Python Kontrol Library

Release 0.0.1

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Contents:

Kontrol (also pronounced "control") is a python package for KAGRA control system related work. It is intented for both offline and real-time (via Ezca and maybe diaggui and nds2 later) usage. In principle, it should cover all control related topics ranging from sensor/actuator diagonalization to system identification and control filter design.

There will be an upcoming Hinf/H2 function for controller synthesis which uses the python-control package and depends on the slycot module. This is automatically installed when installing python-control with Conda while not with pip. So, using under Conda environment is highly recommended.

- **Documentation:** https://kontrol.readthedocs.io/
- **Repository:** https://github.com/terrencetec/kontrol.git

CHAPTER 1

Introduction

Kontrol (also pronounced "control") is a python package for KAGRA control system related work. It is intented for both offline and real-time (via Ezca and maybe diaggui and nds2 later) usage. In principle, it should cover all control related topics ranging from sensor/actuator diagonalization to system identification and control filter design.

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CHAPTER 2

Getting Started

2.1 Dependencies

2.1.1 Required

- numpy
- scipy
- matplotlib
- control

2.1.2 Optional

- ezca (Needed for accessing EPICs records/real-time model process variables. Use kontrol.fakeezca if not needed)

If you would like to install Kontrol on your local machine with, then pip should install the required dependencies automatically for you. However, if you use Kontrol in a Conda environment, you should install the dependencies before installing Kontrol to avoid using pip. In Conda environment, simply type

```
conda install -c conda-forge numpy scipy matplotlib control ezca
```

2.2 Install from source

For local usage, type

```
$ git clone https://github.com/terrencetec/kontrol.git
$ cd kontrol
$ pip install .
```

For k1ctr workstations, make sure a virtual environment is enabled before installing any packages.

CHAPTER 3

Library Reference

3.1 Kontrol

3.1.1 Subpackages

3.1.1.1 kontrol.filter package

3.1.1.1.1 Submodules

3.1.1.1.2 kontrol.filter.complementary module

3.1.1.1.3 kontrol.filter.optimize module

3.1.1.1.4 Module contents

3.1.1.2 kontrol.model package

3.1.1.2.1 Submodules

3.1.1.2.2 kontrol.model.fit module

3.1.1.2.3 kontrol.model.noise module

3.1.1.2.4 Module contents

3.1.1.3 kontrol.sensact package

3.1.1.3.1 Submodules

3.1.1.3.2 kontrol.sensact.diagonalization module

3.1.1.3.3 Module contents

3.1.1.4 kontrol.systemid package

CHAPTER 4

Contact

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CHAPTER 5

For Developers

5.1 Standards and Tools

Please comply with the following standards/guides as much as possible.

5.1.1 Coding style

- **PEP 8**: https://www.python.org/dev/peps/pep-0008/

5.1.2 CHANGELOG

- **Keep a Changelog**: https://keepachangelog.com/en/1.0.0/

5.1.3 Versioning

- **Semantic Versioning**: https://semver.org/spec/v2.0.0.html

5.1.4 Packaging

- **PyPA**: https://www.pypa.io
- **python-packaging**: https://python-packaging.readthedocs.io

5.1.5 Documentation

- **NumPy docstrings**: https://numpydoc.readthedocs.io/en/latest/format.html
- **Sphinx**: https://www.sphinx-doc.org/

- **Read The Docs**: https://readthedocs.org/
- **Documenting Python Code: A Complete Guide**: https://realpython.com/documenting-python-code/

5.2 How to Contribute

Just do it.

5.2.1 Pending

- Documentation.
- tests!
- Model reference sensor/actuator diagonalization
- Add support for reading Shoda-san's SUMCON simulations.
- Controller optimization
- Optimal controller synthesis
- python-foton interface.
- Diaggui support.
- *Issues*: https://github.com/terrencetec/kontrol/issues

5.3 Cheat sheet

Auto generate source files (sphinx) in /kontrol, type

```
sphinx-apidoc -o docs/source kontrol
```

CHAPTER 6

Indices and tables

- genindex
- modindex
- search