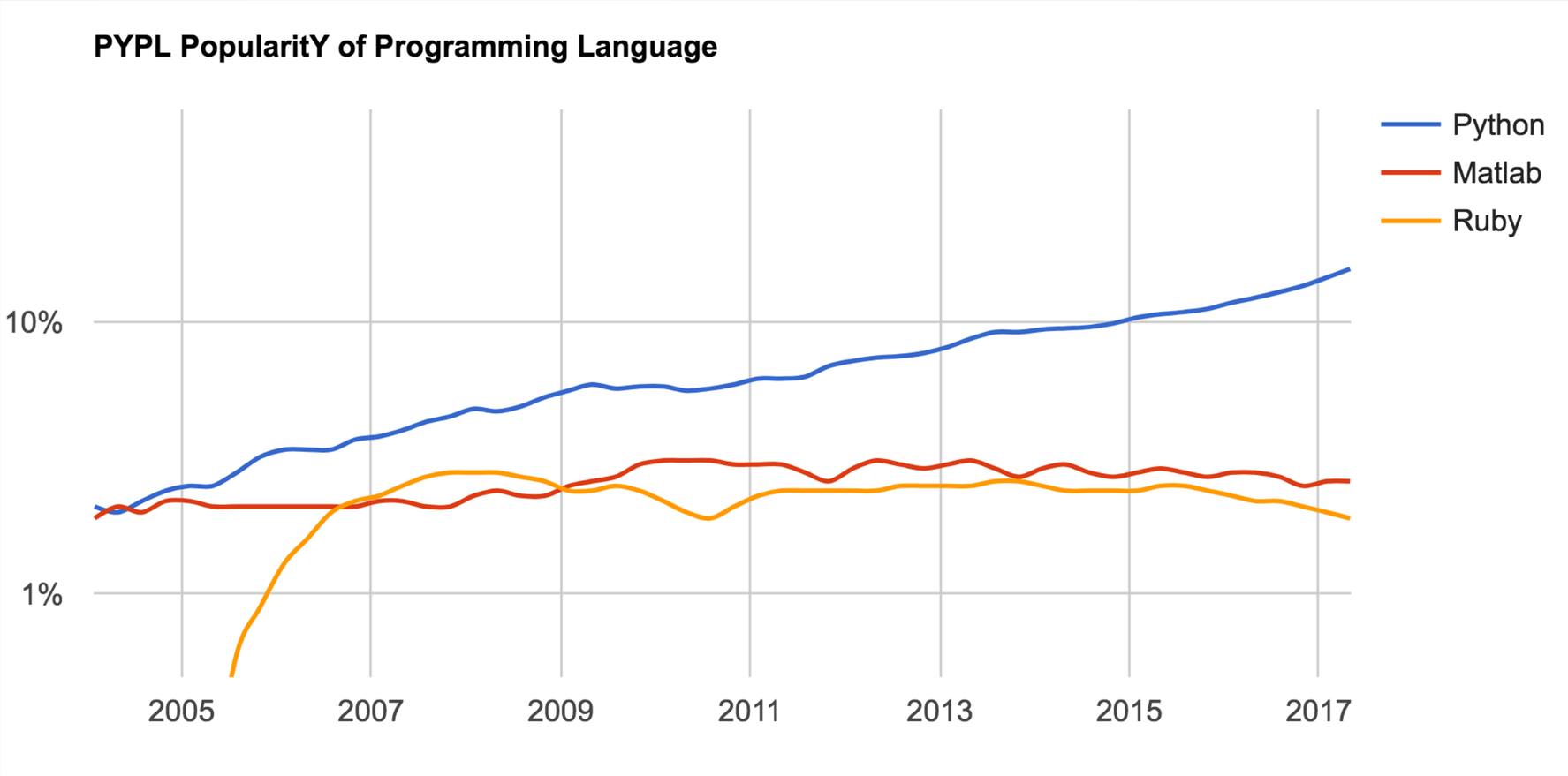
What is SpiceyPy?

