Visualization Interface Tool

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CONTENTS

The Visualization Interface Tool is a Python API that provides an interface between PyAnsys libraries and different plotting backends.

The Visualization Interface Tool offers these main features:

- Serves as an interface between PyAnsys and other plotting libraries (although only PyVista is supported currently).
- Provides out-of-the box picking, viewing, and measuring functionalities.
- Supplies an extensible class for adding custom functionalities.

Getting started Learn how to install the Visualization Interface Tool in user mode and quickly begin using it.

Getting started User guide Understand key concepts for implementing the Visualization Interface Tool in your workflow.

User guide API reference Understand how to use Python to interact programmatically with the Visualization Interface Tool.

API reference Examples Explore examples that show how to use the Visualization Interface Tool to perform many different types of operations.

Examples Contribute Learn how to contribute to the Visualization Interface Tool codebase or documentation.

Contribute

CHAPTER

ONE

GETTING STARTED

This section describes how to install the Visualization Interface Tool in user mode and quickly begin using it. If you are interested in contributing to the Visualization Interface Tool, see *Contribute* for information on installing in developer mode.

1.1 Installation

To use pip to install the Visualization Interface Tool, run this command:

```
pip install ansys-tools-visualization-interface
```

Alternatively, to install the latest version from this library's GitHub repository, run these commands:

```
git clone https://github.com/ansys/ansys-tools-visualization-interface
cd ansys-tools-visualization-interface
pip install .
```

1.1.1 Quick start

The following examples show how to use the Visualization Interface Tool to visualize a mesh file.

This code uses only a PyVista mesh:

```
from ansys.tools.visualization_interface import Plotter

my_mesh = my_custom_object.get_mesh()

# Create a Visualization Interface Tool object
pl = Plotter()
pl.plot(my_mesh)

# Plot the result
pl.show()
```

This code uses objects from a PyAnsys library:

```
from ansys.tools.visualization_interface import Plotter, MeshObjectPlot

my_custom_object = MyObject()
my_mesh = my_custom_object.get_mesh()

mesh_object = MeshObjectPlot(my_custom_object, my_mesh)
```

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```
# Create a Visualization Interface Tool object
pl = Plotter()
pl.plot(mesh_object)

# Plot the result
pl.show()
```

CHAPTER

TWO

USER GUIDE

This section explains key concepts for implementing the Visualization Interface Tool in your workflow. You can use the Visualization Interface Tool in your examples as well as integrate this library into your own code.

2.1 Default plotter usage

The Visualization Interface Tool provides a default plotter that can be used out of the box, using the PyVista backend. This default plotter provides common functionalities so that you do not need to create a custom plotter.

2.1.1 Use with PyVista meshes

You can use the default plotter to plot simple PyVista meshes. This code shows how to use it to visualize a simple PyVista mesh:

```
## Usage example with pyvista meshes ##

import pyvista as pv
from ansys.tools.visualization_interface import Plotter

# Create a pyvista mesh
mesh = pv.Cube()

# Create a plotter
pl = Plotter()

# Add the mesh to the plotter
pl.plot(mesh)

# Show the plotter
pl.show()
```

2.1.2 Use with PyAnsys custom objects

You can also use the default plotter to visualize PyAnsys custom objects. The only requirement is that the custom object must have a method that returns a PyVista mesh a method that exposes a `name` or `id` attribute of your object. To expose a custom object, you use a `MeshObjectPlot` instance. This class relates PyVista meshes with any object.

The following code shows how to use the default plotter to visualize a PyAnsys custom object:

```
## Usage example with PyAnsys custom objects ##
```

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```
from ansys.tools.visualization_interface import Plotter
from ansys.tools.visualization_interface import MeshObjectPlot


# Create a custom object for this example
class CustomObject:
    def __init__(self):
        self.name = "CustomObject"
        self.mesh = pv.Cube()

    def get_mesh(self):
        return self.mesh

    def name(self):
        return self.name


custom_object = CustomObject()

# Create a MeshObjectPlot instance
mesh_object = MeshObjectPlot(custom_object, custom_object.get_mesh())

# Create a plotter
pl = Plotter()

# Add the MeshObjectPlot instance to the plotter
pl.plot(mesh_object)

# Show the plotter
pl.show()
```

2.2 Customize your own plotter

The Visualization Interface Tool provides a base class, `PlotterInterface`, for customizing certain functions of the plotter. This class provides a set of methods that can be overridden so that you can adapt the plotter to the specific need of your PyAnsys library.

The first thing you must do is to create a class that inherits from the `PlotterInterface` class. After that, see these main use cases for customizing the plotter:

- The most common use case is to customize the way that the objects you represent are shown in the plotter. To this end, you can override the `plot` and `plot_iter` methods. These methods are called every time a new object is added to the plotter. The default implementation of this method is to add a PyVista mesh or a `MeshObjectPlot` instance to the plotter. You can override this method to add your own meshes or objects to the plotter in a manner that fits the way that you want to represent the meshes.
- Another use case is the need to have custom button functionalities for your library. For example, you may want buttons for hiding or showing certain objects. To add custom buttons to the plotter, you use the implementable interface provided by the `PlotterWidget` class.

Some practical examples of how to use the `PlotterInterface` class are included in some PyAnsys libraries, such as PyAnsys Geometry.

CHAPTER

THREE

API REFERENCE

This section describes ansys-tools-visualization-interface endpoints, their capabilities, and how to interact with them programmatically.

3.1 The `ansys.tools.visualization_interface` library

3.1.1 Summary

Subpackages

backends	Provides interfaces.
types	Provides custom types.
utils	Provides the Utils package.

Submodules

plotter	Module for the Plotter class.

Attributes

__version__

Constants

USE_TRAME	
DOCUMENTATION_BUILD	Whether the documentation is being built or not.
TESTING_MODE	Whether the library is being built or not, used to avoid showing plots while testing.
USE_HTML_BACKEND	Whether the library is being built or not, used to avoid showing plots while testing.

The `backends` package

Summary

Subpackages

pyvista	Provides interfaces.

The pyvista package

Summary

Subpackages

widgets	Provides widgets for the Visualization Interface Tool plotter.

Submodules

pyvista	Provides a wrapper to aid in plotting.
pyvista_interface	Provides plotting for various PyAnsys objects.
trame_local	Provides trame visualizer interface for visualization.
trame_remote	Module for trame websocket client functions.
trame_service	Trame service module.

The widgets package

Summary

Submodules

button	Provides for implementing buttons in PyAnsys.
displace_arrows	Provides the displacement arrows widget for the PyVista plotter.
hide_buttons	Provides the hide buttons widget for the PyAnsys plotter.
measure	Provides the measure widget for the PyAnsys plotter.
mesh_slider	Provides the measure widget for the PyAnsys plotter.
ruler	Provides the ruler widget for the Visualization Interface Tool plotter.
screenshot	Provides the screenshot widget for the Visualization Interface Tool plotter.
view_button	Provides the view button widget for changing the camera view.
widget	Provides the abstract implementation of plotter widgets.

The button.py module

Summary

Classes

Button	Provides the abstract class for implementing buttons in PyAnsys.

Button

class ansys.tools.visualization_interface.backends.pyvista.widgets.button.**Button**(*plotter: pyvista.Plotter*, *button_config: tuple*)

Bases: *ansys.tools.visualization_interface.backends.pyvista.widgets.widget.PlotterWidget*

Provides the abstract class for implementing buttons in PyAnsys.

Parameters

plotter
[Plotter] Plotter to draw the buttons on.

button_config
[tuple] Tuple containing the position and the path to the icon of the button.

Notes

This class wraps the PyVista `add_checkbox_button_widget()` method.

Overview

Abstract methods

callback	Get the functionality of the button, which is implemented by subclasses.

Methods

update	Assign the image that represents the button.

Attributes

button_config

Import detail

```
from ansys.tools.visualization_interface.backends.pyvista.widgets.button import Button
```

Attribute detail

Button.**button_config**

Method detail

abstract Button.**callback**(*state: bool*) → None

Get the functionality of the button, which is implemented by subclasses.

Parameters

state
[bool] Whether the button is active.

Button.**update**() → None

Assign the image that represents the button.

Description

Provides for implementing buttons in PyAnsys.

The displace_arrows.py module

Summary

Classes

DisplacementArrow	Defines the arrow to draw and what it is to do.

Enums

CameraPanDirection	Provides an enum with the available movement directions of the camera.

DisplacementArrow

class ansys.tools.visualization_interface.backends.pyvista.widgets.displace_arrows.**DisplacementArrow**(*plo*
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er-
a-
Pa
rec
tio

Bases: *ansys.tools.visualization_interface.backends.pyvista.widgets.button.Button*

Defines the arrow to draw and what it is to do.

Parameters

plotter
[Plotter] Plotter to draw the buttons on.

direction
[CameraPanDirection] Direction that the camera is to move.

Overview

Methods

callback	Move the camera in the direction defined by the button.

Attributes

direction

Import detail

```
from ansys.tools.visualization_interface.backends.pyvista.widgets.displace_arrows import␣
↪DisplacementArrow
```

Attribute detail

DisplacementArrow.**direction**

Method detail

DisplacementArrow.**callback**(*state: bool*) → None

Move the camera in the direction defined by the button.

Parameters

state
[bool] Whether the state of the button, which is inherited from PyVista, is active. However, this parameter is unused by this `callback` method.

CameraPanDirection

class ansys.tools.visualization_interface.backends.pyvista.widgets.displace_arrows.**CameraPanDirection**

Bases: enum.Enum

Provides an enum with the available movement directions of the camera.

Overview

Attributes

XUP
XDOWN
YUP
YDOWN
ZUP
ZDOWN

Import detail

```
from ansys.tools.visualization_interface.backends.pyvista.widgets.displace_arrows import␣
↪CameraPanDirection
```

Attribute detail

CameraPanDirection.**XUP = (0, 'upxarrow.png', (5, 170))**

CameraPanDirection.**XDOWN = (1, 'downarrow.png', (5, 130))**

CameraPanDirection.**YUP = (2, 'upyarrow.png', (35, 170))**

CameraPanDirection.**YDOWN = (3, 'downarrow.png', (35, 130))**

CameraPanDirection.**ZUP = (4, 'upzarrow.png', (65, 170))**

CameraPanDirection.**ZDOWN = (5, 'downarrow.png', (65, 130))**

Description

Provides the displacement arrows widget for the PyVista plotter.

The `hide_buttons.py` module

Summary

Classes

HideButton	Provides the hide widget for the Visualization Interface Tool `Plotter` class.

HideButton

class ansys.tools.visualization_interface.backends.pyvista.widgets.hide_buttons.**HideButton**(*plotter: ansys.tools.visuali*

Bases: *ansys.tools.visualization_interface.backends.pyvista.widgets.widget.PlotterWidget*

Provides the hide widget for the Visualization Interface Tool `Plotter` class.

Parameters

plotter_helper
[`PlotterHelper`] Plotter to add the hide widget to.

