scikit-surgery-evaluation Documentation

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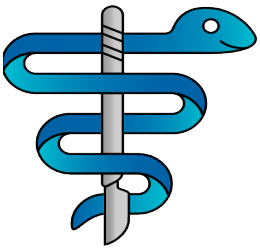

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scikit-surgery-evaluation provides an application to evaluate surgical skills. You can provide a set of unstructured grids representing a set of locations that the user is then expected to target using a tracked pointer, utilising a SciKit-Surgery tracking library (scikit-surgeryarucotracker, or scikit-surgerynditracker). You can specify paths for the user to follow, or let the system select target meshes automatically.

scikit-surgery-evaluation is part of the SciKit-Surgery software project, developed at the Wellcome EPSRC Centre for Interventional and Surgical Sciences, part of University College London (UCL).

scikit-surgery-evaluation supports Python 3.X.

```
python sksurgeryeval.py -c configuration.json
```

CHAPTER 1

Developing

1.1 Cloning

You can clone the repository using the following command:

```
git clone https://github.com/SciKit-Surgery/scikit-surgery-evaluation
```

1.2 Running tests

Pytest is used for running unit tests:

```
pip install pytest
python -m pytest
```

1.3 Linting

This code conforms to the PEP8 standard. Pylint can be used to analyse the code:

```
pip install pylint
pylint --rcfile=tests/pylintrc sksurgeryeval
```

CHAPTER 2

Installing

You can pip install directly from the repository as follows:

```
pip install git+https://github.com/SciKit-Surgery/scikit-surgery-evaluation
```

2.1 Contributing

Please see the contributing guidelines.

2.2 Useful links

- Source code repository
- Documentation

CHAPTER 3

Licensing and copyright

CHAPTER 4

Acknowledgements

Supported by Wellcome and EPSRC.

4.1 Requirements for scikit-surgery-evaluation

This is the software requirements file for scikit-surgery-evaluation, part of the SNAPPY project. The requirements listed below should define what scikit-surgery-evaluation does. Each requirement can be matched to a unit test that checks whether the requirement is met.

4.1.1 Requirements

ID	Description	Test
0000	Module has a help page	pylint, see tests/pylint.rc and tox.ini
0001	Functions are documented	pylint, see tests/pylint.rc and tox.ini
0002	Package has a version number	No test yet, handled by git.

4.2 stable

4.2.1 sksurgeryeval package

Subpackages

sksurgeryeval.algorithms package

Submodules

sksurgeryeval.algorithms.algorithms module

Algorithms for the surgery evaluation application

sksurgeryeval.algorithms.algorithms.**add_map**(*config*)
Loads vtk models from a directory and returns a list of vtk actors, with mesh visualisation

Param configuration, may contain a "map" key

Param model_to_world: 4x4 matrix, of dtype float32

Returns actors, None if no "map" key

sksurgeryeval.algorithms.algorithms.**configure_tracker**(*config*)
Configures the tracking system. :param: A dictionary containing configuration data :return: The tracker object :raises: KeyError if no tracker entry in config

sksurgeryeval.algorithms.algorithms.**np2vtk**(*mat*)
Converts a Numpy array to a vtk matrix :param: the number array, should be 4x4 :return: a vtk 4x4 matrix :raises: ValueError when matrix is not 4x4

sksurgeryeval.algorithms.algorithms.**point_in_locator**(*point*, *point_locators*, *radius=1.0*)
Tests whether a point is within a set distance of any of a list of point locators.

Parameters

- **point** – the point to test, in 3D (x,y,z)
- **point_locators** – a list of vtkPointLocators
- **radius** – optional search radius in mm (default=1.0)

Return locator the index of the nearest point locator,

-1 if no locators within radius) :return distance: distance to nearest point_locator

Raises delegates to vtk

sksurgeryeval.algorithms.algorithms.**populate_models**(*config*)
Loads vtk models from a directory and returns a list of vtk actors and associated vtkPointLocators

Param configuration, should contain a target value

Param model_to_world: 4x4 matrix, of dtype float32

Returns locators

Returns actors

Raises KeyError if target not in config

sksurgeryeval.algorithms.algorithms.**random_targets**(*count*)
Create a list of targets

sksurgeryeval.algorithms.background_image module

A class to provide the background image

class sksurgeryeval.algorithms.background_image.**OverlayBackground**(*config*)
Bases: object

Provides the background image for the overlay window.

next_image()
Returns a background image. The behaviour is determined by the configuration dictionary used at init.

sksurgeryeval.algorithms.locators module

Main loop for surgery evaluation

class sksurgeryeval.algorithms.locators.**Locators**(*config*)
Bases: object

stores a list of vtk models and corresponding locators, and handles associated logic

is_hit(*tracking*, *logger*)
Checks whether a target has been hit :param: the tracking data (3D point) :param: a logger to write notification to

Module contents

sksurgeryeval.logging package

Submodules

sksurgeryeval.logging.surgery_logger module

Class to handle logging

class sksurgeryeval.logging.surgery_logger.**Logger**(*config*)
Bases: object

Implements logging functionality for sksurgery-evaluation. Configuration is done by passing a dictionary on construction. Subsequent calls to log("message") will write to log file.

log(*message*)
If logging, passes message to logger

Module contents

sksurgeryeval.shapes package

Submodules

sksurgeryeval.shapes.cone module

VTK pipeline to represent a surface model via a vtkPolyData.

class sksurgeryeval.shapes.cone.**VTKConeModel**(*height*, *radius*, *colour*, *name*, *visibility=True*, *opacity=1.0*)
Bases: sksurgeryvtk.models.vtk_surface_model.VTKSurfaceModel

Class to create a VTK surface model of a cone.

Module contents

sksurgeryeval.ui package

Submodules

sksurgeryeval.ui.sksurgeryeval_command_line module

Command line processing

sksurgeryeval.ui.sksurgeryeval_command_line.**main**(*args=None*)
Entry point for scikit-surgery-evaluation application

sksurgeryeval.ui.sksurgeryeval_demo module

Hello world demo module

sksurgeryeval.ui.sksurgeryeval_demo.**run_demo**(*configfile*, *verbose*)
Run the application

Module contents

scikit-surgery-evaluation

sksurgeryeval.widgets package

Submodules

sksurgeryeval.widgets.overlay module

Main loop for surgery evaluation

class sksurgeryeval.widgets.overlay.**OverlayApp**(*config*)
Bases: sksurgeryutils.common_overlay_apps.OverlayBaseApp

Inherits from OverlayBaseApp, adding code to test the proximity of a tracked object to a set of vtk objects

update()
Update the background renderer with a new frame, move the model(s) and render

Module contents

Module contents

scikit-surgery-evaluation

4.3 First notebook

You can write up experiments in notebooks, and they can be generated into Sphinx docs using `tox -e docs`, and for example set up to run on readthedocs.

See this and this examples.

4.3.1 NOTE:

Getting jupyter to run your code in this package relies on 3 things:

- You must ensure you start jupyter within the tox environment.

```
# If not already done.
source .tox/py36/bin/activate

# Then launch jupyter
jupyter notebook
```

- Then when you navigate to and run this notebook, select the right kernel (named after your project) from the kernel menu item, in the web browser.
- Add project folder to system path, as below.

[1]:
```
# Jupyter notebook sets the cwd to the folder containing the notebook.
# So, you want to add the root of the project to the sys path, so modules load␣
↪correctly.
import sys
sys.path.append("../../")
```

- modindex
- genindex
- search

Python Module Index

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