

DerivedStateModel

5.3

Generated by Doxygen 1.8.14

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Chapter 1

Module Index

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Chapter 2

Namespace Index

2.1 Namespace List

Here is a list of all namespaces with brief descriptions:

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Chapter 3

Hierarchical Index

3.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

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Chapter 4

Data Structure Index

4.1 Data Structures

Here are the data structures with brief descriptions:

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jeod::EulerDerivedState	The class used for deriving the Euler angle representation of a subject DynBody's attitude . . .	26
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jeod::LvlhRelativeDerivedState	The class used for calculating the LVLH state of a subject DynBody relative to some LVLH reference frame	35
jeod::NedDerivedState	The class used for deriving the North-East-Down representations of a subject DynBody's state	40
jeod::OrbElemDerivedState	The class used for deriving the orbital elements representation of a subject DynBody's position	45
jeod::PlanetaryDerivedState	The class used for deriving the planet-fixed representations of a subject DynBody's position . .	51
jeod::RelativeDerivedState	The class used for deriving the state of some frame associated with the subject DynBody relative to some other target frame	55
jeod::SolarBetaDerivedState	The class for calculating the solar beta of a vehicle	63

Chapter 5

File Index

5.1 File List

Here is a list of all files with brief descriptions:

class_declarations.hh	Forward declarations of classes defined in XXX_derived_state.hh files	69
derived_state.cc	Define methods for the base body initialization class	69
derived_state.hh	Define the class DerivedState, the base class used for deriving a state representation of some subject DynBody	70
derived_state_messages.cc	Implement the class DerivedStateMessages	70
derived_state_messages.hh	Define the class DerivedStateMessages, the class that specifies the message IDs used in the DerivedState model	71
euler_derived_state.cc	Define methods for the Euler attitude derived state class	72
euler_derived_state.hh	Define the class EulerDerivedState, the class used for deriving the Euler angle representation of a subject DynBody's attitude	72
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lvlh_relative_derived_state.cc	Define methods for the LVLH relative state class	74
lvlh_relative_derived_state.hh	Define the class LvlhRelativeDerivedState, the class used for calculating the LVLH state of a subject DynBody relative to some LVLH reference frame	74
ned_derived_state.cc	Define methods for NedDerivedState	75
ned_derived_state.hh	Define the class NedDerivedState, the class used for deriving the NED representations of a subject DynBody's state	75
orb_elem_derived_state.cc	Define methods for the orbital elements derived state class	76

orb_elem_derived_state.hh	Define the class OrbElemDerivedState, the class used for deriving the orbital elements representation of a subject DynBody's position	76
planetary_derived_state.cc	Define methods for the base body initialization class	77
planetary_derived_state.hh	Define the class PlanetaryDerivedState, the class used for deriving the planet-fixed representations of a subject DynBody's position	77
relative_derived_state.cc	Define methods for the base body initialization class	78
relative_derived_state.hh	Define the class RelativeDerivedState, the class used for deriving the state of some frame associated with the subject DynBody relative to some other target frame	78
solar_beta_derived_state.cc	This function calculates the angle between a spacecraft's orbital plane and the vector from the relevant planet to the sun	79
solar_beta_derived_state.hh	A class for calculating the solar beta of a vehicle	80

Chapter 6

Module Documentation

6.1 Models

Modules

- [Dynamics](#)

6.1.1 Detailed Description

6.2 Dynamics

Modules

- [DerivedState](#)

6.2.1 Detailed Description

6.3 DerivedState

Files

- file [class_declarations.hh](#)
Forward declarations of classes defined in XXX_derived_state.hh files.
- file [derived_state.hh](#)
Define the class DerivedState, the base class used for deriving a state representation of some subject DynBody.
- file [derived_state_messages.hh](#)
Define the class DerivedStateMessages, the class that specifies the message IDs used in the DerivedState model.
- file [euler_derived_state.hh](#)
Define the class EulerDerivedState, the class used for deriving the Euler angle representation of a subject DynBody's attitude.
- file [lvlh_derived_state.hh](#)
Define the class LvlhDerivedState, the class used for deriving the rectilinear LVLH representations of a subject DynBody's state.
- file [lvlh_relative_derived_state.hh](#)
Define the class LvlhRelativeDerivedState, the class used for calculating the LVLH state of a subject DynBody relative to some LVLH reference frame.
- file [ned_derived_state.hh](#)
Define the class NedDerivedState, the class used for deriving the NED representations of a subject DynBody's state.
- file [orb_elem_derived_state.hh](#)
Define the class OrbElemDerivedState, the class used for deriving the orbital elements representation of a subject DynBody's position.
- file [planetary_derived_state.hh](#)
Define the class PlanetaryDerivedState, the class used for deriving the planet-fixed representations of a subject DynBody's position.
- file [relative_derived_state.hh](#)
Define the class RelativeDerivedState, the class used for deriving the state of some frame associated with the subject DynBody relative to some other target frame.
- file [solar_beta_derived_state.hh](#)
A class for calculating the solar beta of a vehicle.
- file [derived_state.cc](#)
Define methods for the base body initialization class.
- file [derived_state_messages.cc](#)
Implement the class DerivedStateMessages.
- file [euler_derived_state.cc](#)
Define methods for the Euler attitude derived state class.
- file [lvlh_derived_state.cc](#)
Define methods for the base body initialization class.
- file [lvlh_relative_derived_state.cc](#)
Define methods for the LVLH relative state class.
- file [ned_derived_state.cc](#)
Define methods for NedDerivedState.
- file [orb_elem_derived_state.cc](#)
Define methods for the orbital elements derived state class.
- file [planetary_derived_state.cc](#)
Define methods for the base body initialization class.
- file [relative_derived_state.cc](#)
Define methods for the base body initialization class.
- file [solar_beta_derived_state.cc](#)
This function calculates the angle between a spacecraft's orbital plane and the vector from the relevant planet to the sun.

Namespaces

- [jeod](#)

Namespace jeod.

6.3.1 Detailed Description

Chapter 7

Namespace Documentation

7.1 jeod Namespace Reference

Namespace jeod.

Data Structures

- class [DerivedState](#)
The base class used for deriving a state representation of some subject DynBody.
- class [DerivedStateMessages](#)
The class that specifies the message IDs used in the [DerivedState](#) model.
- class [EulerDerivedState](#)
The class used for deriving the Euler angle representation of a subject DynBody's attitude.
- class [LvlhDerivedState](#)
The class used for deriving the rectilinear LVLH representations of a subject DynBody's state.
- class [LvlhRelativeDerivedState](#)
The class used for calculating the LVLH state of a subject DynBody relative to some LVLH reference frame.
- class [NedDerivedState](#)
The class used for deriving the North-East-Down representations of a subject DynBody's state.
- class [OrbElemDerivedState](#)
The class used for deriving the orbital elements representation of a subject DynBody's position.
- class [PlanetaryDerivedState](#)
The class used for deriving the planet-fixed representations of a subject DynBody's position.
- class [RelativeDerivedState](#)
The class used for deriving the state of some frame associated with the subject DynBody relative to some other target frame.
- class [SolarBetaDerivedState](#)
The class for calculating the solar beta of a vehicle.

Variables

- static constexpr double [epsilon](#) = 0.0000001

7.1.1 Detailed Description

Namespace jeod.

7.1.2 Variable Documentation

7.1.2.1 epsilon

```
constexpr double jeod::epsilon = 0.0000001 [static]
```

Definition at line 53 of file solar_beta_derived_state.cc.

Referenced by jeod::SolarBetaDerivedState::update().

Chapter 8

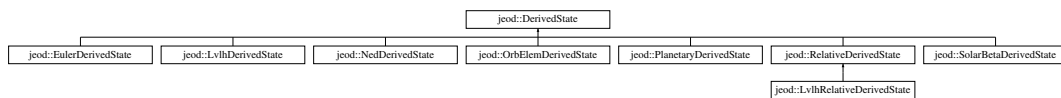
Data Structure Documentation

8.1 jeod::DerivedState Class Reference

The base class used for deriving a state representation of some subject DynBody.

```
#include <derived_state.hh>
```

Inheritance diagram for jeod::DerivedState:



Public Member Functions

- [DerivedState](#) ()=default
- virtual [~DerivedState](#) ()=default
- [DerivedState](#) (const [DerivedState](#) &)=delete
- [DerivedState](#) & [operator=](#) (const [DerivedState](#) &)=delete
- void [set_reference_name](#) (const std::string &new_name)
Set the reference_name to a copy of the supplied value.
- virtual void [initialize](#) (DynBody &subject_body, DynManager &dyn_manager)
Begin initialization of a [DerivedState](#).
- virtual void [update](#) ()
Update the state.

Data Fields

- DynBody * [subject](#) {}
The body that is the subject of the derived state.
- std::string [reference_name](#)
The name of the object with respect to which the subject state is assessed.

Protected Member Functions

- Planet * [find_planet](#) (const DynManager &dyn_manager, const std::string &planet_name, const std::string &variable_name)

Find the Planet with the given name, failing if not found.

Protected Attributes

- std::string [state_identifier](#)

An identifier for this derived state, constructed at initialization time from the class name, the subject body name, and the reference name.

Friends

- class [InputProcessor](#)
- void [init_attrjeod__DerivedState](#) ()

8.1.1 Detailed Description

The base class used for deriving a state representation of some subject DynBody.

Definition at line 85 of file `derived_state.hh`.

8.1.2 Constructor & Destructor Documentation

8.1.2.1 `DerivedState()` [1/2]

```
jeod::DerivedState::DerivedState ( ) [default]
```

8.1.2.2 `~DerivedState()`

```
virtual jeod::DerivedState::~~DerivedState ( ) [virtual], [default]
```

8.1.2.3 `DerivedState()` [2/2]

```
jeod::DerivedState::DerivedState (
    const DerivedState & ) [delete]
```

8.1.3 Member Function Documentation

8.1.3.1 find_planet()

```
Planet * jeod::DerivedState::find_planet (
    const DynManager & dyn_manager,
    const std::string & planet_name,
    const std::string & variable_name ) [protected]
```

Find the Planet with the given name, failing if not found.

Returns

Found Planet

Parameters

in	<i>dyn_manager</i>	Dynamics manager
in	<i>planet_name</i>	Planet name
in	<i>variable_name</i>	For error reporting

Definition at line 104 of file `derived_state.cc`.

References `jeod::DerivedStateMessages::invalid_name`, and `state_identifier`.

Referenced by `jeod::PlanetaryDerivedState::initialize()`, `jeod::OrbElemDerivedState::initialize()`, `jeod::NedDerivedState::initialize()`, and `jeod::SolarBetaDerivedState::initialize()`.

8.1.3.2 initialize()

```
void jeod::DerivedState::initialize (
    DynBody & subject_body,
    DynManager & dyn_manager ) [virtual]
```

Begin initialization of a [DerivedState](#).

The initialize method for all subclasses of [DerivedState](#) *must* pass the initialize call to their immediate parent class, which in turn must do the same, eventually invoking this method.

Assumptions and Limitations

- g++ is being used as the compiler

Parameters

in, out	<i>subject_body</i>	Subject body
in, out	<i>dyn_manager</i>	Dynamics manager

Reimplemented in [jeod::RelativeDerivedState](#), [jeod::SolarBetaDerivedState](#), [jeod::NedDerivedState](#), [jeod::OrbElemDerivedState](#), [jeod::EulerDerivedState](#), [jeod::PlanetaryDerivedState](#), [jeod::LvlhDerivedState](#), and [jeod::LvlhRelativeDerivedState](#).

Definition at line 71 of file `derived_state.cc`.

References `reference_name`, `state_identifier`, and `subject`.