- **A Python wrapper for SPICE**
  - Compatible with Python 2.7 (legacy), and Python 3 on Windows, *NIX, and macOS
  - Implemented in pure Python using the ctypes FFI
- **Conforms to Python idioms, meaning it is *Pythonic***
- **Covers over 500 functions from CSPICE <u>with</u> tests**
- **SPICE data structures like Cells, Ellipses, Planes supported**
- **Open Source (MIT-licensed)**


Number of supported SPICE Functions
ICY
451
MICE
301
SPICEYPY
552
CSPICE
585
Number of Functions

Why?

- Growing use of Python.
- I wanted to use SPICE in Python
- I had some free time.



Pythonic?

- Spiceypy simplifies interaction with the CSPICE API to idiomatic python.
  - no to few “*scratch or work”* arrays that are not important
  - no to few *“how long is the string”* variables
- SPICE Errors are promoted to Python Exceptions
  - Allows granular routing
  - no *“Found”* flags

Installation

- If using pip:
  - “pip install spiceypy”
- If using anaconda:
  - “conda install -c https://conda.anaconda.org/andrewannex spiceypy”
- The installation script takes care of the rest

Example

```
~/Example [ asciinema play demo.json                                    ] 3:44
Python 3.6.1 (default, Apr  4 2017, 09:40:21)
Type 'copyright', 'credits' or 'license' for more information
IPython 6.0.0 -- An enhanced Interactive Python. Type '?' for help.

In [ ]:
```

How?

Used best practices from the open source community!

GitHub

This repository | Search | Pull requests | Issues | Marketplace | Gist

AndrewAnnex / SpiceyPy

Unwatch 15 | Star 51 | Fork 21

Code | Issues 1 | Pull requests 1 | Projects 0 | Wiki | Settings | Insights

SpiceyPy: The NASA JPL NAIF SPICE toolkit wrapper written in Python. Edit

python nasa toolkit spice Manage topics

404 commits | 6 branches | 6 releases | 4 contributors | MIT

Branch: master | New pull request | Create new file | Upload files | Find file | Clone or download

AndrewAnnex committed on GitHub Fixed a typo in drdlat (#191) ··· Latest commit d088ee7 6 days ago

appveyor	Fixed a typo in drdlat (#191)	6 days ago
docs	Fixed a typo in drdlat (#191)	6 days ago
spiceypy	Fixed a typo in drdlat (#191)	6 days ago
.gitignore	adding tests for srfxpt and sincpt (#154)	11 months ago
.travis.yml	added macos to spiceypy build using pyenv (#189)	20 days ago
CHANGELOG.md	SpiceyPy 1.1.1	a month ago
LICENSE	updating code to include explicit licenses copys in header, as well	2 months ago
MANIFEST.in	updated readme, added setup.cfg	a year ago
README.rst	Update README.rst	3 months ago
appveyor.yml	adding python 3.6 builds to appveyor as per #184 (#186)	2 months ago
getspice.py	updating code to include explicit licenses copys in header, as well	2 months ago
requirements.txt	updated readme, added setup.cfg	a year ago
setup.cfg	updated readme, added setup.cfg	a year ago
setup.py	Fixed a typo in drdlat (#191)	6 days ago

1 Open | 39 Closed | Author | Labels | Projects | Milestones | Assignee | Sort

- cannot Install on Canopy OS X with pip install spiceypy invalid support wontfix — 11
  #188 by RichardGFrench was closed 22 days ago
- Update to N66 enhancement — 2
  #187 opened on Apr 10 by AndrewAnnex
- Probably unrelated to SpiceyPy itself: `no module named "six"` question — 3
  #185 by ChristopherRabotin was closed on Mar 3
- update wheel/appveyor builds to include python 3.6 — 4
  #184 by AndrewAnnex was closed on Mar 27
- python3.4 support resolved support — 5
  #181 by sidewalkjoe was closed on Feb 6
- REQUEST: implement undocumented ev2lin function enhancement — 13
  #178 by parkerjon was closed on Feb 15
- Travis builds failing bug — 3
  #176 by AndrewAnnex was closed on Jan 30
- 'install' does not copy into site-packages bug support — 6
  #174 by henrythroop was closed on Nov 30, 2016
- window creation enhancement — 2
  #172 by vancesteven was closed on Nov 2, 2016
- spkez including geodetic correction Spice Question — 4
  #169 by migueldvb was closed on Nov 28, 2016
- Installing on anaconda Python 3.4.4 support — 6
  #168 by vancesteven was closed on Oct 31, 2016
- Tutorial Problem support — 2
  #166 by Rhys314 was closed on Oct 10, 2016