Overview

Methods

callback	Remove or add the hide widget actor upon click.
update	Define the hide widget button parameters.

Import detail

```
from ansys.tools.visualization_interface.backends.pyvista.widgets.hide_buttons import␣
↪HideButton
```

Method detail

HideButton.**callback**(*state: bool*) → None

Remove or add the hide widget actor upon click.

Parameters

state
[bool] Whether the state of the button, which is inherited from PyVista, is active.

HideButton.**update**() → None

Define the hide widget button parameters.

Description

Provides the hide buttons widget for the PyAnsys plotter.

The `measure.py` module

Summary

Classes

MeasureWidget	Provides the measure widget for the Visualization Interface Tool `Plotter` class.

MeasureWidget

class ansys.tools.visualization_interface.backends.pyvista.widgets.measure.**MeasureWidget**(*plotter_helper: ansys.tools.visualizat*

Bases: *ansys.tools.visualization_interface.backends.pyvista.widgets.widget.PlotterWidget*

Provides the measure widget for the Visualization Interface Tool `Plotter` class.

Parameters

plotter_helper
[`PlotterHelper`] Plotter to add the measure widget to.

Overview

Methods

callback	Remove or add the measurement widget actor upon click.
update	Define the measurement widget button parameters.

Attributes

plotter_helper

Import detail

```
from ansys.tools.visualization_interface.backends.pyvista.widgets.measure import␣
↪MeasureWidget
```

Attribute detail

MeasureWidget.**plotter_helper**

Method detail

`MeasureWidget.callback`(*state: bool*) → None

Remove or add the measurement widget actor upon click.

Parameters

state
[bool] Whether the state of the button, which is inherited from PyVista, is active.

`MeasureWidget.update`() → None

Define the measurement widget button parameters.

Description

Provides the measure widget for the PyAnsys plotter.

The `mesh_slider.py` module

Summary

Classes

MeshSliderWidget	Provides the mesh slider widget for the Visualization Interface Tool `Plotter` class.

MeshSliderWidget

class ansys.tools.visualization_interface.backends.pyvista.widgets.mesh_slider.**MeshSliderWidget**(*plotter_he*
ansys.tools.v

Bases: *ansys.tools.visualization_interface.backends.pyvista.widgets.widget.PlotterWidget*

Provides the mesh slider widget for the Visualization Interface Tool `Plotter` class.

Parameters

plotter_helper
[`PlotterHelper`] Plotter to add the mesh slider widget to.

Overview

Methods

callback	Remove or add the mesh slider widget actor upon click.
update	Define the mesh slider widget button parameters.

Attributes

plotter_helper

Import detail

```
from ansys.tools.visualization_interface.backends.pyvista.widgets.mesh_slider import␣
↪MeshSliderWidget
```

Attribute detail

MeshSliderWidget.**plotter_helper**

Method detail

MeshSliderWidget.**callback**(*state: bool*) → None

Remove or add the mesh slider widget actor upon click.

Parameters

state
[bool] Whether the state of the button, which is inherited from PyVista, is active.

MeshSliderWidget.**update**() → None

Define the mesh slider widget button parameters.

Description

Provides the measure widget for the PyAnsys plotter.

The `ruler.py` module

Summary

Classes

Ruler	Provides the ruler widget for the Visualization Interface Tool `Plotter` class.

Ruler

class ansys.tools.visualization_interface.backends.pyvista.widgets.ruler.**Ruler**(*plotter: pyvista.Plotter*)

Bases: *ansys.tools.visualization_interface.backends.pyvista.widgets.widget.PlotterWidget*

Provides the ruler widget for the Visualization Interface Tool `Plotter` class.

Parameters

plotter
[`Plotter`] Provides the plotter to add the ruler widget to.

Overview

Methods

callback	Remove or add the ruler widget actor upon click.
update	Define the configuration and representation of the ruler widget button.

Import detail

```
from ansys.tools.visualization_interface.backends.pyvista.widgets.ruler import Ruler
```

Method detail

Ruler.**callback**(*state: bool*) → None

Remove or add the ruler widget actor upon click.

Parameters

state
[bool] Whether the state of the button, which is inherited from PyVista, is True.

Notes

This method provides a callback function for the ruler widet. It is called every time the ruler widget is clicked.

Ruler.**update**() → None

Define the configuration and representation of the ruler widget button.

Description

Provides the ruler widget for the Visualization Interface Tool plotter.

The screenshot.py module

Summary

Classes

ScreenshotButton	Provides the screenshot widget for the Visualization Interface Tool Plotter class.

ScreenshotButton

class ansys.tools.visualization_interface.backends.pyvista.widgets.screenshot.**ScreenshotButton**(*plotter: pyvista.Plo*

Bases: *ansys.tools.visualization_interface.backends.pyvista.widgets.widget.PlotterWidget*

Provides the screenshot widget for the Visualization Interface Tool Plotter class.

Parameters

plotter
[Plotter] Provides the plotter to add the screenshot widget to.

Overview

Methods

callback	Remove or add the screenshot widget actor upon click.
update	Define the configuration and representation of the screenshot widget button.

Import detail

```
from ansys.tools.visualization_interface.backends.pyvista.widgets.screenshot import␣
↪ScreenshotButton
```

Method detail

ScreenshotButton.**callback**(*state: bool*) → None

Remove or add the screenshot widget actor upon click.

Parameters

state
[bool] Whether the state of the button, which is inherited from PyVista, is `True`.

Notes

This method provides a callback function for the screenshot widget. It is called every time the screenshot widget is clicked.

ScreenshotButton.**update**() → None

Define the configuration and representation of the screenshot widget button.

Description

Provides the screenshot widget for the Visualization Interface Tool plotter.

The `view_button.py` module

Summary

Classes

ViewButton	Provides for changing the view.

Enums

ViewDirection	Provides an enum with the available views.

ViewButton

class ansys.tools.visualization_interface.backends.pyvista.widgets.view_button.**ViewButton**(*plotter: pyvista.Plotter*, *direction: tuple*)

Bases: *ansys.tools.visualization_interface.backends.pyvista.widgets.button.Button*

Provides for changing the view.

Parameters

plotter
[Plotter] Plotter to draw the buttons on.

direction
[ViewDirection] Direction of the view.

Overview

Methods

callback	Change the view depending on button interaction.

Attributes

direction

Import detail

```
from ansys.tools.visualization_interface.backends.pyvista.widgets.view_button import␣
↪ViewButton
```

Attribute detail

ViewButton.**direction**

Method detail

ViewButton.**callback**(*state: bool*) → None

Change the view depending on button interaction.

Parameters

state
[bool] Whether the state of the button, which is inherited from PyVista, is True.

Raises

NotImplementedError
Raised if the specified direction is not implemented.

ViewDirection

class
ansys.tools.visualization_interface.backends.pyvista.widgets.view_button.**ViewDirection**

Bases: enum.Enum

Provides an enum with the available views.

Overview

Attributes

XYPLUS
XYMINUS
XZPLUS
XZMINUS
YZPLUS
YZMINUS
ISOMETRIC

Import detail

```
from ansys.tools.visualization_interface.backends.pyvista.widgets.view_button import␣
↪ViewDirection
```

Attribute detail

ViewDirection.**XYPLUS = (0, '+xy.png', (5, 220))**

ViewDirection.**XYMINUS = (1, '-xy.png', (5, 251))**

ViewDirection.**XZPLUS = (2, '+xz.png', (5, 282))**

ViewDirection.**XZMINUS = (3, '-xz.png', (5, 313))**

ViewDirection.**YZPLUS = (4, '+yz.png', (5, 344))**

ViewDirection.**YZMINUS = (5, '-yz.png', (5, 375))**

ViewDirection.**ISOMETRIC = (6, 'isometric.png', (5, 406))**

Description

Provides the view button widget for changing the camera view.

The `widget.py` module

Summary

Classes

PlotterWidget	Provides an abstract class for plotter widgets.

PlotterWidget

class ansys.tools.visualization_interface.backends.pyvista.widgets.widget.**PlotterWidget**(*plotter: pyvista.Plotter*)

Bases: abc.ABC

Provides an abstract class for plotter widgets.

Parameters

plotter
[Plotter] Plotter instance to add the widget to.

Notes

These widgets are intended to be used with PyVista plotter objects. More specifically, the way in which this abstraction has been built ensures that these widgets can be easily integrated with the Visualization Interface Tool's widgets.

Overview

Abstract methods

callback	General callback function for PlotterWidget objects.
update	General update function for PlotterWidget objects.

Properties

plotter	Plotter object that the widget is assigned to.

Import detail

```
from ansys.tools.visualization_interface.backends.pyvista.widgets.widget import␣
↪PlotterWidget
```

Property detail

property PlotterWidget.**plotter:** pyvista.Plotter

Plotter object that the widget is assigned to.

Method detail

abstract PlotterWidget.**callback**(*state*) → None

General callback function for PlotterWidget objects.

abstract PlotterWidget.**update**() → None

General update function for PlotterWidget objects.

Description

Provides the abstract implementation of plotter widgets.

Description

Provides widgets for the Visualization Interface Tool plotter.

The pyvista.py module

Summary

Classes

PyVistaBackendInterface	Provides the interface for the Visualization Interface Tool plotter.
PyVistaBackend	Provides the generic plotter implementation for PyAnsys libraries.

PyVistaBackendInterface

class ansys.tools.visualization_interface.backends.pyvista.pyvista.**PyVistaBackendInterface**(*use_trame: bool | None = None*, *allow_picking: bool | None = False*, *allow_hovering: bool | None = False*, *plot_picked_nan bool | None = False*, *show_plane: bool | None = False*, *use_qt: bool | None = False*, *show_qt: bool | None = True*, ***plotter_kwargs*)

Bases: ansys.tools.visualization_interface.backends._base.BaseBackend

Provides the interface for the Visualization Interface Tool plotter.

This class is intended to be used as a base class for the custom plotters in the different PyAnsys libraries. It provides the basic plotter functionalities, such as adding objects and enabling widgets and picking capabilities. It also provides the ability to show the plotter using the trame service.

You can override the `plot_iter()`, `plot()`, and `picked_operation()` methods. The `plot_iter()` method is intended to plot a list of objects to the plotter, while the `plot()` method is intended to plot a single object to the plotter. The `show()` method is intended to show the plotter. The `picked_operation()` method is intended to perform an operation on the picked objects.

Parameters

use_trame
[Optional[bool], default: None] Whether to activate the usage of the trame UI instead of the Python window.

allow_picking
[Optional[bool], default: False] Whether to allow picking capabilities in the window. Incompatible with hovering. Picking will take precedence over hovering.

allow_hovering
[Optional[bool], default: False] Whether to allow hovering capabilities in the window. Incompatible with picking. Picking will take precedence over hovering.

plot_picked_names
[Optional[bool], default: False] Whether to plot the names of the picked objects.

show_plane
[Optional[bool], default: False] Whether to show the plane in the plotter.

use_qt
[Optional[bool], default: False] Whether to use the Qt backend for the plotter.

show_qt
[Optional[bool], default: True] Whether to show the Qt window.