Referenced by `jeod::LvlhDerivedState::initialize()`, `jeod::PlanetaryDerivedState::initialize()`, `jeod::EulerDerivedState::initialize()`, `jeod::OrbElemDerivedState::initialize()`, `jeod::NedDerivedState::initialize()`, `jeod::SolarBetaDerivedState::initialize()`, and `jeod::RelativeDerivedState::initialize()`.

8.1.3.3 operator=()

```
DerivedState& jeod::DerivedState::operator= (
    const DerivedState & ) [delete]
```

8.1.3.4 set_reference_name()

```
void jeod::DerivedState::set_reference_name (
    const std::string & new_name )
```

Set the `reference_name` to a copy of the supplied value.

Parameters

in	<i>new_name</i>	new name of reference.
----	-----------------	------------------------

Definition at line 55 of file `derived_state.cc`.

References `reference_name`.

8.1.3.5 update()

```
void jeod::DerivedState::update ( ) [virtual]
```

Update the state.

Reimplemented in [jeod::RelativeDerivedState](#), [jeod::SolarBetaDerivedState](#), [jeod::NedDerivedState](#), [jeod::OrbElemDerivedState](#), [jeod::EulerDerivedState](#), [jeod::PlanetaryDerivedState](#), [jeod::LvlhDerivedState](#), and [jeod::LvlhRelativeDerivedState](#).

Definition at line 87 of file `derived_state.cc`.

Referenced by `jeod::EulerDerivedState::update()`, and `jeod::OrbElemDerivedState::update()`.

8.1.4 Friends And Related Function Documentation

8.1.4.1 init_attrjeod__DerivedState

```
void init_attrjeod__DerivedState ( ) [friend]
```

8.1.4.2 InputProcessor

```
friend class InputProcessor [friend]
```

Definition at line 87 of file derived_state.hh.

8.1.5 Field Documentation

8.1.5.1 reference_name

```
std::string jeod::DerivedState::reference_name
```

The name of the object with respect to which the subject state is assessed.

trick_units(—)

Definition at line 99 of file derived_state.hh.

Referenced by initialize(), jeod::LvlhDerivedState::initialize(), jeod::PlanetaryDerivedState::initialize(), jeod::OrbElemDerivedState::initialize(), jeod::NedDerivedState::initialize(), jeod::SolarBetaDerivedState::initialize(), and set_reference_name().

8.1.5.2 state_identifier

```
std::string jeod::DerivedState::state_identifier [protected]
```

An identifier for this derived state, constructed at initialization time from the class name, the subject body name, and the reference name.

This is used for generating error and debug messages.trick_units(—)

Definition at line 107 of file derived_state.hh.

Referenced by find_planet(), initialize(), and jeod::RelativeDerivedState::initialize().

8.1.5.3 subject

```
DynBody* jeod::DerivedState::subject {}
```

The body that is the subject of the derived state.

```
trick_units(-)
```

Definition at line 93 of file `derived_state.hh`.

Referenced by `initialize()`, `jeod::LvIhDerivedState::initialize()`, `jeod::RelativeDerivedState::initialize()`, `jeod::PlanetaryDerivedState::update()`, `jeod::EulerDerivedState::update()`, `jeod::OrbElemDerivedState::update()`, `jeod::NedDerivedState::update()`, and `jeod::SolarBetaDerivedState::update()`.

The documentation for this class was generated from the following files:

- [derived_state.hh](#)
- [derived_state.cc](#)

8.2 jeod::DerivedStateMessages Class Reference

The class that specifies the message IDs used in the [DerivedState](#) model.

```
#include <derived_state_messages.hh>
```

Public Member Functions

- [DerivedStateMessages](#) ()=delete
- [DerivedStateMessages](#) (const [DerivedStateMessages](#) &)=delete
- [DerivedStateMessages](#) & operator= (const [DerivedStateMessages](#) &)=delete

Static Public Attributes

- static const char * [fatal_error](#) = "dynamics/derived_state/" "fatal_error"
Issued when performing an action results in an error return from the method performing the action.
- static const char * [illegal_value](#) = "dynamics/derived_state/" "illegal_value"
Issued when a simple type (e.g.
- static const char * [invalid_name](#) = "dynamics/derived_state/" "invalid_name"
Issued when a name is invalid (NULL, empty, or does not name an object of the specified type).
- static const char * [invalid_object](#) = "dynamics/derived_state/" "invalid_object"
Issued when a pointer points to an object of the wrong type.
- static const char * [null_pointer](#) = "dynamics/derived_state/" "null_pointer"
Error issued when a pointer is required but was not provided.
- static const char * [trace](#) = "dynamics/derived_state/" "trace"
Debug message issued to trace [DerivedState](#) actions.
- static const char * [divide_by_zero](#) = "dynamics/derived_state/" "divide_by_zero"
Fatal message when a divide by zero is encountered.

Friends

- class [InputProcessor](#)
- void [init_attrjeod__DerivedStateMessages](#) ()

8.2.1 Detailed Description

The class that specifies the message IDs used in the [DerivedState](#) model.

Definition at line 81 of file `derived_state_messages.hh`.

8.2.2 Constructor & Destructor Documentation

8.2.2.1 DerivedStateMessages() [1/2]

```
jeod::DerivedStateMessages::DerivedStateMessages ( ) [delete]
```

8.2.2.2 DerivedStateMessages() [2/2]

```
jeod::DerivedStateMessages::DerivedStateMessages (
    const DerivedStateMessages & ) [delete]
```

8.2.3 Member Function Documentation

8.2.3.1 operator=()

```
DerivedStateMessages& jeod::DerivedStateMessages::operator= (
    const DerivedStateMessages & ) [delete]
```

8.2.4 Friends And Related Function Documentation

8.2.4.1 init_attrjeod__DerivedStateMessages

```
void init_attrjeod__DerivedStateMessages ( ) [friend]
```

8.2.4.2 InputProcessor

```
friend class InputProcessor [friend]
```

Definition at line 83 of file derived_state_messages.hh.

8.2.5 Field Documentation

8.2.5.1 divide_by_zero

```
char const * jeod::DerivedStateMessages::divide_by_zero = "dynamics/derived_state/" "divide_by_zero" [static]
```

Fatal message when a divide by zero is encountered.

trick_units(—)

Definition at line 121 of file derived_state_messages.hh.

Referenced by jeod::SolarBetaDerivedState::update().

8.2.5.2 fatal_error

```
char const * jeod::DerivedStateMessages::fatal_error = "dynamics/derived_state/" "fatal_error" [static]
```

Issued when performing an action results in an error return from the method performing the action.

trick_units(—)

Definition at line 90 of file derived_state_messages.hh.

8.2.5.3 illegal_value

```
char const * jeod::DerivedStateMessages::illegal_value = "dynamics/derived_state/" "illegal_value" [static]
```

Issued when a simple type (e.g.

an enum) has an illegal value.trick_units(—)

Definition at line 95 of file derived_state_messages.hh.

Referenced by jeod::LvlhRelativeDerivedState::convert_circ_to_rect(), jeod::LvlhRelativeDerivedState::convert_rect_to_circ(), jeod::LvlhRelativeDerivedState::update(), and jeod::RelativeDerivedState::update().

8.2.5.4 invalid_name

```
char const * jeod::DerivedStateMessages::invalid_name = "dynamics/derived_state/" "invalid_↵  
name" [static]
```

Issued when a name is invalid (NULL, empty, or does not name an object of the specified type).

trick_units(—)

Definition at line 101 of file derived_state_messages.hh.

Referenced by jeod::DerivedState::find_planet(), and jeod::RelativeDerivedState::initialize().

8.2.5.5 invalid_object

```
char const * jeod::DerivedStateMessages::invalid_object = "dynamics/derived_state/" "invalid_↵  
object" [static]
```

Issued when a pointer points to an object of the wrong type.

trick_units(—)

Definition at line 106 of file derived_state_messages.hh.

8.2.5.6 null_pointer

```
char const * jeod::DerivedStateMessages::null_pointer = "dynamics/derived_state/" "null_↵  
pointer" [static]
```

Error issued when a pointer is required but was not provided.

trick_units(—)

Definition at line 111 of file derived_state_messages.hh.

8.2.5.7 trace

```
char const * jeod::DerivedStateMessages::trace = "dynamics/derived_state/" "trace" [static]
```

Debug message issued to trace [DerivedState](#) actions.

trick_units(—)

Definition at line 116 of file derived_state_messages.hh.

The documentation for this class was generated from the following files:

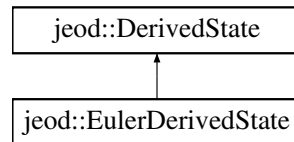
- [derived_state_messages.hh](#)
- [derived_state_messages.cc](#)

8.3 jeod::EulerDerivedState Class Reference

The class used for deriving the Euler angle representation of a subject DynBody's attitude.

```
#include <euler_derived_state.hh>
```

Inheritance diagram for jeod::EulerDerivedState:



Public Member Functions

- [EulerDerivedState](#) ()=default
- [~EulerDerivedState](#) () override
Destruct a [EulerDerivedState](#) object.
- [EulerDerivedState](#) (const [EulerDerivedState](#) &)=delete
- [EulerDerivedState & operator=](#) (const [EulerDerivedState](#) &)=delete
- void [initialize](#) (DynBody &subject_body, DynManager &dyn_manager) override
Begin initialization of a [EulerDerivedState](#).
- virtual void [initialize](#) (RefFrame &ref_frame, DynBody &subject_body, DynManager &dyn_manager)
Begin initialization of a [EulerDerivedState](#).
- void [update](#) () override
Compute the Euler angles.

Data Fields

- Orientation::EulerSequence [sequence](#) {Orientation::Roll_Pitch_Yaw}
Euler angle sequence specification.
- double [ref_body_angles](#) [3] {}
Euler angles from reference frame.
- double [body_ref_angles](#) [3] {}
Euler angles to reference frame.
- RefFrameState [rel_state](#)
The relative state of the body.

Protected Attributes

- RefFrame * [rel_frame](#) {}
Reference frame from which to compute the Euler angle attitude.

Friends

- class [InputProcessor](#)
- void [init_attrjeod__EulerDerivedState](#) ()

Additional Inherited Members

8.3.1 Detailed Description

The class used for deriving the Euler angle representation of a subject DynBody's attitude.

Definition at line 88 of file euler_derived_state.hh.

8.3.2 Constructor & Destructor Documentation

8.3.2.1 EulerDerivedState() [1/2]

```
jeod::EulerDerivedState::EulerDerivedState ( ) [default]
```

8.3.2.2 ~EulerDerivedState()

```
jeod::EulerDerivedState::~~EulerDerivedState ( ) [override]
```

Destruct a [EulerDerivedState](#) object.

Definition at line 46 of file euler_derived_state.cc.

References [rel_frame](#).

8.3.2.3 EulerDerivedState() [2/2]

```
jeod::EulerDerivedState::EulerDerivedState (
    const EulerDerivedState & ) [delete]
```

8.3.3 Member Function Documentation

8.3.3.1 initialize() [1/2]

```
void jeod::EulerDerivedState::initialize (
    DynBody & subject_body,
    DynManager & dyn_manager ) [override], [virtual]
```

Begin initialization of a [EulerDerivedState](#).

The initialize method for all subclasses of [DerivedState](#) *must* pass the initialize call to their immediate parent class, which in turn must do the same, eventually invoking this method.

Parameters

in, out	<i>subject_body</i>	Subject body.
in, out	<i>dyn_manager</i>	Dynamics manager.

Reimplemented from [jeod::DerivedState](#).

Definition at line 63 of file euler_derived_state.cc.