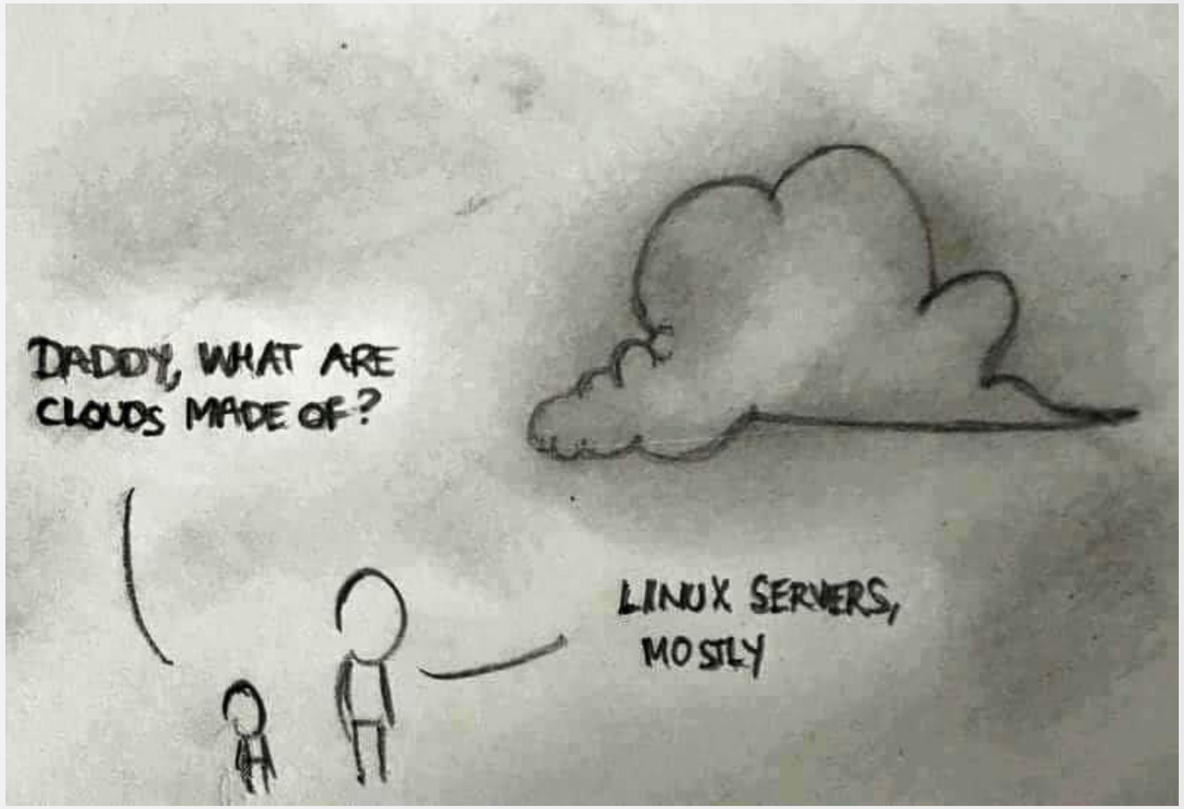
github.com/AndrewAnnex/SpiceyPy

Testing in the Cloud!