Overview

Abstract methods

plot_iter	Plot one or more compatible objects to the plotter.
plot	Plot a single object to the plotter.

Methods

enable_widgets	Enable the widgets for the plotter.
add_widget	Add one or more custom widgets to the plotter.
select_object	Select a custom object in the plotter.
unselect_object	Unselect a custom object in the plotter.
picker_callback	Define the callback for the element picker.
hover_callback	Define the callback for the element hover.
compute_edge_object_map	Compute the mapping between plotter actors and `EdgePlot` objects.
enable_picking	Enable picking capabilities in the plotter.
enable_hover	Enable hover capabilities in the plotter.
disable_picking	Disable picking capabilities in the plotter.
disable_hover	Disable hover capabilities in the plotter.
show	Plot and show any PyAnsys object.
show_plotter	Show the plotter or start the trame service.
picked_operation	Perform an operation on the picked objects.

Properties

pv_interface	PyVista interface.
scene	PyVista scene.

Import detail

```
from ansys.tools.visualization_interface.backends.pyvista.pyvista import␣
↪PyVistaBackendInterface
```

Property detail

property PyVistaBackendInterface.**pv_interface:** *ansys.tools.visualization_interface.backends.pyvista.pyvista_interface.PyVistaInterface*

PyVista interface.

property PyVistaBackendInterface.**scene:** pyvista.Plotter

PyVista scene.

Method detail

PyVistaBackendInterface.**enable_widgets**()

Enable the widgets for the plotter.

PyVistaBackendInterface.**add_widget**(*widget:* ansys.tools.visualization_interface.backends.pyvista.widgets.widget.PlotterWidget | *List[*ansys.tools.visualization_interface.backends.pyvista.widgets.widget.PlotterWidget*]*)

Add one or more custom widgets to the plotter.

Parameters

widget
[Union[PlotterWidget, List[PlotterWidget]]] One or more custom widgets.

PyVistaBackendInterface.**select_object**(*custom_object:* ansys.tools.visualization_interface.types.mesh_object_plot.MeshObjectPlot | ansys.tools.visualization_interface.types.edge_plot.EdgePlot, *pt:* *numpy.ndarray*) → None

Select a custom object in the plotter.

This method highlights the edges of a body and adds a label. It also adds the object to the `_picked_dict` and the actor to the `_picker_added_actors_map`.

Parameters

custom_object
[Union[MeshObjectPlot, EdgePlot]] Custom object to select.

pt
[ndarray] Set of points to determine the label position.

PyVistaBackendInterface.**unselect_object**(*custom_object:* ansys.tools.visualization_interface.types.mesh_object_plot.MeshObjectPlot | ansys.tools.visualization_interface.types.edge_plot.EdgePlot) → None

Unselect a custom object in the plotter.

This method removes edge highlighting and the label from a plotter actor and removes the object from the Visualization Interface Tool object selection.

Parameters

custom_object
[Union[MeshObjectPlot, EdgePlot]] Custom object to unselect.

PyVistaBackendInterface.**picker_callback**(*actor: pyvista.Actor*) → None

Define the callback for the element picker.

Parameters

actor
[Actor] Actor to select for the picker.

PyVistaBackendInterface.**hover_callback**(*_widget*, *event_name*) → None

Define the callback for the element hover.

Parameters

actor
[Actor] Actor to hover for the picker.

PyVistaBackendInterface.**compute_edge_object_map**() → Dict[pyvista.Actor, *ansys.tools.visualization_interface.types.edge_plot.EdgePlot*]

Compute the mapping between plotter actors and EdgePlot objects.

Returns

Dict[Actor, EdgePlot]
Dictionary defining the mapping between plotter actors and EdgePlot objects.

PyVistaBackendInterface.**enable_picking**()

Enable picking capabilities in the plotter.

PyVistaBackendInterface.**enable_hover**()

Enable hover capabilities in the plotter.

PyVistaBackendInterface.**disable_picking**()

Disable picking capabilities in the plotter.

PyVistaBackendInterface.**disable_hover**()

Disable hover capabilities in the plotter.

PyVistaBackendInterface.**show**(*plottable_object: Any = None*, *screenshot: str | None = None*, *view_2d: Dict = None*, *name_filter: str = None*, ***plotting_options*) → List[Any]

Plot and show any PyAnsys object.

The types of objects supported are `MeshObjectPlot`, `pv.MultiBlock`, and `pv.PolyData`.

Parameters

plottable_object
[`Any`, default: `None`] Object or list of objects to plot.

screenshot
[`str`, default: `None`] Path for saving a screenshot of the image that is being represented.

view_2d
[`Dict`, default: `None`] Dictionary with the plane and the viewup vectors of the 2D plane.

name_filter
[`str`, default: `None`] Regular expression with the desired name or names to include in the plotter.

****plotting_options**
[`dict`, default: `None`] Keyword arguments. For allowable keyword arguments, see the `Plotter.add_mesh` method.

Returns

List[Any]
List with the picked bodies in the picked order.

PyVistaBackendInterface.**show_plotter**(*screenshot: str | None = None*) → None

Show the plotter or start the trame service.

Parameters

plotter
[`Plotter`] Visualization Interface Tool plotter with the meshes added.

screenshot
[`str`, default: `None`] Path for saving a screenshot of the image that is being represented.

abstract PyVistaBackendInterface.**plot_iter**(*plottable_object: Any*, *name_filter: str = None*, ***plotting_options*)

Plot one or more compatible objects to the plotter.

Parameters

plottable_object
[`Any`] One or more objects to add.

name_filter
[`str`, default: None.] Regular expression with the desired name or names to include in the plotter.

****plotting_options**
[`dict`, default: `None`] Keyword arguments. For allowable keyword arguments, see the `Plotter.add_mesh` method.

abstract PyVistaBackendInterface.**plot**(*plottable_object: Any*, *name_filter: str = None*, ***plotting_options*)

Plot a single object to the plotter.

Parameters

plottable_object
[Any] Object to add.

name_filter
[str] Regular expression with the desired name or names to include in the plotter.

****plotting_options**
[dict, default: None] Keyword arguments. For allowable keyword arguments, see the Plotter.add_mesh method.

PyVistaBackendInterface.**picked_operation**() → None

Perform an operation on the picked objects.

PyVistaBackend

class ansys.tools.visualization_interface.backends.pyvista.pyvista.**PyVistaBackend**(*use_trame: bool | None = None*, *allow_picking: bool | None = False*, *allow_hovering: bool | None = False*, *plot_picked_names: bool | None = True*, *use_qt: bool | None = False*, *show_qt: bool | None = False*)

Bases: PyVistaBackendInterface

Provides the generic plotter implementation for PyAnsys libraries.

This class accepts MeshObjectPlot, pv.MultiBlock and pv.PolyData objects.

Parameters

use_trame
[bool, default: None] Whether to enable the use of trame. The default is None, in which case the USE_TRAME global setting is used.

allow_picking
[Optional[bool], default: False] Whether to allow picking capabilities in the window. Incompatible with hovering. Picking will take precedence over hovering.

allow_hovering
[Optional[bool], default: False] Whether to allow hovering capabilities in the window. Incompatible with picking. Picking will take precedence over hovering.

plot_picked_names
[bool, default: True] Whether to plot the names of the picked objects.

Overview

Methods

plot_iter	Plot the elements of an iterable of any type of object to the scene.
plot	Plot a pyansys or PyVista object to the plotter.
close	Close the plotter for PyVistaQT.

Properties

base_plotter	Return the base plotter object.

Import detail

```
from ansys.tools.visualization_interface.backends.pyvista.pyvista import PyVistaBackend
```

Property detail

property PyVistaBackend.**base_plotter**

Return the base plotter object.

Method detail

PyVistaBackend.**plot_iter**(*plotting_list: List[Any]*, *name_filter: str = None*, ***plotting_options*) → None

Plot the elements of an iterable of any type of object to the scene.

The types of objects supported are Body, Component, List[pv.PolyData], pv.MultiBlock, and Sketch.

Parameters

plotting_list
[List[Any]] List of objects to plot.

name_filter
[str, default: None] Regular expression with the desired name or names to include in the plotter.

****plotting_options**
[dict, default: None] Keyword arguments. For allowable keyword arguments, see the Plotter.add_mesh method.

PyVistaBackend.**plot**(*plottable_object: Any*, *name_filter: str = None*, ***plotting_options*)

Plot a pyansys or PyVista object to the plotter.

Parameters

plottable_object
[Any] Object to add.

name_filter
[str] Regular expression with the desired name or names to include in the plotter.

****plotting_options**
[dict, default: None] Keyword arguments. For allowable keyword arguments, see the Plotter.add_mesh method.

PyVistaBackend.**close**()

Close the plotter for PyVistaQT.

Description

Provides a wrapper to aid in plotting.

The pyvista_interface.py module

Summary

Classes

PyVistaInterface	Provides the middle class between PyVista plotting operations and PyAnsys objects.

PyVistaInterface

class ansys.tools.visualization_interface.backends.pyvista.pyvista_interface.**PyVistaInterface**(*scene: pyvista.Plotter | None = None, color_opts: Dict | None = None, num_points: int = 100, enable_widgets: bool = True, show_plane: bool = False, use_qt: bool = False, show_qt: bool = True, **plotter_kwargs*)

Provides the middle class between PyVista plotting operations and PyAnsys objects.

The main purpose of this class is to simplify interaction between PyVista and the PyVista backend provided. This class is responsible for creating the PyVista scene and adding the PyAnsys objects to it.

Parameters

scene
[Plotter, default: None] Scene for rendering the objects. If passed, off_screen needs to be set manually beforehand for documentation and testing.

color_opts
[dict, default: None] Dictionary containing the background and top colors.

num_points
[int, default: 100] Number of points to use to render the shapes.

enable_widgets
[bool, default: True] Whether to enable widget buttons in the plotter window. Widget buttons must be disabled when using trame for visualization.

show_plane

[bool, default: False] Whether to show the XY plane in the plotter window.

use_qt
[bool, default: False] Whether to use the Qt backend for the plotter window.

show_qt
[bool, default: True] Whether to show the Qt plotter window.

Overview

Methods

view_xy	View the scene from the XY plane.
view_xz	View the scene from the XZ plane.
view_yx	View the scene from the YX plane.
view_yz	View the scene from the YZ plane.
view_zx	View the scene from the ZX plane.
view_zy	View the scene from the ZY plane.
clip	Clip a given mesh with a plane.
plot_meshobject	Plot a generic `MeshObjectPlot` object to the scene.
plot_edges	Plot the outer edges of an object to the plot.
plot	Plot any type of object to the scene.
plot_iter	Plot elements of an iterable of any type of objects to the scene.
show	Show the rendered scene on the screen.
set_add_mesh_defaults	Set the default values for the plotting options.