References [jeod::DerivedState::initialize\(\)](#).

8.3.3.2 initialize() [2/2]

```
void jeod::EulerDerivedState::initialize (
    RefFrame & ref_frame,
    DynBody & subject_body,
    DynManager & dyn_manager ) [virtual]
```

Begin initialization of a [EulerDerivedState](#).

The initialize method for all subclasses of [DerivedState](#) *must* pass the initialize call to their immediate parent class, which in turn must do the same, eventually invoking this method.

Parameters

in	<i>ref_frame</i>	Reference frame for angles.
in, out	<i>subject_body</i>	Subject body.
in, out	<i>dyn_manager</i>	Dynamics manager.

Definition at line 78 of file euler_derived_state.cc.

References [jeod::DerivedState::initialize\(\)](#), and [rel_frame](#).

8.3.3.3 operator=()

```
EulerDerivedState& jeod::EulerDerivedState::operator= (
    const EulerDerivedState & ) [delete]
```

8.3.3.4 update()

```
void jeod::EulerDerivedState::update ( ) [override], [virtual]
```

Compute the Euler angles.

Assumptions and Limitations

- Depends upon the Trick Euler angle math macros and routines.

Reimplemented from [jeod::DerivedState](#).

Definition at line 96 of file euler_derived_state.cc.

References [body_ref_angles](#), [ref_body_angles](#), [rel_frame](#), [rel_state](#), [sequence](#), [jeod::DerivedState::subject](#), and [jeod::DerivedState::update\(\)](#).

8.3.4 Friends And Related Function Documentation

8.3.4.1 init_attrjeod__EulerDerivedState

```
void init_attrjeod__EulerDerivedState ( ) [friend]
```

8.3.4.2 InputProcessor

```
friend class InputProcessor [friend]
```

Definition at line 90 of file euler_derived_state.hh.

8.3.5 Field Documentation

8.3.5.1 body_ref_angles

```
double jeod::EulerDerivedState::body_ref_angles[3] {}
```

Euler angles to reference frame.

trick_units(rad)

Definition at line 106 of file euler_derived_state.hh.

Referenced by [update\(\)](#).

8.3.5.2 ref_body_angles

```
double jeod::EulerDerivedState::ref_body_angles[3] {}
```

Euler angles from reference frame.

trick_units(rad)

Definition at line 101 of file euler_derived_state.hh.

Referenced by update().

8.3.5.3 rel_frame

```
RefFrame* jeod::EulerDerivedState::rel_frame {} [protected]
```

Reference frame from which to compute the Euler angle attitude.

If this is NULL then the body's parent frame is used.trick_units(-)

Definition at line 120 of file euler_derived_state.hh.

Referenced by initialize(), update(), and ~EulerDerivedState().

8.3.5.4 rel_state

```
RefFrameState jeod::EulerDerivedState::rel_state
```

The relative state of the body.

This is just a copy of the body's state when the relative frame is the parent frame. This is a computed relative state when the relative frame is not the parent frame.trick_units(-)

Definition at line 113 of file euler_derived_state.hh.

Referenced by update().

8.3.5.5 sequence

```
Orientation::EulerSequence jeod::EulerDerivedState::sequence {Orientation::Roll_Pitch_Yaw}
```

Euler angle sequence specification.

trick_units(-)

Definition at line 96 of file euler_derived_state.hh.

Referenced by update().

The documentation for this class was generated from the following files:

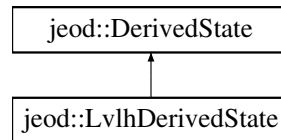
- [euler_derived_state.hh](#)
- [euler_derived_state.cc](#)

8.4 jeod::LvlhDerivedState Class Reference

The class used for deriving the rectilinear LVLH representations of a subject DynBody's state.

```
#include <lvlh_derived_state.hh>
```

Inheritance diagram for jeod::LvlhDerivedState:



Public Member Functions

- [LvlhDerivedState](#) ()=default
- [~LvlhDerivedState](#) () override
Destruct a [LvlhDerivedState](#) object.
- [LvlhDerivedState](#) (const [LvlhDerivedState](#) &)=delete
- [LvlhDerivedState](#) & operator= (const [LvlhDerivedState](#) &)=delete
- void [initialize](#) (DynBody &subject_body, DynManager &dyn_manager) override
Begin initialization of a [LvlhDerivedState](#).
- void [update](#) () override
Update the state.

Data Fields

- bool [register_frame](#) {true}
If set (default), the LVLH frame will be registered with the dynamics manager at initialization time.
- RefFrame [lvlh_frame](#)
The LVLH frame of the subject body with respect to the planet specified by the reference name.
- LvlhFrame [lvlh_state](#)
The LvlhFrame object responsible for maintaining the lvlh_frame.

Protected Attributes

- RefFrame * [planet_centered_inertial](#) {}
The inertial frame with origin at the center of the specified planet.
- DynManager * [local_dm](#) {}

Friends

- class [InputProcessor](#)
- void [init_attrjeod__LvlhDerivedState](#) ()

Additional Inherited Members

8.4.1 Detailed Description

The class used for deriving the rectilinear LVLH representations of a subject DynBody's state.

Definition at line 84 of file `lvlh_derived_state.hh`.

8.4.2 Constructor & Destructor Documentation

8.4.2.1 LvlhDerivedState() [1/2]

```
jeod::LvlhDerivedState::LvlhDerivedState ( ) [default]
```

8.4.2.2 ~LvlhDerivedState()

```
jeod::LvlhDerivedState::~~LvlhDerivedState ( ) [override]
```

Destruct a [LvlhDerivedState](#) object.

Definition at line 50 of file `lvlh_derived_state.cc`.

References `local_dm`, and `lvlh_frame`.

8.4.2.3 LvlhDerivedState() [2/2]

```
jeod::LvlhDerivedState::LvlhDerivedState (
    const LvlhDerivedState & ) [delete]
```

8.4.3 Member Function Documentation

8.4.3.1 initialize()

```
void jeod::LvlhDerivedState::initialize (
    DynBody & subject_body,
    DynManager & dyn_manager ) [override], [virtual]
```

Begin initialization of a [LvlhDerivedState](#).

The initialize method for all subclasses of [DerivedState](#) *must* pass the initialize call to their immediate parent class, which in turn must do the same, eventually invoking this method.

Parameters

in, out	<i>subject_body</i>	Subject body
in, out	<i>dyn_manager</i>	Dynamics manager

Reimplemented from [jeod::DerivedState](#).

Definition at line 70 of file `lvlh_derived_state.cc`.

References `jeod::DerivedState::initialize()`, `local_dm`, `lvlh_frame`, `lvlh_state`, `planet_centered_inertial`, `jeod::DerivedState::reference_name`, `register_frame`, and `jeod::DerivedState::subject`.

8.4.3.2 operator=()

```
LvlhDerivedState& jeod::LvlhDerivedState::operator= (
    const LvlhDerivedState & ) [delete]
```

8.4.3.3 update()

```
void jeod::LvlhDerivedState::update ( ) [override], [virtual]
```

Update the state.

Reimplemented from [jeod::DerivedState](#).

Definition at line 93 of file `lvlh_derived_state.cc`.

References `lvlh_frame`, and `lvlh_state`.

8.4.4 Friends And Related Function Documentation

8.4.4.1 init_attrjeod__LvlhDerivedState

```
void init_attrjeod__LvlhDerivedState ( ) [friend]
```

8.4.4.2 InputProcessor

```
friend class InputProcessor [friend]
```

Definition at line 86 of file `lvlh_derived_state.hh`.

8.4.5 Field Documentation

8.4.5.1 local_dm

```
DynManager* jeod::LvlhDerivedState::local_dm {} [protected]
```

Definition at line 113 of file lvlh_derived_state.hh.

Referenced by initialize(), and ~LvlhDerivedState().

8.4.5.2 lvlh_frame

```
RefFrame jeod::LvlhDerivedState::lvlh_frame
```

The LVLH frame of the subject body with respect to the planet specified by the reference name.

trick_units(-)

Definition at line 100 of file lvlh_derived_state.hh.

Referenced by initialize(), update(), and ~LvlhDerivedState().

8.4.5.3 lvlh_state

```
LvlhFrame jeod::LvlhDerivedState::lvlh_state
```

The LvlhFrame object responsible for maintaining the lvlh_frame.

trick_units(-)

Definition at line 105 of file lvlh_derived_state.hh.

Referenced by initialize(), and update().

8.4.5.4 planet_centered_inertial

```
RefFrame* jeod::LvlhDerivedState::planet_centered_inertial {} [protected]
```

The inertial frame with origin at the center of the specified planet.

trick_units(-)

Definition at line 111 of file lvlh_derived_state.hh.

Referenced by initialize().

8.4.5.5 register_frame

```
bool jeod::LvlhDerivedState::register_frame {true}
```

If set (default), the LVLH frame will be registered with the dynamics manager at initialization time.

This will make the frame accessible through the dynamic manager via its `find_ref_frame` method. `trick_units(-)`

Definition at line 94 of file `lvlh_derived_state.hh`.

Referenced by `initialize()`.

The documentation for this class was generated from the following files:

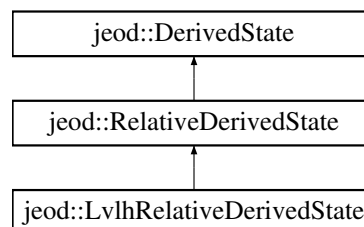
- [lvlh_derived_state.hh](#)
- [lvlh_derived_state.cc](#)

8.5 jeod::LvlhRelativeDerivedState Class Reference

The class used for calculating the LVLH state of a subject `DynBody` relative to some LVLH reference frame.

```
#include <lvlh_relative_derived_state.hh>
```

Inheritance diagram for `jeod::LvlhRelativeDerivedState`:



Public Member Functions

- [LvlhRelativeDerivedState](#) ()
Default Constructor.
- [~LvlhRelativeDerivedState](#) () override=default
- [LvlhRelativeDerivedState](#) (const [LvlhRelativeDerivedState](#) &)=delete
- [LvlhRelativeDerivedState](#) & operator= (const [LvlhRelativeDerivedState](#) &)=delete
- void [initialize](#) (DynBody &subject_body, DynManager &dyn_manager) override
Begin initialization of an [LvlhRelativeDerivedState](#).
- void [update](#) () override
Update the state.
- void [convert_rect_to_circ](#) (const RefFrameState &rect_rel_state)
Convert from rectilinear LVLH coordinates to circular curvilinear.
- void [convert_circ_to_rect](#) (const RefFrameState &circ_rel_state)
Convert from circular curvilinear LVLH coordinates to rectilinear.

Data Fields

- `LvlhType::Type` `lvlh_type` `{LvlhType::Rectilinear}`
Indicates type of LVLH coordinates desired.
- `bool` `use_theta_dot_correction` `{}`
Indicates whether or not to correct for changing phase angle in curvilinear coordinates.

Private Member Functions

- `void` `do_theta_dot_correction` (`double` `omega[3]`, `const` `RefFrameState` `&state`, `const` `double` `r`, `bool` `c2r`)
Compute thetadot correction to omega.

Friends

- `class` `InputProcessor`
- `void` `init_attrjeod__LvlhRelativeDerivedState` `()`

Additional Inherited Members

8.5.1 Detailed Description

The class used for calculating the LVLH state of a subject `DynBody` relative to some LVLH reference frame.

Definition at line 87 of file `lvlh_relative_derived_state.hh`.

8.5.2 Constructor & Destructor Documentation

8.5.2.1 `LvlhRelativeDerivedState()` [1/2]

```
jeod::LvlhRelativeDerivedState::LvlhRelativeDerivedState ( )
```

Default Constructor.