Travis CI (For Mac and Linux)

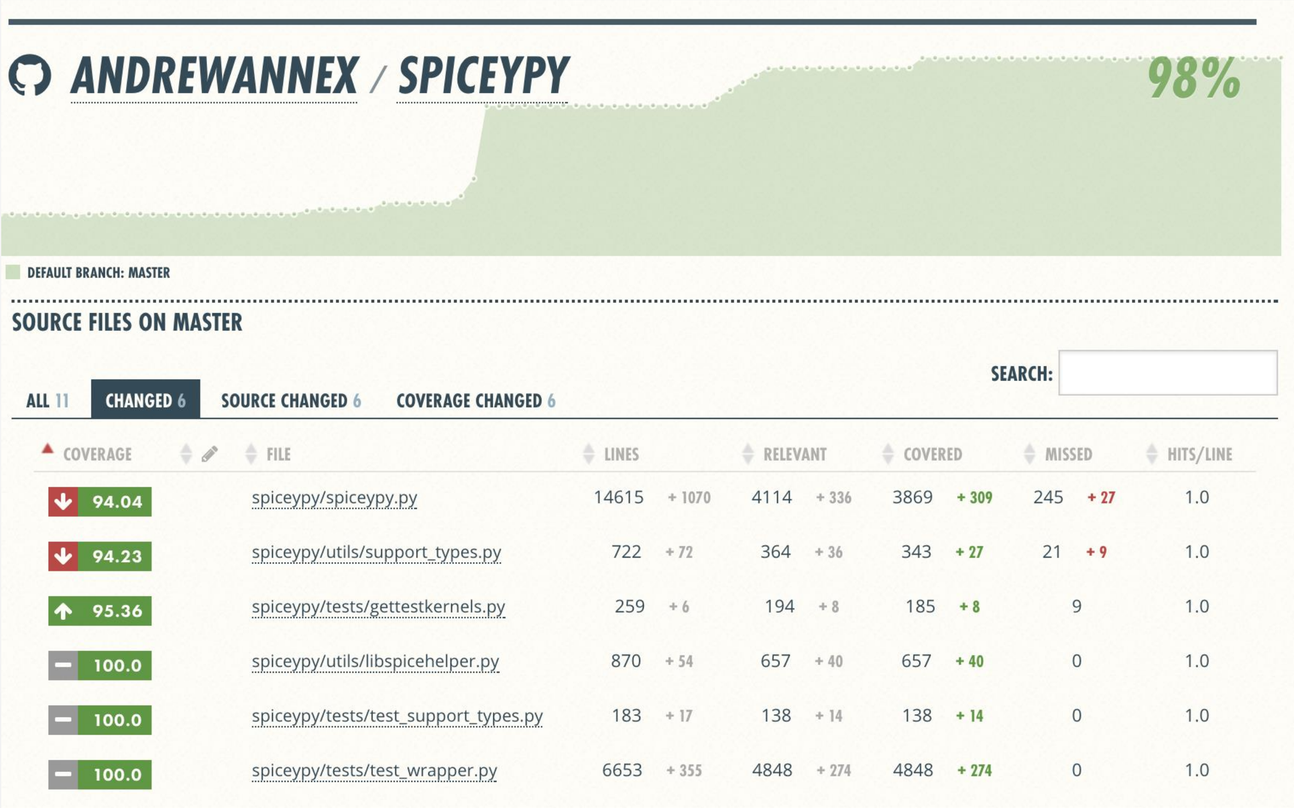
AppVeyor (For Windows)

- **For each commit:**
  - Tested across all platform / python combinations using CI services
  - Logs show when errors occur
  - Verifies that it works!
- On new releases, artifacts are uploaded automatically to PyPI and Anaconda Cloud



Code coverage

- Goal: Have at least 1 test function per SPICE function
- Tests mostly come from examples provided in SPICE documentation
- Tests provide useful examples for users