Properties

scene	Rendered scene object.
object_to_actors_map	Mapping between the PyVista actor and the PyAnsys objects.

Import detail

```
from ansys.tools.visualization_interface.backends.pyvista.pyvista_interface import␣
↪PyVistaInterface
```

Property detail

property PyVistaInterface.**scene:** pyvista.plotting.plotter.Plotter

Rendered scene object.

Returns

Plotter
Rendered scene object.

property PyVistaInterface.**object_to_actors_map:** Dict[pyvista.Actor, *ansys.tools.visualization_interface.types.mesh_object_plot.MeshObjectPlot*]

Mapping between the PyVista actor and the PyAnsys objects.

Method detail

PyVistaInterface.**view_xy**() → None

View the scene from the XY plane.

PyVistaInterface.**view_xz**() → None

View the scene from the XZ plane.

PyVistaInterface.**view_yx**() → None

View the scene from the YX plane.

PyVistaInterface.**view_yz**() → None

View the scene from the YZ plane.

PyVistaInterface.**view_zx**() → None

View the scene from the ZX plane.

PyVistaInterface.**view_zy**() → None

View the scene from the ZY plane.

PyVistaInterface.**clip**(*mesh:* *pyvista.PolyData* | *pyvista.MultiBlock* | *pyvista.UnstructuredGrid*, *plane:* ansys.tools.visualization_interface.utils.clip_plane.ClipPlane) → pyvista.PolyData | pyvista.MultiBlock

Clip a given mesh with a plane.

Parameters

mesh
[Union[pv.PolyData, pv.MultiBlock]] Mesh.

normal
[str, default: "x"] Plane to use for clipping. Options are "x", "-x", "y", "-y", "z", and "-z".

origin
[tuple, default: None] Origin point of the plane.

plane
[ClipPlane, default: None] Clipping plane to cut the mesh with.

Returns

Union[pv.PolyData,pv.MultiBlock]
Clipped mesh.

PyVistaInterface.**plot_meshobject**(*custom_object:* ansys.tools.visualization_interface.types.mesh_object_plot.MeshObjectPlot, ***plotting_options*)

Plot a generic MeshObjectPlot object to the scene.

Parameters

plottable_object
[MeshObjectPlot] Object to add to the scene.

****plotting_options**
[dict, default: None] Keyword arguments. For allowable keyword arguments, see the Plotter.add_mesh method.

PyVistaInterface.**plot_edges**(*custom_object:* ansys.tools.visualization_interface.types.mesh_object_plot.MeshObjectPlot, ***plotting_options*) → None

Plot the outer edges of an object to the plot.

This method has the side effect of adding the edges to the `MeshObjectPlot` object that you pass through the parameters.

Parameters

custom_object
[`MeshObjectPlot`] Custom object with the edges to add.

****plotting_options**
[`dict`, default: `None`] Keyword arguments. For allowable keyword arguments, see the `Plotter.add_mesh` method.

PyVistaInterface.**plot**(*plottable_object: pyvista.PolyData | pyvista.MultiBlock | ansys.tools.visualization_interface.types.mesh_object_plot.MeshObjectPlot | pyvista.UnstructuredGrid*, *name_filter: str = None*, ***plotting_options*) → None

Plot any type of object to the scene.

Supported object types are `List[pv.PolyData]`, `MeshObjectPlot`, and `pv.MultiBlock`.

Parameters

plottable_object
[`Union[pv.PolyData, pv.MultiBlock, MeshObjectPlot, pv.UnstructuredGrid, pv.StructuredGrid]`] Object to plot.

name_filter
[`str`, default: `None`] Regular expression with the desired name or names to include in the plotter.

****plotting_options**
[`dict`, default: `None`] Keyword arguments. For allowable keyword arguments, see the `Plotter.add_mesh` method.

PyVistaInterface.**plot_iter**(*plotting_list: List[Any]*, *name_filter: str = None*, ***plotting_options*) → None

Plot elements of an iterable of any type of objects to the scene.

Parameters

plotting_list
[`List[Any]`] List of objects to plot.

name_filter
[`str`, default: `None`] Regular expression with the desired name or names to include in the plotter.

****plotting_options**
[`dict`, default: `None`] Keyword arguments. For allowable keyword arguments, see the `Plotter.add_mesh` method.

PyVistaInterface.**show**(*show_plane: bool = False*, *jupyter_backend: str | None = None*, ***kwargs: Dict | None*) → None

Show the rendered scene on the screen.

Parameters

show_plane
[bool, default: `True`] Whether to show the XY plane.

jupyter_backend
[str, default: None] PyVista Jupyter backend.

****kwargs**
[dict, default: None] Plotting keyword arguments. For allowable keyword arguments, see the Plotter.show method.

Notes

For more information on supported Jupyter backends, see Jupyter Notebook Plotting in the PyVista documentation.

PyVistaInterface.**set_add_mesh_defaults**(*plotting_options: Dict | None*) → None

Set the default values for the plotting options.

Parameters

plotting_options
[Optional[Dict]] Keyword arguments. For allowable keyword arguments, see the Plotter.add_mesh method.

Description

Provides plotting for various PyAnsys objects.

The trame_local.py module

Summary

Classes

TrameVisualizer	Defines the trame layout view.

Constants

CLIENT_TYPE

TrameVisualizer

class ansys.tools.visualization_interface.backends.pyvista.trame_local.**TrameVisualizer**

Defines the trame layout view.

Overview

Methods

set_scene	Set the trame layout view and the mesh to show through the PyVista plotter.
show	Start the trame server and show the mesh.

Attributes

server

Import detail

```
from ansys.tools.visualization_interface.backends.pyvista.trame_local import␣
↪TrameVisualizer
```

Attribute detail

TrameVisualizer.**server = None**

Method detail

TrameVisualizer.**set_scene**(*plotter*)

Set the trame layout view and the mesh to show through the PyVista plotter.

Parameters

plotter
[Plotter] PyVista plotter with the rendered mesh.

TrameVisualizer.**show**()

Start the trame server and show the mesh.

Description

Provides trame visualizer interface for visualization.

Module detail

trame_local.**CLIENT_TYPE = 'vue2'**

The trame_remote.py module

Summary

Functions

send_pl	Send the plotter meshes to a remote trame service.
send_mesh	Send a mesh to a remote trame service.

Description

Module for trame websocket client functions.

Module detail

trame_remote.**send_pl**(*plotter: pyvista.Plotter*, *host: str = 'localhost'*, *port: int = 8765*)

Send the plotter meshes to a remote trame service.

Since plotter can't be pickled, we send the meshes list instead.

Parameters

plotter
[pv.Plotter] Plotter to send.

host
[str, optional] Websocket host to connect to, by default "localhost".

port
[int, optional] Websocket port to connect to, by default 8765.

trame_remote.**send_mesh**(*mesh: pyvista.PolyData | pyvista.MultiBlock*, *host: str = 'localhost'*, *port: int = 8765*)

Send a mesh to a remote trame service.

Parameters

mesh
[Union[pv.PolyData, pv.MultiBlock]] Mesh to send.

host
[str, optional] Websocket host to connect to, by default "localhost".

port
[int, optional] Websocket port to connect to, by default 8765.

The trame_service.py module

Summary

Classes

TrameService	Trame service class.

TrameService

class ansys.tools.visualization_interface.backends.pyvista.trame_service.**TrameService**(*websocket_host: str = 'localhost'*, *websocket_port: int = 8765*)

Trame service class.

Initializes a trame service where you can send meshes to plot in a trame webview plotter.

Parameters

websocket_host
[str, optional] Host where the webserver will listen for new plotters and meshes, by default "localhost".

websocket_port
[int, optional] Port where the webserver will listen for new plotters and meshes, by default 8765.

Overview

Methods

clear_plotter	Clears the web view in the service.
set_scene	Sets the web view scene for the trame service.
run	Start the trame web view and the websocket services.

Import detail

```
from ansys.tools.visualization_interface.backends.pyvista.trame_service import␣
↪TrameService
```

Method detail

TrameService.**clear_plotter**()
Clears the web view in the service.

TrameService.**set_scene**()
Sets the web view scene for the trame service.

TrameService.**run**()
Start the trame web view and the websocket services.

Description

Trame service module.

Description

Provides interfaces.

Description

Provides interfaces.

The types package

Summary

Submodules

edge_plot	Provides the edge type for plotting.
mesh_object_plot	Provides the MeshObjectPlot class.

The edge_plot.py module

Summary

Classes

EdgePlot	Provides the mapper class for relating PyAnsys object edges with its PyVista actor.

EdgePlot

class ansys.tools.visualization_interface.types.edge_plot.**EdgePlot**(*actor: pyvista.Actor*, *edge_object: Any*, *parent: Any = None*)

Provides the mapper class for relating PyAnsys object edges with its PyVista actor.

Parameters

actor
[Actor] PyVista actor that represents the edge.

edge_object
[Edge] PyAnsys object edge that is represented by the PyVista actor.

parent
[MeshObjectPlot, default: None] Parent PyAnsys object of the edge.

Overview

Properties

actor	PyVista actor of the object.
edge_object	PyAnsys edge.
parent	Parent PyAnsys object of the edge.
name	Name of the edge.

Import detail

```
from ansys.tools.visualization_interface.types.edge_plot import EdgePlot
```

Property detail

property EdgePlot.**actor:** pyvista.Actor

PyVista actor of the object.

Returns

Actor
PyVista actor.

property EdgePlot.**edge_object:** Any

PyAnsys edge.

Returns

Any
PyAnsys edge.

property EdgePlot.**parent: Any**
Parent PyAnsys object of the edge.

Returns

Any
Parent PyAnsys object.

property EdgePlot.**name: str**
Name of the edge.

Returns

str
Name of the edge.

Description

Provides the edge type for plotting.

The mesh_object_plot.py module

Summary

Classes

MeshObjectPlot	Relates a custom object with a mesh, provided by the consumer library.

MeshObjectPlot

class ansys.tools.visualization_interface.types.mesh_object_plot.**MeshObjectPlot**(*custom_object: Any*, *mesh: pyvista.PolyData | pyvista.MultiBlock*, *actor: pyvista.Actor = None*, *edges: List[*ansys.tools.visualization_ *= None*)

Relates a custom object with a mesh, provided by the consumer library.

Overview

Properties

mesh	Mesh of the object in PyVista format.
custom_object	Custom object.
actor	PyVista actor of the object in the plotter.
edges	Edges of the object.
name	Name of the object.

Import detail

```
from ansys.tools.visualization_interface.types.mesh_object_plot import MeshObjectPlot
```

Property detail

property MeshObjectPlot.**mesh**: pyvista.PolyData | pyvista.MultiBlock

Mesh of the object in PyVista format.

Returns

Union[pv.PolyData, pv.MultiBlock]
Mesh of the object.

property MeshObjectPlot.**custom_object**: Any

Custom object.