Definition at line 53 of file `lvlh_relative_derived_state.cc`.

References `jeod::RelativeDerivedState::ComputeSubjectStateinTarget`, and `jeod::RelativeDerivedState::direction`↔
`_sense`.

8.5.2.2 `~LvlhRelativeDerivedState()`

```
jeod::LvlhRelativeDerivedState::~~LvlhRelativeDerivedState ( ) [override], [default]
```


8.5.2.3 LvlhRelativeDerivedState() [2/2]

```
jeod::LvlhRelativeDerivedState::LvlhRelativeDerivedState (
    const LvlhRelativeDerivedState & ) [delete]
```

8.5.3 Member Function Documentation

8.5.3.1 convert_circ_to_rect()

```
void jeod::LvlhRelativeDerivedState::convert_circ_to_rect (
    const RefFrameState & curvi_rel_state )
```

Convert from circular curvilinear LVLH coordinates to rectilinear.

Parameters

in	<i>curvi_rel_state</i>	Source state
----	------------------------	--------------

Definition at line 190 of file lvlh_relative_derived_state.cc.

References [do_theta_dot_correction\(\)](#), [jeod::DerivedStateMessages::illegal_value](#), [jeod::RelativeDerivedState::name](#), [jeod::RelativeDerivedState::rel_state](#), and [jeod::RelativeDerivedState::target_frame](#).

8.5.3.2 convert_rect_to_circ()

```
void jeod::LvlhRelativeDerivedState::convert_rect_to_circ (
    const RefFrameState & rect_rel_state )
```

Convert from rectilinear LVLH coordinates to circular curvilinear.

Parameters

in	<i>rect_rel_state</i>	Source state
----	-----------------------	--------------

Definition at line 115 of file lvlh_relative_derived_state.cc.

References [do_theta_dot_correction\(\)](#), [jeod::DerivedStateMessages::illegal_value](#), [jeod::RelativeDerivedState::name](#), [jeod::RelativeDerivedState::rel_state](#), and [jeod::RelativeDerivedState::target_frame](#).

Referenced by [update\(\)](#).

8.5.3.3 do_theta_dot_correction()

```
void jeod::LvlhRelativeDerivedState::do_theta_dot_correction (
    double omega[3],
    const RefFrameState & state,
    const double r,
    bool c2r ) [private]
```

Compute thetadot correction to omega.

Definition at line 266 of file lvlh_relative_derived_state.cc.

References jeod::RelativeDerivedState::target_frame, and use_theta_dot_correction.

Referenced by convert_circ_to_rect(), and convert_rect_to_circ().

8.5.3.4 initialize()

```
void jeod::LvlhRelativeDerivedState::initialize (
    DynBody & subject_body,
    DynManager & dyn_manager ) [override], [virtual]
```

Begin initialization of an [LvlhRelativeDerivedState](#).

The initialize method for all subclasses of [DerivedState](#) *must* pass the initialize call to their immediate parent class.

Parameters

in, out	<i>subject_body</i>	Subject body
in, out	<i>dyn_manager</i>	Dynamics manager

Reimplemented from [jeod::DerivedState](#).

Definition at line 66 of file lvlh_relative_derived_state.cc.

References jeod::RelativeDerivedState::initialize().

8.5.3.5 operator=()

```
LvlhRelativeDerivedState& jeod::LvlhRelativeDerivedState::operator= (
    const LvlhRelativeDerivedState & ) [delete]
```

8.5.3.6 update()

```
void jeod::LvlhRelativeDerivedState::update ( ) [override], [virtual]
```

Update the state.

Reimplemented from [jeod::DerivedState](#).

Definition at line 75 of file lvlh_relative_derived_state.cc.

References [convert_rect_to_circ\(\)](#), [jeod::DerivedStateMessages::illegal_value](#), [lvlh_type](#), [jeod::RelativeDerivedState::rel_state](#), [jeod::RelativeDerivedState::subject_frame](#), and [jeod::RelativeDerivedState::target_frame](#).

8.5.4 Friends And Related Function Documentation

8.5.4.1 init_attrjeod__LvlhRelativeDerivedState

```
void init_attrjeod__LvlhRelativeDerivedState ( ) [friend]
```

8.5.4.2 InputProcessor

```
friend class InputProcessor [friend]
```

Definition at line 89 of file lvlh_relative_derived_state.hh.

8.5.5 Field Documentation

8.5.5.1 lvlh_type

```
LvlhType::Type jeod::LvlhRelativeDerivedState::lvlh_type {LvlhType::Rectilinear}
```

Indicates type of LVLH coordinates desired.

Default is `rectilinear.trick_units(-)`

Definition at line 95 of file lvlh_relative_derived_state.hh.

Referenced by [update\(\)](#).

8.5.5.2 use_theta_dot_correction

```
bool jeod::LvlhRelativeDerivedState::use_theta_dot_correction {}
```

Indicates whether or not to correct for changing phase angle in curvilinear coordinates.

Default is false. `trick_units(-)`

Definition at line 101 of file `lvlh_relative_derived_state.hh`.

Referenced by `do_theta_dot_correction()`.

The documentation for this class was generated from the following files:

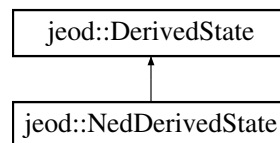
- [lvlh_relative_derived_state.hh](#)
- [lvlh_relative_derived_state.cc](#)

8.6 jeod::NedDerivedState Class Reference

The class used for deriving the North-East-Down representations of a subject `DynBody`'s state.

```
#include <ned_derived_state.hh>
```

Inheritance diagram for `jeod::NedDerivedState`:



Public Member Functions

- [NedDerivedState](#) ()=default
- [~NedDerivedState](#) () override
NedDerivedState destructor.
- [NedDerivedState](#) (const [NedDerivedState](#) &)=delete
- [NedDerivedState](#) & [operator=](#) (const [NedDerivedState](#) &)=delete
- void [set_use_alt_pfix](#) (const bool use_alt_pfix_in)
Setter for use_alt_pfix.
- void [initialize](#) (`DynBody` &subject_body, `DynManager` &dyn_manager) override
Begin initialization of a [LvlhDerivedState](#).
- void [update](#) () override
Update the state.

Data Fields

- bool [register_frame](#) {true}
If set (default), the NED frame will be registered with the dynamics manager at initialization time.
- NorthEastDown [ned_state](#)
The NorthEastDown frame plus spherical/elliptical selector.
- Planet * [planet](#) {}
The planet, the name of which is specified by the inherited `reference_name` data member.

Protected Member Functions

- void [compute_ned_frame](#) (const RefFrameTrans &rel_trans)
Update the state.

Protected Attributes

- bool [use_alt_pfix](#) {}
Use pfix or alt_pfix flag.
- EphemerisRefFrame * [pfix_ptr](#) {}
Pointer to planet fixed frame to be used, either pfix or alt_pfix.
- RefFrameState [pfix_rel_state](#)
Vehicle state relative to the planet-center, planet-fixed frame.

Private Attributes

- DynManager * [local_dm](#) {}

Friends

- class [InputProcessor](#)
- void [init_attrjeod__NedDerivedState](#) ()

8.6.1 Detailed Description

The class used for deriving the North-East-Down representations of a subject DynBody's state.

Definition at line 87 of file ned_derived_state.hh.

8.6.2 Constructor & Destructor Documentation

8.6.2.1 NedDerivedState() [1/2]

```
jeod::NedDerivedState::NedDerivedState ( ) [default]
```

8.6.2.2 ~NedDerivedState()

```
jeod::NedDerivedState::~~NedDerivedState ( ) [override]
```

[NedDerivedState](#) destructor.

Definition at line 51 of file ned_derived_state.cc.

References [local_dm](#), [ned_state](#), and [pfix_ptr](#).

8.6.2.3 NedDerivedState() [2/2]

```
jeod::NedDerivedState::NedDerivedState (
    const NedDerivedState & ) [delete]
```

8.6.3 Member Function Documentation

8.6.3.1 compute_ned_frame()

```
void jeod::NedDerivedState::compute_ned_frame (
    const RefFrameTrans & rel_trans ) [protected]
```

Update the state.

Parameters

in	<i>rel_trans</i>	Planet relative state
----	------------------	-----------------------

Definition at line 139 of file ned_derived_state.cc.

References [ned_state](#).

Referenced by [update\(\)](#).

8.6.3.2 initialize()

```
void jeod::NedDerivedState::initialize (
    DynBody & subject_body,
    DynManager & dyn_manager ) [override], [virtual]
```

Begin initialization of a [LvlhDerivedState](#).

The initialize method for all subclasses of [DerivedState](#) *must* pass the initialize call to their immediate parent class, which in turn must do the same, eventually invoking this method.

Parameters

in, out	<i>subject_body</i>	Subject body
in, out	<i>dyn_manager</i>	Dynamics manager

Reimplemented from [jeod::DerivedState](#).

Definition at line 84 of file ned_derived_state.cc.

References [jeod::DerivedState::find_planet\(\)](#), [jeod::DerivedState::initialize\(\)](#), [local_dm](#), [ned_state](#), [pfix_ptr](#), [planet](#), [jeod::DerivedState::reference_name](#), [register_frame](#), and [use_alt_pfix](#).

8.6.3.3 operator=()

```
NedDerivedState& jeod::NedDerivedState::operator= (
    const NedDerivedState & ) [delete]
```

8.6.3.4 set_use_alt_pfix()

```
void jeod::NedDerivedState::set_use_alt_pfix (
    const bool use_alt_pfix_in )
```

Setter for use_alt_pfix.

Definition at line 71 of file ned_derived_state.cc.

References use_alt_pfix.

8.6.3.5 update()

```
void jeod::NedDerivedState::update ( ) [override], [virtual]
```

Update the state.

Reimplemented from [jeod::DerivedState](#).

Definition at line 125 of file ned_derived_state.cc.

References compute_ned_frame(), ned_state, pfix_ptr, pfix_rel_state, and jeod::DerivedState::subject.

8.6.4 Friends And Related Function Documentation

8.6.4.1 init_attrjeod__NedDerivedState

```
void init_attrjeod__NedDerivedState ( ) [friend]
```

8.6.4.2 InputProcessor

```
friend class InputProcessor [friend]
```

Definition at line 89 of file ned_derived_state.hh.

8.6.5 Field Documentation

8.6.5.1 local_dm

```
DynManager* jeod::NedDerivedState::local_dm {} [private]
```

Definition at line 128 of file ned_derived_state.hh.

Referenced by initialize(), and ~NedDerivedState().

8.6.5.2 ned_state

```
NorthEastDown jeod::NedDerivedState::ned_state
```

The NorthEastDown frame plus spherical/elliptical selector.

trick_units(-)

Definition at line 102 of file ned_derived_state.hh.

Referenced by compute_ned_frame(), initialize(), update(), and ~NedDerivedState().

8.6.5.3 pfix_ptr

```
EphemerisRefFrame* jeod::NedDerivedState::pfix_ptr {} [protected]
```

Pointer to planet fixed frame to be used, either pfix or alt_pfix.

Definition at line 120 of file ned_derived_state.hh.

Referenced by initialize(), update(), and ~NedDerivedState().

8.6.5.4 pfix_rel_state

```
RefFrameState jeod::NedDerivedState::pfix_rel_state [protected]
```

Vehicle state relative to the planet-center, planet-fixed frame.

trick_units(-)

Definition at line 125 of file ned_derived_state.hh.

Referenced by update().

8.6.5.5 planet

```
Planet* jeod::NedDerivedState::planet {}
```

The planet, the name of which is specified by the inherited `reference_name` data member.