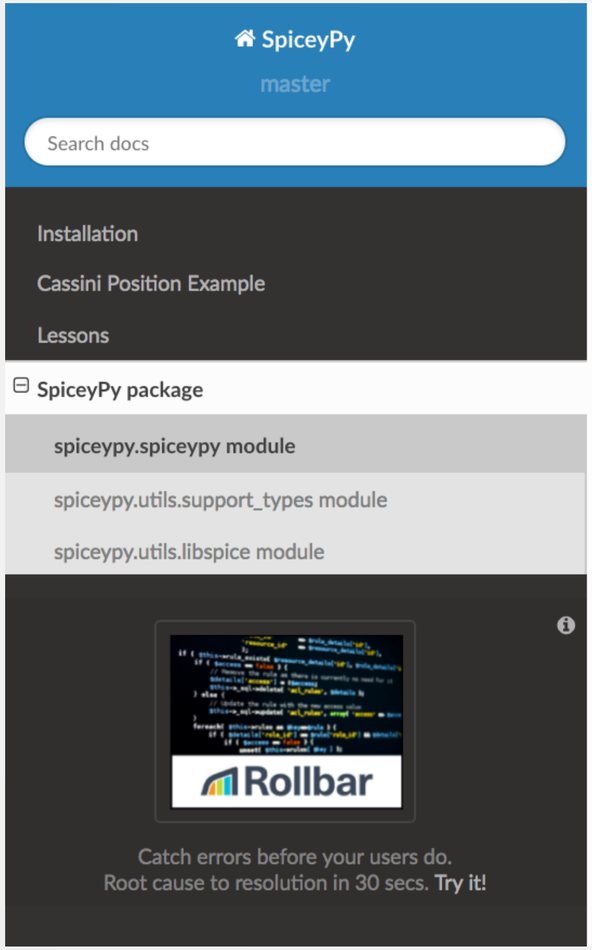


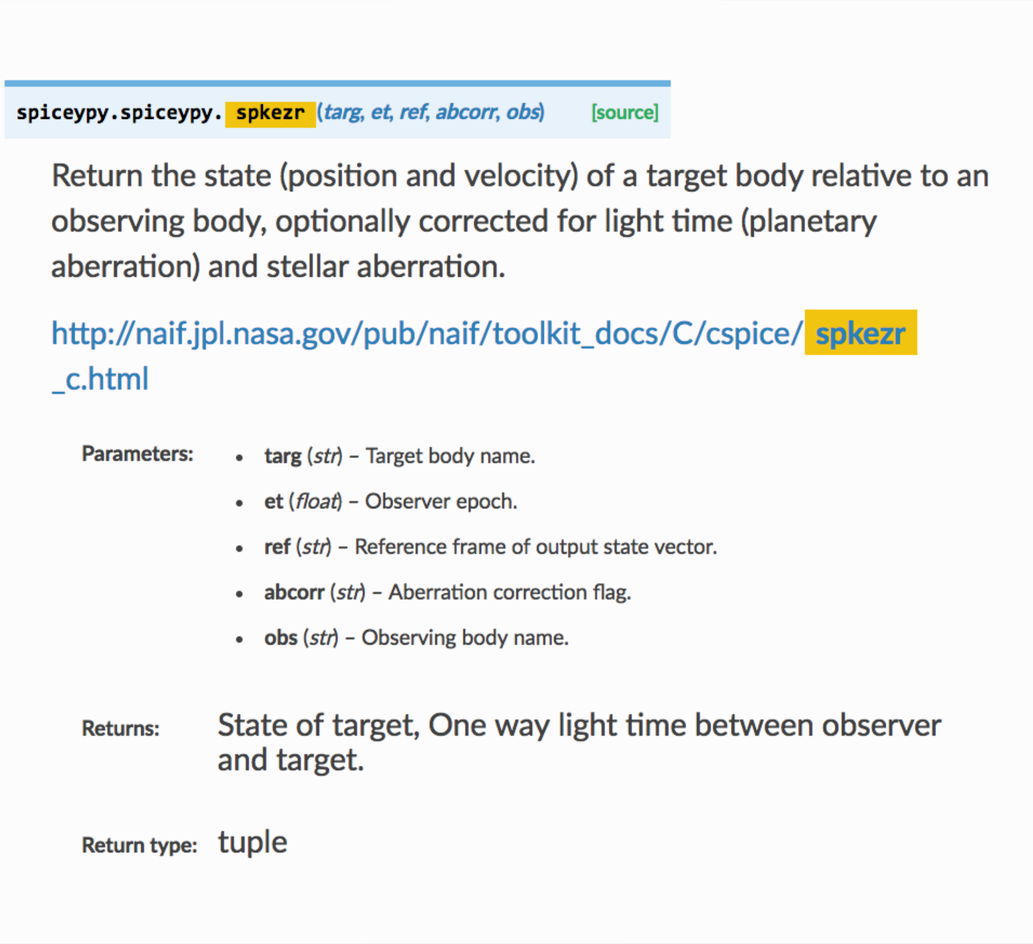
COVERAGE	FILE	LINES		RELEVANT		COVERED		MISSED		HITS/LINE
94.04	spiceypy/spiceypy.py	14615	+ 1070	4114	+ 336	3869	+ 309	245	+ 27	1.0
94.23	spiceypy/utils/support_types.py	722	+ 72	364	+ 36	343	+ 27	21	+ 9	1.0
95.36	spiceypy/tests/gettestkernels.py	259	+ 6	194	+ 8	185	+ 8	9		1.0
100.0	spiceypy/utils/libspicehelper.py	870	+ 54	657	+ 40	657	+ 40	0		1.0
100.0	spiceypy/tests/test_support_types.py	183	+ 17	138	+ 14	138	+ 14	0		1.0
100.0	spiceypy/tests/test_wrapper.py	6653	+ 355	4848	+ 274	4848	+ 274	0		1.0