Returns

Any
Custom object.

property MeshObjectPlot.**actor**: pyvista.Actor

PyVista actor of the object in the plotter.

Returns

pv.Actor
PyVista actor of the object.

property MeshObjectPlot.**edges**:
List[*ansys.tools.visualization_interface.types.edge_plot.EdgePlot*]

Edges of the object.

Returns

List[EdgePlot]
Edges of the object.

property MeshObjectPlot.**name**: str

Name of the object.

Returns

str
Name of the object.

Description

Provides the MeshObjectPlot class.

Description

Provides custom types.

The utils package

Summary

Submodules

clip_plane	Provides the ClipPlane class.
color	Provides an enum with the color to use for the plotter actors.
logger	Provides the singleton helper class for the logger.

The clip_plane.py module

Summary

Classes

ClipPlane	Provides the clipping plane for clipping meshes in the plotter.

ClipPlane

class ansys.tools.visualization_interface.utils.clip_plane.**ClipPlane**(*normal: Tuple[float, float, float] = (1, 0, 0)*, *origin: Tuple[float, float, float] = (0, 0, 0)*)

Provides the clipping plane for clipping meshes in the plotter.

The clipping plane is defined by both normal and origin vectors.

Parameters

normal
[Tuple[float, float, float], default: (1, 0, 0)] Normal of the plane.

origin
[Tuple[float, float, float], default: (0, 0, 0)] Origin point of the plane.

Overview

Properties

normal	Normal of the plane.
origin	Origin of the plane.

Import detail

```
from ansys.tools.visualization_interface.utils.clip_plane import ClipPlane
```

Property detail

property ClipPlane.**normal**: **Tuple[float, float, float]**

Normal of the plane.

Returns

Tuple[float, float, float]
Normal of the plane.

property ClipPlane.**origin: Tuple**[float, float, float]
Origin of the plane.

Returns

Tuple[float, float, float]
Origin of the plane.

Description

Provides the `ClipPlane` class.

The `color.py` module

Summary

Enums

Color	Provides an enum with the color to use for the plotter actors.

Color

class ansys.tools.visualization_interface.utils.color.**Color**
Bases: enum.Enum

Provides an enum with the color to use for the plotter actors.

Overview

Attributes

DEFAULT	Default color for the plotter actors.
PICKED	Color for the actors that are currently picked.
EDGE	Default color for the edges.
PICKED_EDGE	Color for the edges that are currently picked.

Import detail

```
from ansys.tools.visualization_interface.utils.color import Color
```

Attribute detail

Color.**DEFAULT = '#D6F7D1'**
Default color for the plotter actors.

Color.**PICKED = '#BB6EEE'**
Color for the actors that are currently picked.

Color.**EDGE = '#000000'**
Default color for the edges.

Color.**PICKED_EDGE = '#9C9C9C'**

Color for the edges that are currently picked.

Description

Provides an enum with the color to use for the plotter actors.

The logger.py module

Summary

Classes

SingletonType	Provides the singleton helper class for the logger.
VizLogger	Provides the singleton logger for the visualizer.

Attributes

logger

SingletonType

class ansys.tools.visualization_interface.utils.logger.**SingletonType**

Bases: type

Provides the singleton helper class for the logger.

Overview

Special methods

__call__	Call to redirect new instances to the singleton instance.

Import detail

```
from ansys.tools.visualization_interface.utils.logger import SingletonType
```

Method detail

SingletonType.**__call__**(**args*, ***kwargs*)

Call to redirect new instances to the singleton instance.

VizLogger

class ansys.tools.visualization_interface.utils.logger.**VizLogger**(*level: int = logging.ERROR*, *logger_name: str = 'VizLogger'*)

Bases: object

Provides the singleton logger for the visualizer.

Parameters

to_file
[bool, default: `False`] Whether to include the logs in a file.

Overview

Methods

get_logger	Get the logger.
set_level	Set the logger output level.
enable_output	Enable logger output to a given stream.
add_file_handler	Save logs to a file in addition to printing them to the standard output.

Import detail

```
from ansys.tools.visualization_interface.utils.logger import VizLogger
```

Method detail

`VizLogger.`**`get_logger`**`()`

Get the logger.

Returns

Logger
Logger.

`VizLogger.`**`set_level`**`(`*level: int*`)`

Set the logger output level.

Parameters

level
[`int`] Output Level of the logger.

`VizLogger.`**`enable_output`**`(`*stream=None*`)`

Enable logger output to a given stream.

If a stream is not specified, `sys.stderr` is used.

Parameters

stream: TextIO, default: ``sys.stderr``
Stream to output the log output to.

`VizLogger.`**`add_file_handler`**`(`*logs_dir: str = './.log'*`)`

Save logs to a file in addition to printing them to the standard output.

Parameters

logs_dir
[`str`, default: `"./.log"`] Directory of the logs.

Description

Provides the singleton helper class for the logger.

Module detail

`logger.logger`

Description

Provides the Utils package.

The `plotter.py` module

Summary

Classes

Plotter	Base plotting class containing common methods and attributes.

Plotter

class ansys.tools.visualization_interface.plotter.**Plotter**(*backend: ansys.tools.visualization_interface.backends._base.BaseBacke = None*)

Base plotting class containing common methods and attributes.

This class is responsible for plotting objects using the specified backend.

Parameters

backend
[`BaseBackend`, `optional`] Plotting backend to use, by default PyVistaBackend.

Overview

Methods

plot	Plots an object using the specified backend.
show	Show the plotted objects.

Properties

backend	Return the base plotter object.

Import detail

```
from ansys.tools.visualization_interface.plotter import Plotter
```

Property detail

property Plotter.**backend**

Return the base plotter object.

Method detail

Plotter.**plot**(*plottable_object: Any*, ***plotting_options*)

Plots an object using the specified backend.

Parameters

plottable_object
[Any] Object to plot.

plotting_options
[dict] Additional plotting options.

Plotter.**show**(*plottable_object: Any = None*, *screenshot: str = None*, *name_filter: bool = None*, ***plotting_options*) → None

Show the plotted objects.

Parameters

plottable_object
[Any, optional] Object to show, by default None.

screenshot
[str, optional] Path to save a screenshot, by default None.

name_filter
[bool, optional] Flag to filter the object, by default None.

plotting_options
[dict] Additional plotting options the selected backend accepts.

Description

Module for the Plotter class.

3.1.2 Description

Visualization Interface Tool is a Python client library for visualizing the results of Ansys simulations.

3.1.3 Module detail

visualization_interface.**USE_TRAME: bool = False**

visualization_interface.**DOCUMENTATION_BUILD: bool**

Whether the documentation is being built or not.

visualization_interface.**TESTING_MODE: bool**

Whether the library is being built or not, used to avoid showing plots while testing.

visualization_interface.**USE_HTML_BACKEND: bool**

Whether the library is being built or not, used to avoid showing plots while testing.

visualization_interface.**__version__**

CHAPTER

FOUR

EXAMPLES

This section show how to use the Visualization Interface Tool to perform many different types of operations.

CHAPTER

FIVE

BASIC USAGE EXAMPLES

These examples show how to use the general plotter included in the Visualization Interface Tool.

CHAPTER

SIX

ADVANCED USAGE EXAMPLES

These examples show how to use the Visualization Interface Tool to postprocess simulation data.

6.1 Basic usage examples

These examples show how to use the general plotter included in the Visualization Interface Tool.

6.1.1 Use trame as a remote service

This example shows how to launch a trame service and use it as a remote service.

First, we need to launch the trame service. We can do this by running the following code:

```
# import required libraries
from ansys.tools.visualization_interface.backends.pyvista.trame_service import (
    TrameService,
)

# create a trame service, in whatever port is available in your system
ts = TrameService(websocket_port=8765)

# run the service
ts.run()
```

Now, we can send meshes and plotter to the trame service. We can do this by running the following code in a separate terminal:

```
# import required libraries
import time

import pyvista as pv

from ansys.tools.visualization_interface.backends.pyvista.trame_remote import (
    send_mesh,
    send_pl,
)

# create an example plotter
plotter = pv.Plotter()
plotter.add_mesh(pv.Cube())

# send some example meshes
```

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```
send_mesh(pv.Sphere())
send_mesh(pv.Sphere(center=(3, 0, 0)))
time.sleep(4)

# if we send a plotter, the previous meshes will be deleted.
send_pl(plotter)
```

Total running time of the script: (0 minutes 0.000 seconds)

6.1.2 Use a PyVista Qt backend

PyVista Qt is a package that extends the PyVista functionality through the usage of Qt. Qt applications operate in a separate thread than VTK, you can simultaneously have an active VTK plot and a non-blocking Python session.

This example shows how to use the PyVista Qt backend to create a plotter

```
import pyvista as pv

from ansys.tools.visualization_interface import Plotter
from ansys.tools.visualization_interface.backends.pyvista import PyVistaBackend
```

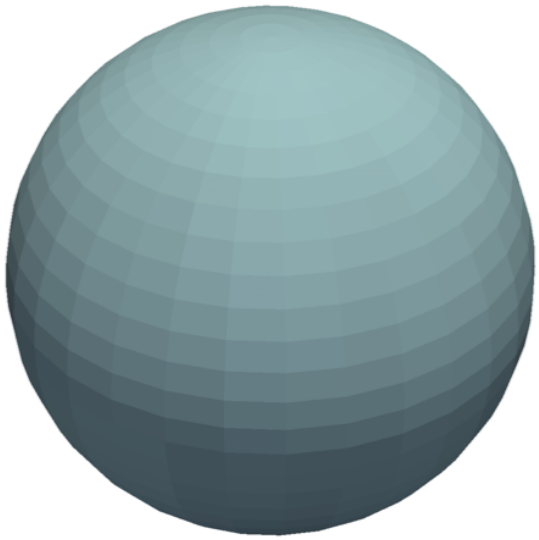
Open a pyvistaqt window

```
cube = pv.Cube()
pv_backend = PyVistaBackend(use_qt=True, show_qt=True)
pl = Plotter(backend=pv_backend)
pl.plot(cube)
pl.backend.enable_widgets()
pv_backend.scene.show()
```

Parallel VTK window

```
sphere = pv.Sphere()

pl_parallel = Plotter()
pl_parallel.plot(sphere)
pl_parallel.show()
```

Static Scene



Interactive Scene

Close the pyvistaqt window

```
pv_backend.close()
```

Integrate the plotter in a Qt application

```
pv_backend = PyVistaBackend(use_qt=True, show_qt=False)
pv_backend.enable_widgets()