`trick_units(-)`

Definition at line 108 of file `ned_derived_state.hh`.

Referenced by `initialize()`.

8.6.5.6 register_frame

```
bool jeod::NedDerivedState::register_frame {true}
```

If set (default), the NED frame will be registered with the dynamics manager at initialization time.

This will make the frame accessible through the dynamic manager via its `find_ref_frame` method.`trick_units(-)`

Definition at line 97 of file `ned_derived_state.hh`.

Referenced by `initialize()`.

8.6.5.7 use_alt_pfix

```
bool jeod::NedDerivedState::use_alt_pfix {} [protected]
```

Use `pfix` or `alt_pfix` flag.

Definition at line 114 of file `ned_derived_state.hh`.

Referenced by `initialize()`, and `set_use_alt_pfix()`.

The documentation for this class was generated from the following files:

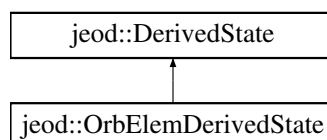
- [ned_derived_state.hh](#)
- [ned_derived_state.cc](#)

8.7 jeod::OrbElemDerivedState Class Reference

The class used for deriving the orbital elements representation of a subject `DynBody`'s position.

```
#include <orb_elem_derived_state.hh>
```

Inheritance diagram for `jeod::OrbElemDerivedState`:



Public Member Functions

- [OrbElemDerivedState](#) ()=default
- [~OrbElemDerivedState](#) () override
Destruct a [OrbElemDerivedState](#) object.
- [OrbElemDerivedState](#) (const [OrbElemDerivedState](#) &)=delete
- [OrbElemDerivedState](#) & operator= (const [OrbElemDerivedState](#) &)=delete
- void [set_use_alt_inertial](#) (const bool use_alt_inertial_in)
Setter for use_alt_inertial.
- void [initialize](#) (DynBody &subject_body, DynManager &dyn_manager) override
Begin initialization of a [OrbElemDerivedState](#).
- void [update](#) () override
Update the state.

Data Fields

- OrbitalElements [elements](#)
The orbital elements of the subject body with respect to the planet specified by the reference name.
- Planet * [planet](#) {}
The planet, the name of which is specified by the inherited reference_name data member.

Protected Member Functions

- void [compute_orbital_elements](#) (const RefFrameTrans &rel_trans)
Compute the orbital elements for the current state.

Protected Attributes

- bool [use_alt_inertial](#) {}
Use inertial or alt_inertial flag.
- EphemerisRefFrame * [inertial_ptr](#) {}
Pointer to planet inertial frame to be used, either inertial or alt_inertial.
- RefFrameState [rel_state](#)
Relative state; only used when the vehicle integration from is not the planet-centered inertial frame.

Friends

- class [InputProcessor](#)
- void [init_attrjeod__OrbElemDerivedState](#) ()

8.7.1 Detailed Description

The class used for deriving the orbital elements representation of a subject DynBody's position.

Definition at line 87 of file orb_elem_derived_state.hh.

8.7.2 Constructor & Destructor Documentation

8.7.2.1 OrbElemDerivedState() [1/2]

```
jeod::OrbElemDerivedState::OrbElemDerivedState ( ) [default]
```

8.7.2.2 ~OrbElemDerivedState()

```
jeod::OrbElemDerivedState::~~OrbElemDerivedState ( ) [override]
```

Destruct a [OrbElemDerivedState](#) object.

Definition at line 47 of file orb_elem_derived_state.cc.

References [inertial_ptr](#).

8.7.2.3 OrbElemDerivedState() [2/2]

```
jeod::OrbElemDerivedState::OrbElemDerivedState (
    const OrbElemDerivedState & ) [delete]
```

8.7.3 Member Function Documentation

8.7.3.1 compute_orbital_elements()

```
void jeod::OrbElemDerivedState::compute_orbital_elements (
    const RefFrameTrans & rel_trans ) [protected]
```

Compute the orbital elements for the current state.

Parameters

in	<i>rel_trans</i>	Planet relative state.
----	------------------	------------------------

Definition at line 123 of file orb_elem_derived_state.cc.

References [elements](#), and [planet](#).

Referenced by [update\(\)](#).

8.7.3.2 initialize()

```
void jeod::OrbElemDerivedState::initialize (
    DynBody & subject_body,
    DynManager & dyn_manager ) [override], [virtual]
```

Begin initialization of a [OrbElemDerivedState](#).

The initialize method for all subclasses of [DerivedState](#) *must* pass the initialize call to their immediate parent class, which in turn must do the same, eventually invoking this method.

Parameters

in, out	<i>subject_body</i>	Subject body
in, out	<i>dyn_manager</i>	Dynamics manager

Reimplemented from [jeod::DerivedState](#).

Definition at line 71 of file orb_elem_derived_state.cc.

References [elements](#), [jeod::DerivedState::find_planet\(\)](#), [inertial_ptr](#), [jeod::DerivedState::initialize\(\)](#), [planet](#), [jeod::DerivedState::reference_name](#), and [use_alt_inertial](#).

8.7.3.3 operator=()

```
OrbElemDerivedState& jeod::OrbElemDerivedState::operator= (
    const OrbElemDerivedState & ) [delete]
```

8.7.3.4 set_use_alt_inertial()

```
void jeod::OrbElemDerivedState::set_use_alt_inertial (
    const bool use_alt_inertial_in )
```

Setter for [use_alt_inertial](#).

Definition at line 58 of file orb_elem_derived_state.cc.

References [use_alt_inertial](#).

8.7.3.5 update()

```
void jeod::OrbElemDerivedState::update ( ) [override], [virtual]
```

Update the state.

Reimplemented from [jeod::DerivedState](#).

Definition at line 101 of file orb_elem_derived_state.cc.

References [compute_orbital_elements\(\)](#), [inertial_ptr](#), [rel_state](#), [jeod::DerivedState::subject](#), and [jeod::DerivedState::update\(\)](#).

8.7.4 Friends And Related Function Documentation

8.7.4.1 init_attrjeod__OrbElemDerivedState

```
void init_attrjeod__OrbElemDerivedState ( ) [friend]
```

8.7.4.2 InputProcessor

```
friend class InputProcessor [friend]
```

Definition at line 89 of file orb_elem_derived_state.hh.

8.7.5 Field Documentation

8.7.5.1 elements

```
OrbitalElements jeod::OrbElemDerivedState::elements
```

The orbital elements of the subject body with respect to the planet specified by the reference name.

[trick_units\(-\)](#)

Definition at line 96 of file orb_elem_derived_state.hh.

Referenced by [compute_orbital_elements\(\)](#), and [initialize\(\)](#).

8.7.5.2 inertial_ptr

```
EphemerisRefFrame* jeod::OrbElemDerivedState::inertial_ptr {} [protected]
```

Pointer to planet inertial frame to be used, either inertial or alt_inertial.

Definition at line 114 of file orb_elem_derived_state.hh.

Referenced by initialize(), update(), and ~OrbElemDerivedState().

8.7.5.3 planet

```
Planet* jeod::OrbElemDerivedState::planet {}
```

The planet, the name of which is specified by the inherited reference_name data member.

trick_units(-)

Definition at line 102 of file orb_elem_derived_state.hh.

Referenced by compute_orbital_elements(), and initialize().

8.7.5.4 rel_state

```
RefFrameState jeod::OrbElemDerivedState::rel_state [protected]
```

Relative state; only used when the vehicle integration from is not the planet-centered inertial frame.

trick_units(-)

Definition at line 120 of file orb_elem_derived_state.hh.

Referenced by update().

8.7.5.5 use_alt_inertial

```
bool jeod::OrbElemDerivedState::use_alt_inertial {} [protected]
```

Use inertial or alt_inertial flag.

Definition at line 108 of file orb_elem_derived_state.hh.

Referenced by initialize(), and set_use_alt_inertial().

The documentation for this class was generated from the following files:

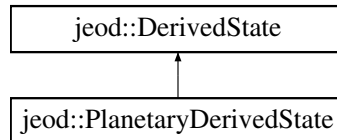
- [orb_elem_derived_state.hh](#)
- [orb_elem_derived_state.cc](#)

8.8 jeod::PlanetaryDerivedState Class Reference

The class used for deriving the planet-fixed representations of a subject DynBody's position.

```
#include <planetary_derived_state.hh>
```

Inheritance diagram for jeod::PlanetaryDerivedState:



Public Member Functions

- [PlanetaryDerivedState](#) ()=default
- [~PlanetaryDerivedState](#) () override
Destruct a [PlanetaryDerivedState](#) object.
- [PlanetaryDerivedState](#) (const [PlanetaryDerivedState](#) &)=delete
- [PlanetaryDerivedState](#) & operator= (const [PlanetaryDerivedState](#) &)=delete
- void [set_use_alt_pfix](#) (const bool use_alt_pfix_in)
Setter for use_alt_pfix.
- void [initialize](#) (DynBody &subject_body, DynManager &dyn_manager) override
Begin initialization of a [PlanetaryDerivedState](#).
- void [update](#) () override
Update the state.

Data Fields

- PlanetFixedPosition [state](#)
The planet-fixed state of the subject body's composite CoM.
- Planet * [planet](#) {}
The planet, the name of which is specified by the inherited reference_name data member.

Protected Attributes

- bool [use_alt_pfix](#) {}
Use pfix or alt_pfix flag.
- EphemerisRefFrame * [pfix_ptr](#) {}
Pointer to planet fixed frame to be used, either pfix or alt_pfix.

Friends

- class [InputProcessor](#)
- void [init_attrjeod__PlanetaryDerivedState](#) ()

Additional Inherited Members

8.8.1 Detailed Description

The class used for deriving the planet-fixed representations of a subject DynBody's position.

Definition at line 85 of file planetary_derived_state.hh.

8.8.2 Constructor & Destructor Documentation

8.8.2.1 PlanetaryDerivedState() [1/2]

```
jeod::PlanetaryDerivedState::PlanetaryDerivedState ( ) [default]
```

8.8.2.2 ~PlanetaryDerivedState()

```
jeod::PlanetaryDerivedState::~~PlanetaryDerivedState ( ) [override]
```

Destruct a [PlanetaryDerivedState](#) object.

Definition at line 46 of file planetary_derived_state.cc.

References [pfix_ptr](#).

8.8.2.3 PlanetaryDerivedState() [2/2]

```
jeod::PlanetaryDerivedState::PlanetaryDerivedState (
    const PlanetaryDerivedState & ) [delete]
```

8.8.3 Member Function Documentation

8.8.3.1 initialize()

```
void jeod::PlanetaryDerivedState::initialize (
    DynBody & subject_body,
    DynManager & dyn_manager ) [override], [virtual]
```

Begin initialization of a [PlanetaryDerivedState](#).

The initialize method for all subclasses of [DerivedState](#) *must* pass the initialize call to their immediate parent class, which in turn must do the same, eventually invoking this method.

Parameters

in, out	<i>subject_body</i>	Subject body
in, out	<i>dyn_manager</i>	Dynamics manager

Reimplemented from [jeod::DerivedState](#).

Definition at line 70 of file planetary_derived_state.cc.

References [jeod::DerivedState::find_planet\(\)](#), [jeod::DerivedState::initialize\(\)](#), [pfix_ptr](#), [planet](#), [jeod::DerivedState::reference_name](#), [state](#), and [use_alt_pfix](#).

8.8.3.2 operator=()

```
PlanetaryDerivedState& jeod::PlanetaryDerivedState::operator= (
    const PlanetaryDerivedState & ) [delete]
```

8.8.3.3 set_use_alt_pfix()

```
void jeod::PlanetaryDerivedState::set_use_alt_pfix (
    const bool use_alt_pfix_in )
```

Setter for [use_alt_pfix](#).