Documentation

Read the Docs

- Documentation is regenerated from the code after each merge with master and each new tagged release
- spiceypy.readthedocs.io





Free!

Continuous Integration & Delivery

Test Coverage Reports (every build)

Git SCM/VCR

GitHub

(macOS and Linux)

Travis CI

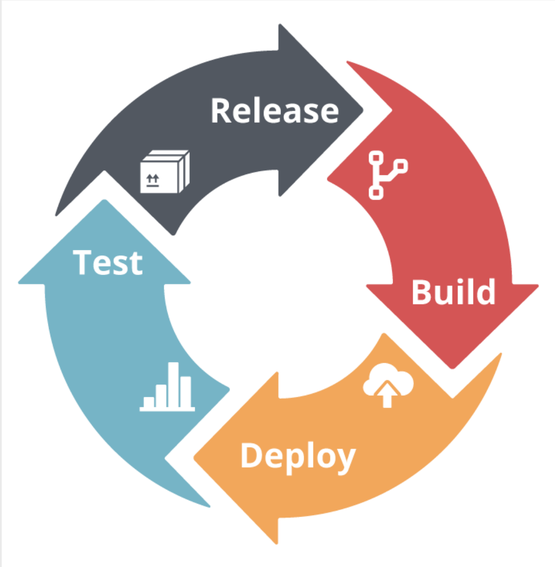
AppVeyor

(Windows)

COVERALLS

Read the Docs

Hosted Documentation



(on new release)

python™ Package Index

ANACONDA CLOUD

(package indexes)

Use in the community

- Table is repeated from #7081
  - *Python 3.6 was not released until late 2016
  - Growing adoption of Python 3 over legacy Python?
- Fewer anaconda users?
- 4 explicit citations….

Pip installs as of March 2017

Version	Py 2.6	Py 2.7	Py 3.4	Py 3.5	Py 3.6
SpiceyPy 1.1.0 (Oct 2016)	1	204	107	103	44
SpiceyPy 1.0.0 (Mar 2016)	7	315	17	57	**NA***

Python for Rapid Science Operations Analysis, Prototyping and Planning for BepiColombo
JP McAuliffe, P Lanaspa - 14th International Conference on Space …, 2016 - arc.aiaa.org

Scheduling observations of celestial objects for Earth observing sensor calibration
T Wilson, X Xiong - SPIE Remote Sensing, 2016 - proceedings.spiedigitallibrary.org

Mass loading at 67P/Churyumov-Gerasimenko: A case study
E Behar, H Nilsson, GS Wieser… - Geophysical …, 2016 - Wiley Online Library

Realization of intelligent systems for the observation, identification and classification of geostationary and low orbit satellites
S BELLESIA - 2017 - politesi.polimi.it

What’s next?

- Review of older wrapper functions for simplifications, uniformity
- Continue to wrap outstanding functions
- Investigate CFFI for a faster wrapper.

How you can help!

- Try it, let me know what you think!
- Star the Repo, Cite the Project in papers, Spread the Word!
- If you are up for it, consider becoming a maintainer!

Thanks!

github.com/AndrewAnnex/SpiceyPy

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