# You can use this plotter in a Qt application
pl = pv_backend.scene
```

Total running time of the script: (0 minutes 1.307 seconds)

6.1.3 Use a clipping plane

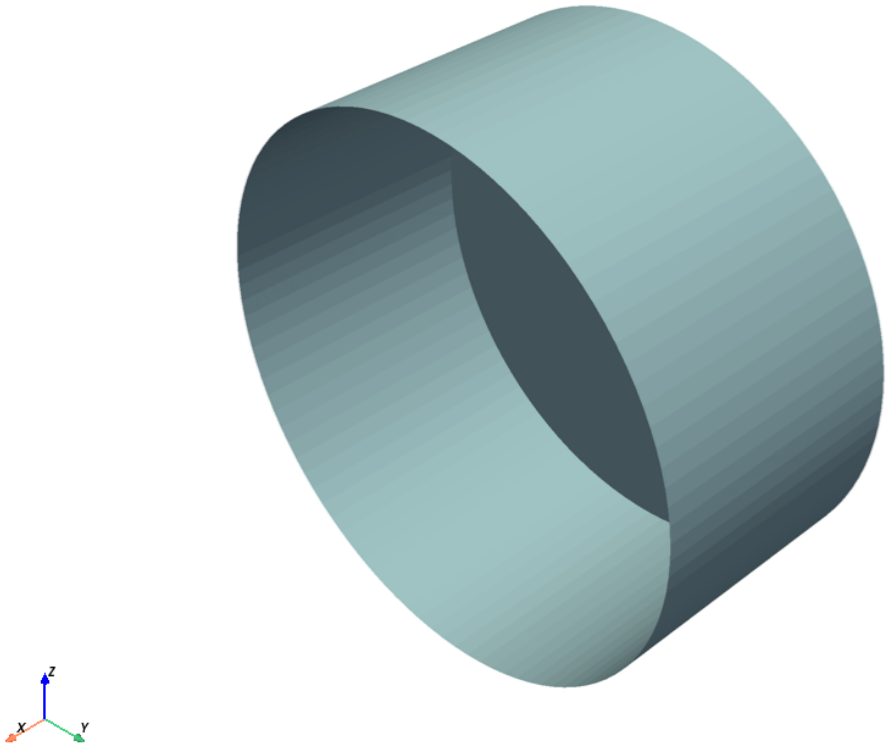
This example shows how to use a clipping plane in the Visualization Interface Tool to cut a mesh.

```
import pyvista as pv

from ansys.tools.visualization_interface import ClipPlane, Plotter

mesh = pv.Cylinder()
```

Create a plotter and clip the mesh

```
pl = Plotter()

# Create a clipping plane
clipping_plane = ClipPlane(normal=(1, 0, 0), origin=(0, 0, 0))

# Add the mesh to the plotter with the clipping plane
pl.plot(mesh, clipping_plane=clipping_plane)
pl.show()
```

Static Scene



Interactive Scene

Total running time of the script: (0 minutes 0.438 seconds)

6.1.4 Use the `MeshObjectPlot` class

The Visualization Interface Tool provides the `MeshObject` helper class to relate a custom object with its mesh. With a custom object, you can take advantage of the full potential of the Visualization Interface Tool.

This example shows how to use the `MeshObjectPlot` class to plot your custom objects.

Relate `CustomObject` class with a PyVista mesh

```
import pyvista as pv

# Note that the ``CustomObject`` class must have a way to get the mesh
# and a name or ID.

class CustomObject:
    def __init__(self):
        self.name = "CustomObject"
        self.mesh = pv.Cube()

    def get_mesh(self):
        return self.mesh

    def name(self):
        return self.name

# Create a custom object
custom_object = CustomObject()
```

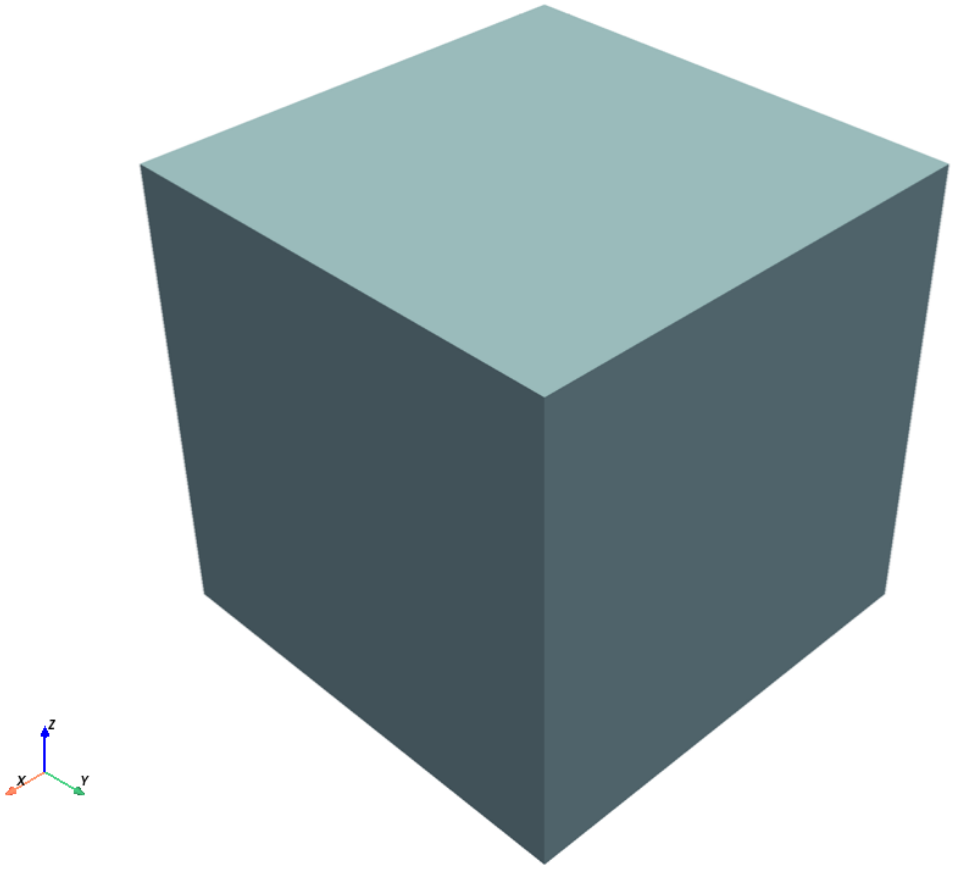
Create a `MeshObjectPlot` instance

```
from ansys.tools.visualization_interface import MeshObjectPlot

# Create an instance

mesh_object = MeshObjectPlot(custom_object, custom_object.get_mesh())
```

Plot the `MeshObjectPlot` instance

```
from ansys.tools.visualization_interface import Plotter

pl = Plotter()
pl.plot(mesh_object)
pl.show()
```

Static Scene



Interactive Scene

Total running time of the script: (0 minutes 0.342 seconds)

6.1.5 Use the plotter

This example shows how to add one or more meshes to the plotter.

Add a mesh to the plotter

This code shows how to add a single mesh to the plotter.

```
import pyvista as pv

from ansys.tools.visualization_interface import Plotter

mesh = pv.Cube()

# Create a plotter
pl = Plotter()

# Add the mesh to the plotter
pl.plot(mesh)
```

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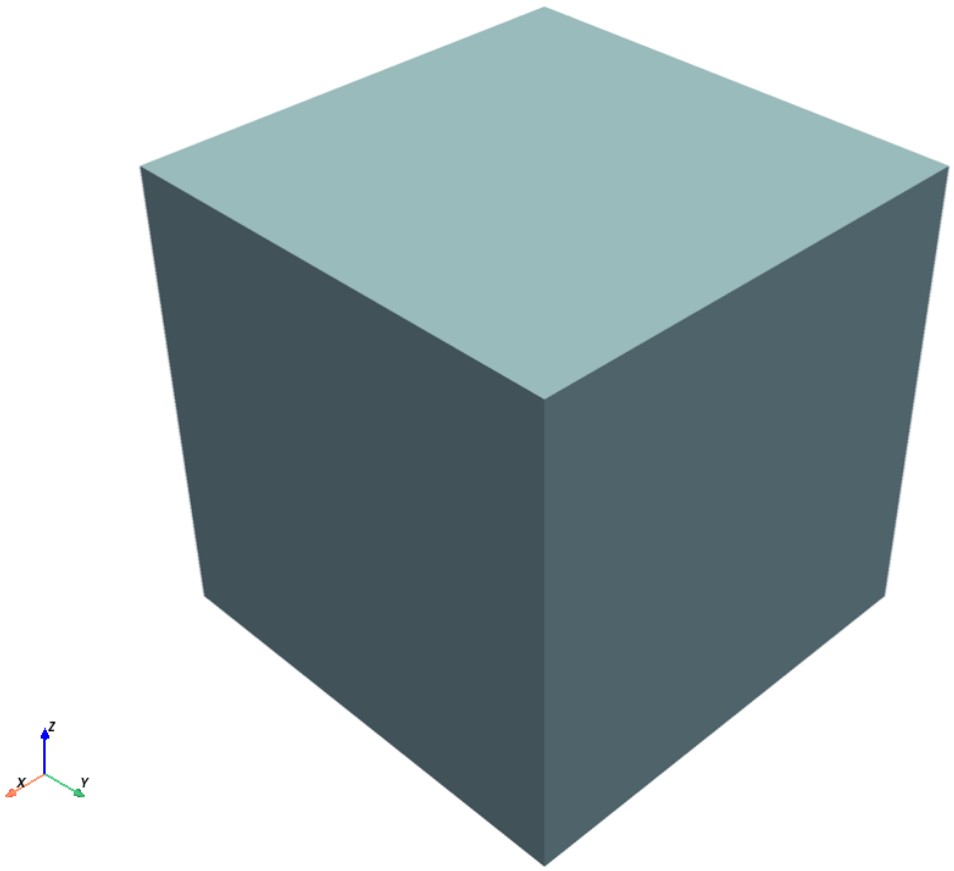
```
# Show the plotter
pl.show()
```

Static Scene



Interactive Scene

Getting a screenshot

Now we will check how to get a screenshot from our plotter.