Definition at line 57 of file planetary_derived_state.cc.

References [use_alt_pfix](#).

8.8.3.4 update()

```
void jeod::PlanetaryDerivedState::update ( ) [override], [virtual]
```

Update the state.

Reimplemented from [jeod::DerivedState](#).

Definition at line 97 of file planetary_derived_state.cc.

References [pfix_ptr](#), [state](#), and [jeod::DerivedState::subject](#).

8.8.4 Friends And Related Function Documentation

8.8.4.1 `init_attrjeod__PlanetaryDerivedState`

```
void init_attrjeod__PlanetaryDerivedState ( ) [friend]
```

8.8.4.2 `InputProcessor`

```
friend class InputProcessor [friend]
```

Definition at line 87 of file `planetary_derived_state.hh`.

8.8.5 Field Documentation

8.8.5.1 `pfix_ptr`

```
EphemerisRefFrame* jeod::PlanetaryDerivedState::pfix_ptr {} [protected]
```

Pointer to planet fixed frame to be used, either `pfix` or `alt_pfix`.

Definition at line 111 of file `planetary_derived_state.hh`.

Referenced by `initialize()`, `update()`, and `~PlanetaryDerivedState()`.

8.8.5.2 `planet`

```
Planet* jeod::PlanetaryDerivedState::planet {}
```

The planet, the name of which is specified by the inherited `reference_name` data member.

`trick_units(-)`

Definition at line 99 of file `planetary_derived_state.hh`.

Referenced by `initialize()`.

8.8.5.3 `state`

```
PlanetFixedPosition jeod::PlanetaryDerivedState::state
```

The planet-fixed state of the subject body's composite CoM.

`trick_units(-)`

Definition at line 93 of file `planetary_derived_state.hh`.

Referenced by `initialize()`, and `update()`.

8.8.5.4 use_alt_prefix

```
bool jeod::PlanetaryDerivedState::use_alt_prefix {} [protected]
```

Use prefix or alt_prefix flag.

Definition at line 105 of file planetary_derived_state.hh.

Referenced by initialize(), and set_use_alt_prefix().

The documentation for this class was generated from the following files:

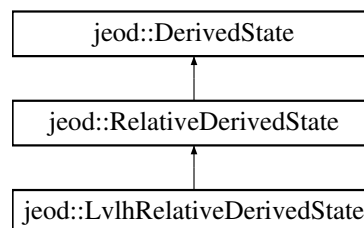
- [planetary_derived_state.hh](#)
- [planetary_derived_state.cc](#)

8.9 jeod::RelativeDerivedState Class Reference

The class used for deriving the state of some frame associated with the subject DynBody relative to some other target frame.

```
#include <relative_derived_state.hh>
```

Inheritance diagram for jeod::RelativeDerivedState:



Public Types

- enum [DirectionSense](#) { [undefined](#) = -1, [ComputeSubjectStateinTarget](#) = 0, [ComputeTargetStateinSubject](#) = 2 }

an enumeration to specify the direction and sense, and frame representation intended for output from the [RelativeDerivedState](#) calculations.

Public Member Functions

- [RelativeDerivedState](#) ()=default
- [~RelativeDerivedState](#) () override
 - Destruct a [RelativeDerivedState](#) object.*
- [RelativeDerivedState](#) (const [RelativeDerivedState](#) &)=delete
- [RelativeDerivedState](#) & operator= (const [RelativeDerivedState](#) &)=delete
- void [set_name](#) (std::string name_in)
 - Setter for the name.*
- void [set_target_frame](#) (RefFrame &tf)
 - Quick shortcut allowing use of conversion routines without requiring initialization.*
- void [set_subject_frame](#) (BodyRefFrame &sf)
 - Quick shortcut allowing use of conversion routines without requiring initialization.*
- void [initialize](#) (DynBody &subject_body, DynManager &dyn_manager) override
 - Begin initialization of a [RelativeDerivedState](#).*
- virtual void [initialize](#) (DynManager &dyn_manager)
 - Initialize a [RelativeDerivedState](#), without a DynBody.*
- void [update](#) () override
 - Update the state.*
- void [set_activation_flag](#) (bool raf)
 - Setter for the activation flag to on or off and If off, unsubscribes subject and target frames /param raf [RelativeDerivedState](#) activation flag for RelKin manager.*

Data Fields

- std::string [name](#) {""}
 - The name of this relative derived state.*
- std::string [subject_frame_name](#)
 - The name of the frame on the subject vehicle.*
- std::string [target_frame_name](#)
 - The name of the target reference frame.*
- [DirectionSense](#) [direction_sense](#) {undefined}
 - Indicates direction in which relative state is to be computed.*
- RefFrameState [rel_state](#)
 - Computed relative state.*
- bool [active](#) {true}
 - Bool flag used by the RelKin model to turn on/off which Relative Derived State needs to be managed.*

Protected Attributes

- BodyRefFrame * [subject_frame](#) {}
 - The reference frame corresponding to the user-input [subject_frame_name](#).*
- RefFrame * [target_frame](#) {}
 - The reference frame corresponding to the user-input [target_frame_name](#).*

Friends

- class [InputProcessor](#)
- void [init_attrjeod__RelativeDerivedState](#) ()

Additional Inherited Members

8.9.1 Detailed Description

The class used for deriving the state of some frame associated with the subject DynBody relative to some other target frame.

Definition at line 88 of file relative_derived_state.hh.

8.9.2 Member Enumeration Documentation

8.9.2.1 DirectionSense

```
enum jeod::RelativeDerivedState::DirectionSense
```

an enumeration to specify the direction and sense, and frame representation intended for output from the [RelativeDerivedState](#) calculations.

Enumerator

undefined	
ComputeSubjectStateinTarget	
ComputeTargetStateinSubject	

Definition at line 98 of file relative_derived_state.hh.

8.9.3 Constructor & Destructor Documentation

8.9.3.1 RelativeDerivedState() [1/2]

```
jeod::RelativeDerivedState::RelativeDerivedState ( ) [default]
```

8.9.3.2 ~RelativeDerivedState()

```
jeod::RelativeDerivedState::~~RelativeDerivedState ( ) [override]
```

Destruct a [RelativeDerivedState](#) object.

Definition at line 50 of file relative_derived_state.cc.

References [subject_frame](#), and [target_frame](#).

8.9.3.3 RelativeDerivedState() [2/2]

```
jeod::RelativeDerivedState::RelativeDerivedState (
    const RelativeDerivedState & ) [delete]
```

8.9.4 Member Function Documentation

8.9.4.1 initialize() [1/2]

```
void jeod::RelativeDerivedState::initialize (
    DynBody & subject_body,
    DynManager & dyn_manager ) [override], [virtual]
```

Begin initialization of a [RelativeDerivedState](#).

The initialize method for all subclasses of [DerivedState](#) *must* pass the initialize call to their immediate parent class, which in turn must do the same, eventually invoking this method.

Parameters

in, out	<i>subject_body</i>	Subject body
in, out	<i>dyn_manager</i>	Dynamics manager

Reimplemented from [jeod::DerivedState](#).

Definition at line 71 of file `relative_derived_state.cc`.

References `jeod::DerivedState::initialize()`.

Referenced by `jeod::LvlhRelativeDerivedState::initialize()`.

8.9.4.2 initialize() [2/2]

```
void jeod::RelativeDerivedState::initialize (
    DynManager & dyn_manager ) [virtual]
```

Initialize a [RelativeDerivedState](#), without a `DynBody`.

No pass up the initialization chain is possible for this method, since it is not inherited.

Parameters

in, out	<i>dyn_manager</i>	Dynamics manager
---------	--------------------	------------------

Definition at line 86 of file `relative_derived_state.cc`.

References `jeod::DerivedStateMessages::invalid_name`, `jeod::DerivedState::state_identifier`, `jeod::DerivedState::subject`, `subject_frame`, `subject_frame_name`, `target_frame`, and `target_frame_name`.

8.9.4.3 operator=()

```
RelativeDerivedState& jeod::RelativeDerivedState::operator= (
    const RelativeDerivedState & ) [delete]
```

8.9.4.4 set_activation_flag()

```
void jeod::RelativeDerivedState::set_activation_flag (
    bool raf )
```

Setter for the activation flag to on or off and If off, unsubscribes subject and target frames /param raf `RelativeDerivedState` activation flag for RelKin manager.

Definition at line 201 of file `relative_derived_state.cc`.

References `active`, `subject_frame`, and `target_frame`.

8.9.4.5 set_name()

```
void jeod::RelativeDerivedState::set_name (
    std::string name_in ) [inline]
```

Setter for the name.

Definition at line 172 of file `relative_derived_state.hh`.

8.9.4.6 set_subject_frame()

```
void jeod::RelativeDerivedState::set_subject_frame (
    BodyRefFrame & sf ) [inline]
```

Quick shortcut allowing use of conversion routines without requiring initialization.

Parameters

<code>sf</code>	New subject frame.
-----------------	--------------------

Definition at line 192 of file `relative_derived_state.hh`.

8.9.4.7 set_target_frame()

```
void jeod::RelativeDerivedState::set_target_frame (
    RefFrame & tf ) [inline]
```

Quick shortcut allowing use of conversion routines without requiring initialization.

Parameters

<i>tf</i>	New target frame.
-----------	-------------------

Definition at line 182 of file relative_derived_state.hh.

8.9.4.8 update()

```
void jeod::RelativeDerivedState::update ( ) [override], [virtual]
```

Update the state.

Reimplemented from [jeod::DerivedState](#).

Definition at line 174 of file relative_derived_state.cc.

References [ComputeSubjectStateinTarget](#), [ComputeTargetStateinSubject](#), [direction_sense](#), [jeod::DerivedState](#), [Messages::illegal_value](#), [rel_state](#), [subject_frame](#), and [target_frame](#).

8.9.5 Friends And Related Function Documentation

8.9.5.1 init_attrjeod__RelativeDerivedState

```
void init_attrjeod__RelativeDerivedState ( ) [friend]
```

8.9.5.2 InputProcessor

```
friend class InputProcessor [friend]
```

Definition at line 90 of file relative_derived_state.hh.

8.9.6 Field Documentation

8.9.6.1 active

```
bool jeod::RelativeDerivedState::active {true}
```

Bool flag used by the RelKin model to turn on/off which Relative Derived State needs to be managed.

trick_units(-)

Definition at line 147 of file relative_derived_state.hh.

Referenced by set_activation_flag().

8.9.6.2 direction_sense

```
DirectionSense jeod::RelativeDerivedState::direction_sense {undefined}
```

Indicates direction in which relative state is to be computed.

trick_units(-)

Definition at line 136 of file relative_derived_state.hh.

Referenced by jeod::LvlhRelativeDerivedState::LvlhRelativeDerivedState(), and update().

8.9.6.3 name

```
std::string jeod::RelativeDerivedState::name {""}
```

The name of this relative derived state.

trick_units(-)

Definition at line 116 of file relative_derived_state.hh.

Referenced by jeod::LvlhRelativeDerivedState::convert_circ_to_rect(), and jeod::LvlhRelativeDerivedState::convert_rect_to_circ().

8.9.6.4 rel_state

```
RefFrameState jeod::RelativeDerivedState::rel_state
```

Computed relative state.

trick_units(-)

Definition at line 141 of file relative_derived_state.hh.

Referenced by `jeod::LvlhRelativeDerivedState::convert_circ_to_rect()`, `jeod::LvlhRelativeDerivedState::convert_rect_to_circ()`, `jeod::LvlhRelativeDerivedState::update()`, and `update()`.