```
import pyvista as pv

from ansys.tools.visualization_interface import Plotter

mesh = pv.Cube()

# Create a plotter
pl = Plotter()

# Add the mesh to the plotter
```

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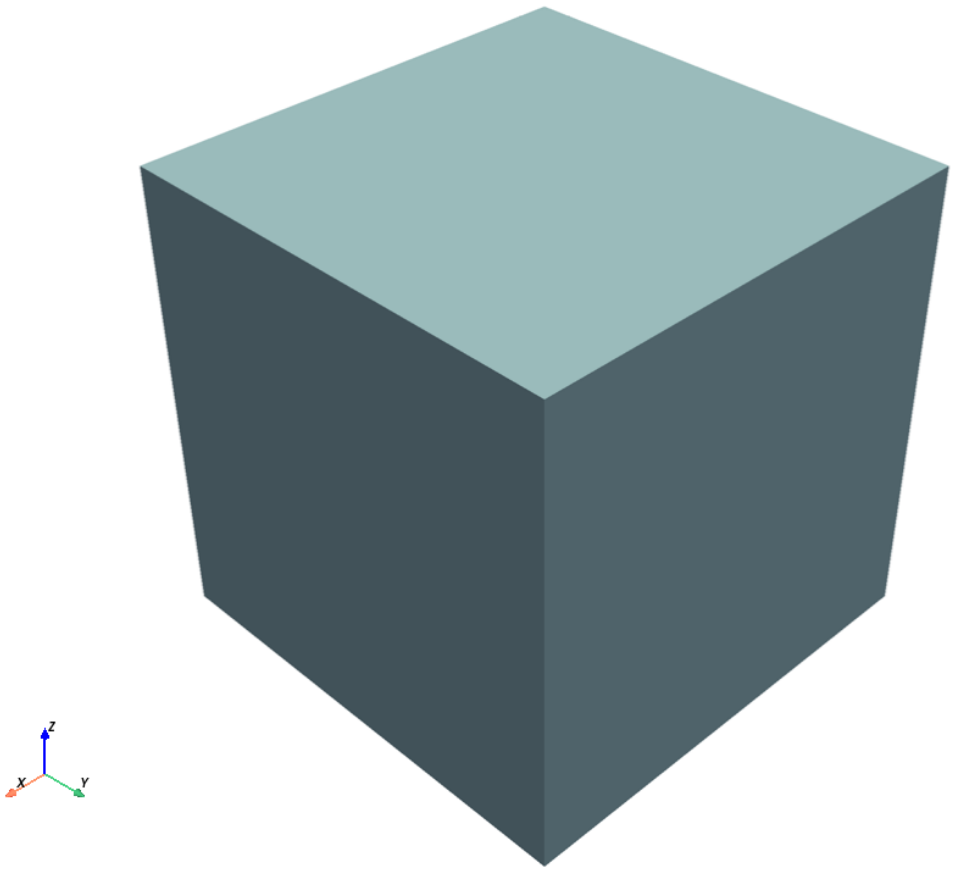
```
pl.plot(mesh)

# Show the plotter
pl.show(screenshot="screenshot.png")
```

Static Scene



Interactive Scene

Add a list of meshes

This code shows how to add a list of meshes to the plotter.

```
import pyvista as pv

from ansys.tools.visualization_interface import Plotter

mesh1 = pv.Cube()
mesh2 = pv.Sphere(center=(2, 0, 0))
mesh_list = [mesh1, mesh2]
# Create a plotter
pl = Plotter()
```

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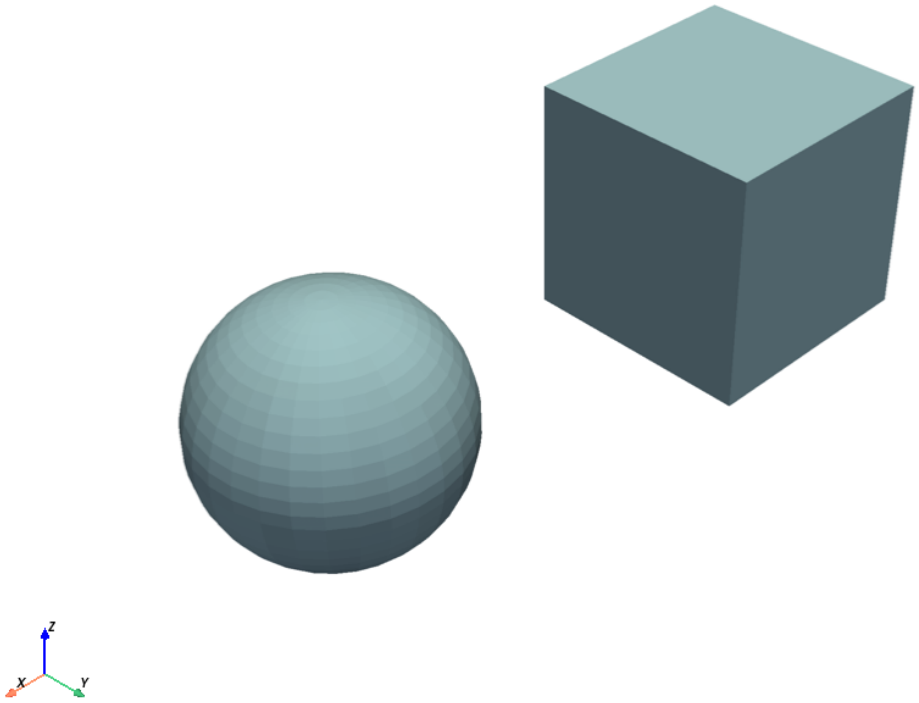
```
# Add a list of meshes to the plotter
pl.plot(mesh_list)

# Show the plotter
pl.show()
```

Static Scene



Interactive Scene

Total running time of the script: (0 minutes 1.044 seconds)

6.1.6 Activate the picker

This example shows how to activate the picker, which is the tool that you use to select an object in the plotter and get its name.

Relate `CustomObject` class with a PyVista mesh

```
import pyvista as pv

# Note that the ``CustomObject`` class must have a way to get the mesh
# and a name or ID.

class CustomObject:
    def __init__(self):
        self.name = "CustomObject"
        self.mesh = pv.Cube(center=(1, 1, 0))

    def get_mesh(self):
        return self.mesh

    def name(self):
        return self.name



# Create a custom object
custom_cube = CustomObject()
custom_cube.name = "CustomCube"
custom_sphere = CustomObject()
custom_sphere.mesh = pv.Sphere(center=(0, 0, 5))
custom_sphere.name = "CustomSphere"
```

Create two `MeshObjectPlot` instances

```
from ansys.tools.visualization_interface import MeshObjectPlot

# Create an instance
mesh_object_cube = MeshObjectPlot(custom_cube, custom_cube.get_mesh())
mesh_object_sphere = MeshObjectPlot(custom_sphere, custom_sphere.get_mesh())
```

Activate the picking capabilities

```
from ansys.tools.visualization_interface import Plotter
from ansys.tools.visualization_interface.backends.pyvista import PyVistaBackend

pv_backend = PyVistaBackend(allow_picking=True, plot_picked_names=True)
pl = Plotter(backend=pv_backend)
pl.plot(mesh_object_cube)
pl.plot(mesh_object_sphere)
pl.show()
```

Static Scene

Interactive Scene

Activate the hover capabilities

```
from ansys.tools.visualization_interface import Plotter
from ansys.tools.visualization_interface.backends.pyvista import PyVistaBackend

pv_backend = PyVistaBackend(allow_hovering=True)
pl = Plotter(backend=pv_backend)
pl.plot(mesh_object_cube)
pl.plot(mesh_object_sphere)
pl.show()
```

Static Scene

Interactive Scene

Using StructuredGrid mesh

```
import numpy as np


class CustomStructuredObject:
    def __init__(self):
        self.name = "CustomObject"
        xrng = np.arange(-10, 10, 2, dtype=np.float32)
        yrng = np.arange(-10, 10, 5, dtype=np.float32)
        zrng = np.arange(-10, 10, 1, dtype=np.float32)
        x, y, z = np.meshgrid(xrng, yrng, zrng, indexing='ij')
        grid = pv.StructuredGrid(x, y, z)
        self.mesh = grid

    def get_mesh(self):
        return self.mesh

    def name(self):
```

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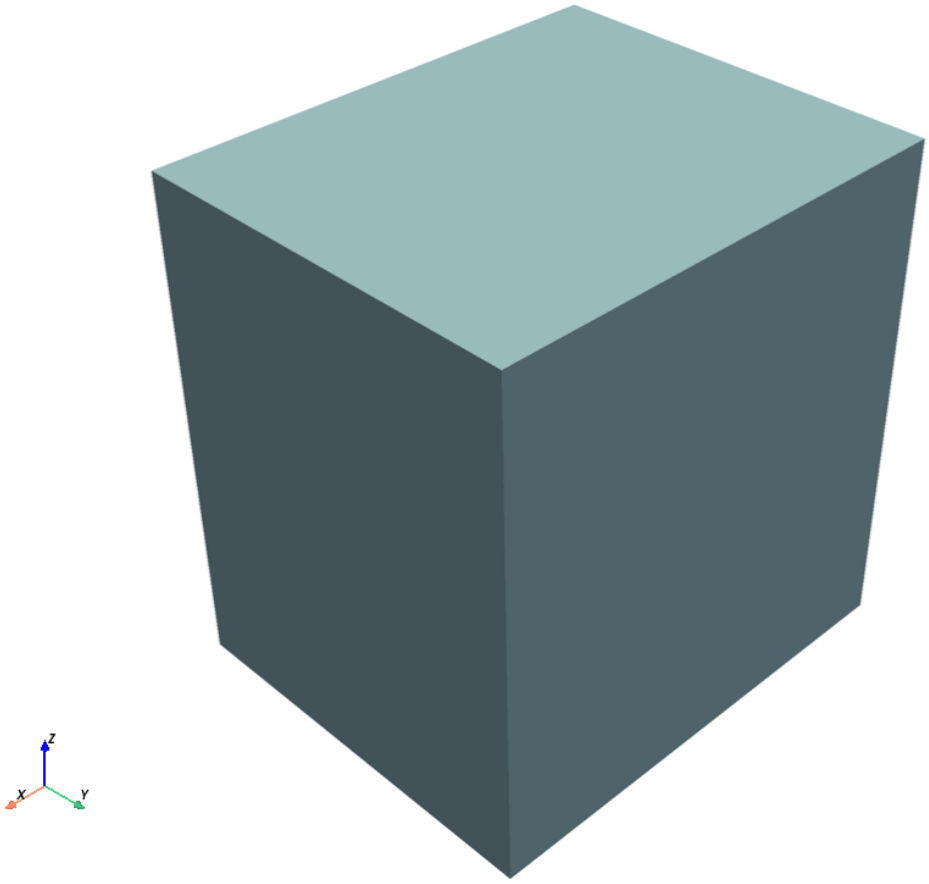
```
        return self.name


pv_backend = PyVistaBackend()
pl = Plotter(backend=pv_backend)

structured_object = CustomStructuredObject()
mo_plot = MeshObjectPlot(structured_object, structured_object.get_mesh())
pl.plot(mo_plot)
pl.show()
```

Static Scene



Interactive Scene

Total running time of the script: (0 minutes 0.863 seconds)

6.2 Advanced usage examples

These examples show how to use the Visualization Interface Tool to postprocess simulation data.

6.2.1 Postprocessing simulation results using the `MeshObjectPlot` class

The Visualization Interface Tool provides the `MeshObject` helper class to relate a custom object. With a custom object, you can take advantage of the full potential of the Visualization Interface Tool.

This example shows how to use the `MeshObjectPlot` class to plot your custom objects with scalar data on mesh.

Necessary imports

```
from ansys.fluent.core import examples
import pyvista as pv

from ansys.tools.visualization_interface.backends.pyvista import PyVistaBackend
from ansys.tools.visualization_interface import MeshObjectPlot, Plotter
```

Download the VTK file

A VTK dataset can be produced utilizing PyDPF for Ansys Flagship products simulations results file format.