8.9.6.5 subject_frame

```
BodyRefFrame* jeod::RelativeDerivedState::subject_frame {} [protected]
```

The reference frame corresponding to the user-input `subject_frame_name`.

trick_units(-)

Definition at line 153 of file relative_derived_state.hh.

Referenced by `initialize()`, `set_activation_flag()`, `jeod::LvlhRelativeDerivedState::update()`, `update()`, and `~RelativeDerivedState()`.

8.9.6.6 subject_frame_name

```
std::string jeod::RelativeDerivedState::subject_frame_name
```

The name of the frame on the subject vehicle.

This can specify one of the vehicle's three primary reference frames (core body, composite body, or structure) or one of the vehicle's vehicle point frames. The vehicle name can be included in or omitted from the subject frame name. A vehicle name prefix is assumed if it is omitted.

Definition at line 126 of file relative_derived_state.hh.

Referenced by `initialize()`.

8.9.6.7 target_frame

```
RefFrame* jeod::RelativeDerivedState::target_frame {} [protected]
```

The reference frame corresponding to the user-input target_frame_name.

trick_units(-)

Definition at line 158 of file relative_derived_state.hh.

Referenced by jeod::LvlhRelativeDerivedState::convert_circ_to_rect(), jeod::LvlhRelativeDerivedState::convert_rect_to_circ(), jeod::LvlhRelativeDerivedState::do_theta_dot_correction(), initialize(), set_activation_flag(), jeod::LvlhRelativeDerivedState::update(), update(), and ~RelativeDerivedState().

8.9.6.8 target_frame_name

```
std::string jeod::RelativeDerivedState::target_frame_name
```

The name of the target reference frame.

trick_units(-)

Definition at line 131 of file relative_derived_state.hh.

Referenced by initialize().

The documentation for this class was generated from the following files:

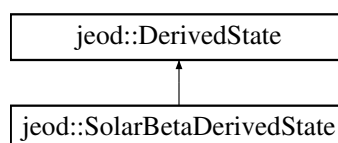
- [relative_derived_state.hh](#)
- [relative_derived_state.cc](#)

8.10 jeod::SolarBetaDerivedState Class Reference

The class for calculating the solar beta of a vehicle.

```
#include <solar_beta_derived_state.hh>
```

Inheritance diagram for jeod::SolarBetaDerivedState:



Public Member Functions

- [SolarBetaDerivedState](#) ()=default
- [~SolarBetaDerivedState](#) () override
Destruct a [SolarBetaDerivedState](#).
- [SolarBetaDerivedState](#) (const [SolarBetaDerivedState](#) &)=delete
- [SolarBetaDerivedState](#) & operator= (const [SolarBetaDerivedState](#) &)=delete
- void [initialize](#) (DynBody &subject_body, DynManager &dyn_manager) override
Begin initialization of a [SolarBetaDerivedState](#).
- void [update](#) () override
Update the state.

Data Fields

- Planet * [planet](#) {}
The planet, the name of which is specified by the inherited reference_name data member.
- Planet * [sun](#) {}
The sun, found by looking for the planetary object named "Sun".
- double [solar_beta](#) {}
The angle between the orbital plane and the sun position vector.
- bool [active](#) {true}
Indicates whether the model is "active".

Protected Attributes

- RefFrameState [veh_wrt_planet](#)
The state of the vehicle with respect to the planet.
- double [sun_wrt_planet](#) [3] {}
The position of the sun with respect to the planet.

Friends

- class [InputProcessor](#)
- void [init_attrjeod__SolarBetaDerivedState](#) ()

Additional Inherited Members

8.10.1 Detailed Description

The class for calculating the solar beta of a vehicle.

Assumptions and Limitations

- The vehicle must be in orbit about the named planet

Definition at line 83 of file [solar_beta_derived_state.hh](#).

8.10.2 Constructor & Destructor Documentation

8.10.2.1 SolarBetaDerivedState() [1/2]

```
jeod::SolarBetaDerivedState::SolarBetaDerivedState ( ) [default]
```

8.10.2.2 ~SolarBetaDerivedState()

```
jeod::SolarBetaDerivedState::~~SolarBetaDerivedState ( ) [override]
```

Destruct a [SolarBetaDerivedState](#).

Definition at line 146 of file `solar_beta_derived_state.cc`.

References `planet`, and `sun`.

8.10.2.3 SolarBetaDerivedState() [2/2]

```
jeod::SolarBetaDerivedState::SolarBetaDerivedState (
    const SolarBetaDerivedState & ) [delete]
```

8.10.3 Member Function Documentation

8.10.3.1 initialize()

```
void jeod::SolarBetaDerivedState::initialize (
    DynBody & subject_body,
    DynManager & dyn_manager ) [override], [virtual]
```

Begin initialization of a [SolarBetaDerivedState](#).

The initialize method for all subclasses of [DerivedState](#) *must* pass the initialize call to their immediate parent class, which in turn must do the same, eventually invoking this method.

Parameters

<code>in, out</code>	<code><i>subject_body</i></code>	Subject body
<code>in, out</code>	<code><i>dyn_manager</i></code>	Dynamics manager

Reimplemented from [jeod::DerivedState](#).

Definition at line 63 of file solar_beta_derived_state.cc.

References [active](#), [jeod::DerivedState::find_planet\(\)](#), [jeod::DerivedState::initialize\(\)](#), [planet](#), [jeod::DerivedState::reference_name](#), and [sun](#).

8.10.3.2 operator=()

```
SolarBetaDerivedState& jeod::SolarBetaDerivedState::operator= (
    const SolarBetaDerivedState & ) [delete]
```

8.10.3.3 update()

```
void jeod::SolarBetaDerivedState::update ( ) [override], [virtual]
```

Update the state.

Reimplemented from [jeod::DerivedState](#).

Definition at line 88 of file solar_beta_derived_state.cc.

References [active](#), [jeod::DerivedStateMessages::divide_by_zero](#), [jeod::epsilon](#), [planet](#), [solar_beta](#), [jeod::DerivedState::subject](#), [sun](#), [sun_wrt_planet](#), and [veh_wrt_planet](#).

8.10.4 Friends And Related Function Documentation

8.10.4.1 init_attrjeod__SolarBetaDerivedState

```
void init_attrjeod__SolarBetaDerivedState ( ) [friend]
```

8.10.4.2 InputProcessor

```
friend class InputProcessor [friend]
```

Definition at line 85 of file solar_beta_derived_state.hh.

8.10.5 Field Documentation

8.10.5.1 active

```
bool jeod::SolarBetaDerivedState::active {true}
```

Indicates whether the model is "active".

This flag defaults to true. This default value results in

- Initialization-time subscriptions issued against the planet-centered and sun-centered inertial frames to ensure that the planet and the Sun are a part of the active reference frame tree, and
- Run-time calculations of the solar beta angle, updated by calls to [SolarBetaDerivedState::update](#).

Setting the active flag to false prior to the call to [SolarBetaDerivedState::initialize](#) permanently disables the model. Setting the active flag to true after having set it to false prior to the call to initialize initially will have no effect; the model is permanently disabled.

If the value of the flag is true at the time of the call to [SolarBetaDerivedState::initialize](#), subsequently setting the flag to false will temporarily disable the model (cause [SolarBetaDerivedState::update](#) to immediately return). Updates will once again be performed when the flag is set to true.[trick_units\(-\)](#)

Definition at line 132 of file `solar_beta_derived_state.hh`.

Referenced by `initialize()`, and `update()`.

8.10.5.2 planet

```
Planet* jeod::SolarBetaDerivedState::planet {}
```

The planet, the name of which is specified by the inherited `reference_name` data member.

[trick_units\(-\)](#)

Definition at line 95 of file `solar_beta_derived_state.hh`.

Referenced by `initialize()`, `update()`, and `~SolarBetaDerivedState()`.

8.10.5.3 solar_beta

```
double jeod::SolarBetaDerivedState::solar_beta {}
```

The angle between the orbital plane and the sun position vector.

Positive solar beta will be on the side of the positive angular momentum vector.[trick_units\(rad\)](#)

Definition at line 107 of file `solar_beta_derived_state.hh`.

Referenced by `update()`.

8.10.5.4 sun

```
Planet* jeod::SolarBetaDerivedState::sun {}
```

The sun, found by looking for the planetary object named "Sun".

trick_units(-)

Definition at line 100 of file solar_beta_derived_state.hh.

Referenced by initialize(), update(), and ~SolarBetaDerivedState().

8.10.5.5 sun_wrt_planet

```
double jeod::SolarBetaDerivedState::sun_wrt_planet[3] {} [protected]
```

The position of the sun with respect to the planet.

trick_units(m)

Definition at line 165 of file solar_beta_derived_state.hh.

Referenced by update().

8.10.5.6 veh_wrt_planet

```
RefFrameState jeod::SolarBetaDerivedState::veh_wrt_planet [protected]
```

The state of the vehicle with respect to the planet.

trick_units(-)

Definition at line 160 of file solar_beta_derived_state.hh.

Referenced by update().

The documentation for this class was generated from the following files:

- [solar_beta_derived_state.hh](#)
- [solar_beta_derived_state.cc](#)

Chapter 9

File Documentation

9.1 `class_declarations.hh` File Reference

Forward declarations of classes defined in `XXX_derived_state.hh` files.

Namespaces

- [jeod](#)
Namespace jeod.

9.1.1 Detailed Description

Forward declarations of classes defined in `XXX_derived_state.hh` files.

9.2 `derived_state.cc` File Reference

Define methods for the base body initialization class.

```
#include <array>
#include <cstdlib>
#include <typeinfo>
#include "dynamics/dyn_body/include/dyn_body.hh"
#include "dynamics/dyn_manager/include/dyn_manager.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/message/include/message_handler.hh"
#include "utils/named_item/include/named_item.hh"
#include "../include/derived_state.hh"
#include "../include/derived_state_messages.hh"
```

Namespaces

- [jeod](#)
Namespace jeod.

9.2.1 Detailed Description

Define methods for the base body initialization class.

9.3 `derived_state.hh` File Reference

Define the class `DerivedState`, the base class used for deriving a state representation of some subject `DynBody`.

```
#include <string>
#include "dynamics/dyn_body/include/class_declarations.hh"
#include "dynamics/dyn_manager/include/class_declarations.hh"
#include "environment/planet/include/class_declarations.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "class_declarations.hh"
#include "dynamics/dyn_body/include/dyn_body.hh"
```

Data Structures

- class [jeod::DerivedState](#)

The base class used for deriving a state representation of some subject `DynBody`.

Namespaces

- [jeod](#)

Namespace `jeod`.

9.3.1 Detailed Description

Define the class `DerivedState`, the base class used for deriving a state representation of some subject `DynBody`.

9.4 `derived_state_messages.cc` File Reference

Implement the class `DerivedStateMessages`.

```
#include "utils/message/include/make_message_code.hh"
#include "../include/derived_state_messages.hh"
```

Namespaces

- [jeod](#)

Namespace `jeod`.

Macros

- `#define MAKE_DERIVEDSTATE_MESSAGE_CODE(id) JEOD_MAKE_MESSAGE_CODE(DerivedStateMessages, "dynamics/derived_state/", id)`

9.4.1 Detailed Description

Implement the class `DerivedStateMessages`.

9.4.2 Macro Definition Documentation

9.4.2.1 MAKE_DERIVEDSTATE_MESSAGE_CODE

```
#define MAKE_DERIVEDSTATE_MESSAGE_CODE(  
    id ) JEOD_MAKE_MESSAGE_CODE(DerivedStateMessages, "dynamics/derived_state/", id)
```

Definition at line 37 of file `derived_state_messages.cc`.