```
mixing_elbow_file_src = examples.download_file("mixing_elbow.vtk", "result_files/fluent-
↪mixing_elbow_steady-state")
```

Define a custom object class

Note that the `CustomObject` class must have a way to get the mesh and a name or ID.

```
class CustomObject:
    def __init__(self):
        self.name = "CustomObject"
        self.mesh = pv.read(mixing_elbow_file_src)

    def get_mesh(self):
        return self.mesh

    def get_field_array_info(self):
        return self.mesh.array_names

    def name(self):
        return self.name


# Create a custom object
custom_vtk = CustomObject()
```

Create a `MeshObjectPlot` instance

```
mesh_object = MeshObjectPlot(custom_vtk, custom_vtk.get_mesh())

# Define the camera position
cpos = (
    (-0.3331763564757694, 0.08802797061044923, -1.055269197114142),
    (0.08813476356878325, -0.03975174212669032, -0.012819952697089087),
    (0.045604530283921085, 0.9935979348314435, 0.10336039239608838),
)
```

Get the available field data arrays

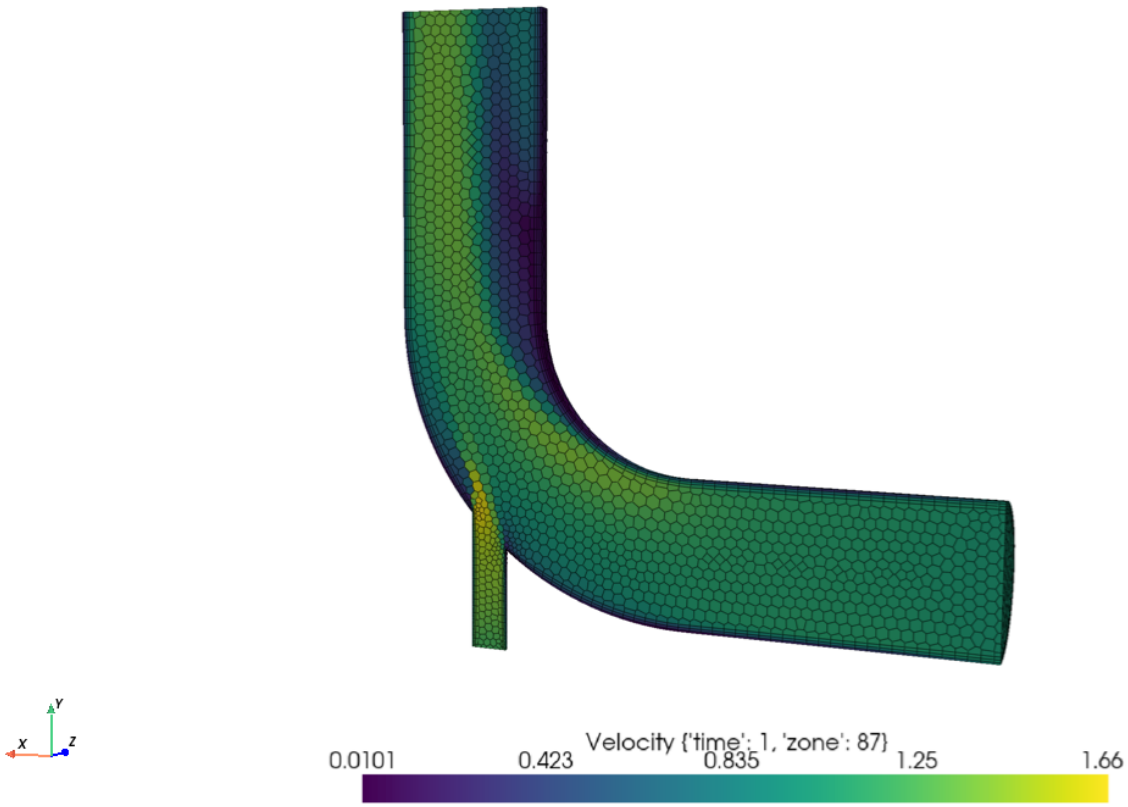
```
field_data_arrays = custom_vtk.get_field_array_info()
print(f"Field data arrays: {field_data_arrays}")
```

```
Field data arrays: ["Velocity {'time': 1, 'zone': 87}", "Temperature {'time': 1, 'zone':␣
↪87}"]
```

Plot the `MeshObjectPlot` instance with mesh object & field data (0)

```
pv_backend = PyVistaBackend()
pl = Plotter(backend=pv_backend)
pl.plot(
    mesh_object,
    scalars=field_data_arrays[0],
    show_edges=True,
    show_scalar_bar=True,
)
pl._backend.pv_interface.scene.camera_position = cpos
pl.show()
```

Static Scene

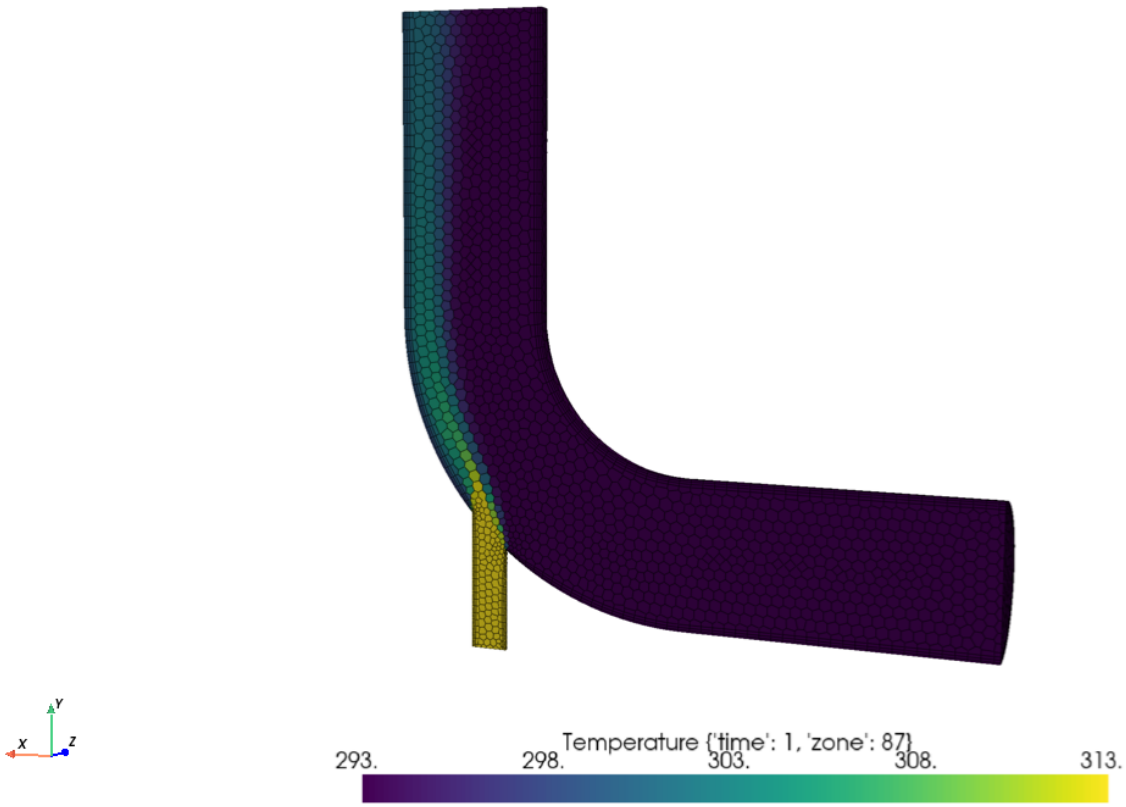


Interactive Scene

Plot the `MeshObjectPlot` instance with mesh object & other field data (1)

```
pv_backend = PyVistaBackend()
pl = Plotter(backend=pv_backend)
pl.plot(
    mesh_object,
    scalars=field_data_arrays[1],
    show_edges=True,
    show_scalar_bar=True,
)
pl._backend.pv_interface.scene.camera_position = cpos
pl.show()
```

Static Scene



Interactive Scene

Total running time of the script: (0 minutes 6.996 seconds)

CHAPTER

SEVEN

CONTRIBUTE

Overall guidance on contributing to a PyAnsys library appears in the Contributing topic in the *PyAnsys developer's guide*. Ensure that you are thoroughly familiar with this guide before attempting to contribute to the Visualization Interface Tool.

The following contribution information is specific to the Visualization Interface Tool.

7.1 Install in developer mode

Installing the Visualization Interface Tool in developer mode allows you to modify and enhance the source.

To clone and install the latest Visualization Interface Tool release in development mode, run these commands:

```
git clone https://github.com/ansys/ansys-tools-visualization-interface
cd ansys-tools-visualization-interface
python -m pip install --upgrade pip
pip install -e .
```

7.2 Run tests

The Visualization Interface Tool uses pytest for testing.

1. Prior to running tests, you must run this command to install test dependencies:

   ```
   pip install -e .[tests]
   ```

2. To then run the tests, navigate to the root directory of the repository and run this command:

   ```
   pytest
   ```

7.3 Adhere to code style

The Visualization Interface Tool follows the PEP8 standard as outlined in PEP 8 in the *PyAnsys developer's guide* and implements style checking using pre-commit.

To ensure your code meets minimum code styling standards, run these commands:

```
pip install pre-commit
pre-commit run --all-files
```

You can also install this as a pre-commit hook by running this command:

```
pre-commit install
```

This way, it's not possible for you to push code that fails the style checks:

```
$ pre-commit install
$ git commit -am "added my cool feature"
black....................................................................Passed
blacken-docs.............................................................Passed
isort....................................................................Passed
flake8...................................................................Passed
docformatter.............................................................Passed
codespell................................................................Passed
pydocstyle...............................................................Passed
check for merge conflicts................................................Passed
debug statements (python)................................................Passed
check yaml...............................................................Passed
trim trailing whitespace.................................................Passed
Add License Headers......................................................Passed
Validate GitHub Workflows................................................Passed
```

7.4 Build the documentation

You can build the Visualization Interface Tool documentation locally.

1. Prior to building the documentation, you must run this command to install documentation dependencies:

   ```
   pip install -e .[doc]
   ```

2. To then build the documentation, navigate to the `docs` directory and run this command:

   ```
   # On Linux or macOS
   make html

   # On Windows
   ./make.bat html
   ```

The documentation is built in the `docs/_build/html` directory.

You can clean the documentation build by running this command:

```
# On Linux or macOS
make clean

# On Windows
./make.bat clean
```

7.5 Post issues

Use the Visualization Interface Tool Issues page to report bugs and request new features. When possible, use the issue templates provided. If your issue does not fit into one of these templates, click the link for opening a blank issue.

If you have general questions about the PyAnsys ecosystem, email pyansys.core@ansys.com. If your question is specific to the Visualization Interface Tool, ask your question in an issue as described in the previous paragraph.

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