9.5 derived_state_messages.hh File Reference

Define the class `DerivedStateMessages`, the class that specifies the message IDs used in the `DerivedState` model.

```
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class `jeod::DerivedStateMessages`
The class that specifies the message IDs used in the `DerivedState` model.

Namespaces

- `jeod`
Namespace `jeod`.

9.5.1 Detailed Description

Define the class `DerivedStateMessages`, the class that specifies the message IDs used in the `DerivedState` model.

9.6 euler_derived_state.cc File Reference

Define methods for the Euler attitude derived state class.

```
#include <cstddef>
#include "dynamics/dyn_body/include/dyn_body.hh"
#include "utils/math/include/matrix3x3.hh"
#include "utils/orientation/include/orientation.hh"
#include "../include/euler_derived_state.hh"
```

Namespaces

- [jeod](#)
Namespace jeod.

9.6.1 Detailed Description

Define methods for the Euler attitude derived state class.

9.7 euler_derived_state.hh File Reference

Define the class EulerDerivedState, the class used for deriving the Euler angle representation of a subject Dyn↔Body's attitude.

```
#include "dynamics/dyn_body/include/class_declarations.hh"
#include "dynamics/dyn_manager/include/class_declarations.hh"
#include "utils/orientation/include/orientation.hh"
#include "utils/ref_frames/include/class_declarations.hh"
#include "utils/ref_frames/include/ref_frame_state.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "derived_state.hh"
```

Data Structures

- class [jeod::EulerDerivedState](#)
The class used for deriving the Euler angle representation of a subject DynBody's attitude.

Namespaces

- [jeod](#)
Namespace jeod.

9.7.1 Detailed Description

Define the class EulerDerivedState, the class used for deriving the Euler angle representation of a subject Dyn↔Body's attitude.

9.8 lvlh_derived_state.cc File Reference

Define methods for the base body initialization class.

```
#include <cstdint>
#include "dynamics/dyn_body/include/dyn_body.hh"
#include "dynamics/dyn_manager/include/dyn_manager.hh"
#include "environment/planet/include/planet.hh"
#include "utils/math/include/vector3.hh"
#include "../include/lvlh_derived_state.hh"
```

Namespaces

- [jeod](#)
Namespace jeod.

9.8.1 Detailed Description

Define methods for the base body initialization class.

9.9 lvlh_derived_state.hh File Reference

Define the class LvlhDerivedState, the class used for deriving the rectilinear LVLH representations of a subject DynBody's state.

```
#include "dynamics/dyn_body/include/class_declarations.hh"
#include "dynamics/dyn_manager/include/class_declarations.hh"
#include "utils/lvlh_frame/include/lvlh_frame.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "derived_state.hh"
```

Data Structures

- class [jeod::LvlhDerivedState](#)
The class used for deriving the rectilinear LVLH representations of a subject DynBody's state.

Namespaces

- [jeod](#)
Namespace jeod.

9.9.1 Detailed Description

Define the class LvlhDerivedState, the class used for deriving the rectilinear LVLH representations of a subject DynBody's state.

9.10 `lvlh_relative_derived_state.cc` File Reference

Define methods for the LVLH relative state class.

```
#include <cstdlib>
#include "dynamics/dyn_body/include/dyn_body.hh"
#include "dynamics/dyn_manager/include/dyn_manager.hh"
#include "utils/math/include/matrix3x3.hh"
#include "utils/math/include/vector3.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/derived_state_messages.hh"
#include "../include/lvlh_relative_derived_state.hh"
```

Namespaces

- [jeod](#)

Namespace jeod.

9.10.1 Detailed Description

Define methods for the LVLH relative state class.

9.11 `lvlh_relative_derived_state.hh` File Reference

Define the class `LvlhRelativeDerivedState`, the class used for calculating the LVLH state of a subject `DynBody` relative to some LVLH reference frame.

```
#include "dynamics/dyn_body/include/class_declarations.hh"
#include "dynamics/dyn_manager/include/class_declarations.hh"
#include "environment/planet/include/base_planet.hh"
#include "utils/lvlh_frame/include/lvlh_type.hh"
#include "utils/ref_frames/include/class_declarations.hh"
#include "utils/ref_frames/include/ref_frame_state.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "relative_derived_state.hh"
```

Data Structures

- class [jeod::LvlhRelativeDerivedState](#)

The class used for calculating the LVLH state of a subject `DynBody` relative to some LVLH reference frame.

Namespaces

- [jeod](#)

Namespace jeod.

9.11.1 Detailed Description

Define the class `LvlhRelativeDerivedState`, the class used for calculating the LVLH state of a subject `DynBody` relative to some LVLH reference frame.

9.12 ned_derived_state.cc File Reference

Define methods for `NedDerivedState`.

```
#include <cstdint>
#include "dynamics/dyn_body/include/dyn_body.hh"
#include "dynamics/dyn_manager/include/dyn_manager.hh"
#include "environment/planet/include/planet.hh"
#include "utils/planet_fixed/north_east_down/include/north_east_down.hh"
#include "utils/ref_frames/include/ref_frame_state.hh"
#include "../include/ned_derived_state.hh"
```

Namespaces

- [jeod](#)
Namespace `jeod`.

9.12.1 Detailed Description

Define methods for `NedDerivedState`.

9.13 ned_derived_state.hh File Reference

Define the class `NedDerivedState`, the class used for deriving the NED representations of a subject `DynBody`'s state.

```
#include "dynamics/dyn_body/include/class_declarations.hh"
#include "dynamics/dyn_manager/include/class_declarations.hh"
#include "environment/ephemerides/ephem_interface/include/ephem_ref_frame.↵
hh"
#include "utils/planet_fixed/north_east_down/include/north_east_down.hh"
#include "utils/ref_frames/include/class_declarations.hh"
#include "utils/ref_frames/include/ref_frame_state.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "derived_state.hh"
```

Data Structures

- class [jeod::NedDerivedState](#)
The class used for deriving the North-East-Down representations of a subject `DynBody`'s state.

Namespaces

- [jeod](#)

Namespace jeod.

9.13.1 Detailed Description

Define the class NedDerivedState, the class used for deriving the NED representations of a subject DynBody's state.

9.14 orb_elem_derived_state.cc File Reference

Define methods for the orbital elements derived state class.

```
#include <cstdlib>
#include "dynamics/dyn_body/include/dyn_body.hh"
#include "environment/planet/include/planet.hh"
#include "utils/orbital_elements/include/orbital_elements.hh"
#include "../include/orb_elem_derived_state.hh"
```

Namespaces

- [jeod](#)

Namespace jeod.

9.14.1 Detailed Description

Define methods for the orbital elements derived state class.

9.15 orb_elem_derived_state.hh File Reference

Define the class OrbElemDerivedState, the class used for deriving the orbital elements representation of a subject DynBody's position.

```
#include "dynamics/dyn_body/include/class_declarations.hh"
#include "dynamics/dyn_manager/include/class_declarations.hh"
#include "environment/ephemerides/ephem_interface/include/ephem_ref_frame.↵
hh"
#include "environment/planet/include/class_declarations.hh"
#include "utils/orbital_elements/include/orbital_elements.hh"
#include "utils/ref_frames/include/ref_frame_state.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "derived_state.hh"
#include "environment/planet/include/planet.hh"
```


Data Structures

- class [jeod::OrbElemDerivedState](#)

The class used for deriving the orbital elements representation of a subject DynBody's position.

Namespaces

- [jeod](#)

Namespace jeod.

9.15.1 Detailed Description

Define the class OrbElemDerivedState, the class used for deriving the orbital elements representation of a subject DynBody's position.

9.16 planetary_derived_state.cc File Reference

Define methods for the base body initialization class.

```
#include <cstdint>
#include "dynamics/dyn_body/include/dyn_body.hh"
#include "environment/planet/include/planet.hh"
#include "../include/planetary_derived_state.hh"
```

Namespaces

- [jeod](#)

Namespace jeod.

9.16.1 Detailed Description

Define methods for the base body initialization class.

9.17 planetary_derived_state.hh File Reference

Define the class PlanetaryDerivedState, the class used for deriving the planet-fixed representations of a subject DynBody's position.

```
#include "dynamics/dyn_body/include/class_declarations.hh"
#include "dynamics/dyn_manager/include/class_declarations.hh"
#include "environment/planet/include/class_declarations.hh"
#include "utils/planet_fixed/planet_fixed_posn/include/planet_fixed_posn.↵
hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "derived_state.hh"
```

Data Structures

- class [jeod::PlanetaryDerivedState](#)

The class used for deriving the planet-fixed representations of a subject DynBody's position.

Namespaces

- [jeod](#)

Namespace jeod.

9.17.1 Detailed Description

Define the class PlanetaryDerivedState, the class used for deriving the planet-fixed representations of a subject DynBody's position.

9.18 relative_derived_state.cc File Reference

Define methods for the base body initialization class.

```
#include <cstddef>
#include "dynamics/dyn_body/include/dyn_body.hh"
#include "dynamics/dyn_manager/include/dyn_manager.hh"
#include "utils/message/include/message_handler.hh"
#include "utils/ref_frames/include/ref_frame.hh"
#include "../include/derived_state_messages.hh"
#include "../include/relative_derived_state.hh"
```

Namespaces

- [jeod](#)

Namespace jeod.

9.18.1 Detailed Description

Define methods for the base body initialization class.

9.19 relative_derived_state.hh File Reference

Define the class RelativeDerivedState, the class used for deriving the state of some frame associated with the subject DynBody relative to some other target frame.

```
#include "derived_state.hh"
#include "dynamics/dyn_body/include/class_declarations.hh"
#include "dynamics/dyn_manager/include/class_declarations.hh"
#include "utils/ref_frames/include/class_declarations.hh"
#include "utils/ref_frames/include/ref_frame_state.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include <string>
#include <utility>
```

Data Structures

- class [jeod::RelativeDerivedState](#)

The class used for deriving the state of some frame associated with the subject DynBody relative to some other target frame.

Namespaces

- [jeod](#)

Namespace jeod.

9.19.1 Detailed Description

Define the class RelativeDerivedState, the class used for deriving the state of some frame associated with the subject DynBody relative to some other target frame.

9.20 solar_beta_derived_state.cc File Reference

This function calculates the angle between a spacecraft's orbital plane and the vector from the relevant planet to the sun.

```
#include <cstdlib>
#include "dynamics/dyn_body/include/dyn_body.hh"
#include "dynamics/dyn_manager/include/dyn_manager.hh"
#include "environment/planet/include/planet.hh"
#include "utils/math/include/vector3.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/message/include/message_handler.hh"
#include "utils/named_item/include/named_item.hh"
#include "../include/derived_state_messages.hh"
#include "../include/solar_beta_derived_state.hh"
```

Namespaces

- [jeod](#)

Namespace jeod.

Variables

- static constexpr double [jeod::epsilon](#) = 0.0000001

9.20.1 Detailed Description

This function calculates the angle between a spacecraft's orbital plane and the vector from the relevant planet to the sun.

9.21 solar_beta_derived_state.hh File Reference

A class for calculating the solar beta of a vehicle.

```
#include "dynamics/dyn_manager/include/class_declarations.hh"
#include "environment/planet/include/class_declarations.hh"
#include "utils/ref_frames/include/ref_frame_state.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "class_declarations.hh"
#include "derived_state.hh"
#include "environment/planet/include/planet.hh"
```

Data Structures

- class [jeod::SolarBetaDerivedState](#)
The class for calculating the solar beta of a vehicle.

Namespaces

- [jeod](#)
Namespace jeod.

9.21.1 Detailed Description

A class for calculating the solar beta of a vehicle.

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