

OrbitalElementsModel

5.1

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Chapter 1

Module Index

1.1 Modules

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Chapter 2

Namespace Index

2.1 Namespace List

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3.1 Data Structures

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Chapter 5

Module Documentation

5.1 Models

Modules

- [Utils](#)

5.1.1 Detailed Description

5.2 Utils

Modules

- [OrbitalElements](#)

5.2.1 Detailed Description

5.3 OrbitalElements

Files

- file [orbital_elements.hh](#)
Orbital elements class definition.
- file [orbital_elements_messages.hh](#)
Define the class OrbitalElementsMessages, the class that specifies the message IDs used in the orbital elements model.
- file [orbital_elements.cc](#)
Define methods for the OrbitalElements class.
- file [orbital_elements_messages.cc](#)
Implement the class OrbitalElementsMessages.

Namespaces

- [jeod](#)
Namespace jeod.

Macros

- `#define PATH "utils/orbital_elements/"`

5.3.1 Detailed Description

5.3.2 Macro Definition Documentation

5.3.2.1 PATH

```
#define PATH "utils/orbital_elements/"
```

Definition at line 36 of file orbital_elements_messages.cc.

Chapter 6

Namespace Documentation

6.1 jeod Namespace Reference

Namespace jeod.

Data Structures

- class [OrbitalElements](#)
Represents state in terms of Keplerian orbital elements.
- class [OrbitalElementsMessages](#)
Specifies the message IDs used in the orbital elements model.

6.1.1 Detailed Description

Namespace jeod.

Chapter 7

Data Structure Documentation

7.1 jeod::OrbitalElements Class Reference

Represents state in terms of Keplerian orbital elements.

```
#include <orbital_elements.hh>
```

Public Member Functions

- [OrbitalElements](#) ()=default
- virtual [~OrbitalElements](#) ()=default
- [OrbitalElements](#) (const [OrbitalElements](#) &)=delete
- [OrbitalElements](#) & [operator=](#) (const [OrbitalElements](#) &)=delete
- const std::string & [get_object_name](#) () const
Return the object name.
- const std::string & [get_planet_name](#) () const
Return the planet name.
- void [set_object_name](#) (const std::string &name)
Set the object name.
- void [set_planet_name](#) (const std::string &name)
Set the planet name.
- int [from_cartesian](#) (double mu, const double pos[3], const double vel[3])
- int [to_cartesian](#) (double mu, double pos[3], double vel[3])
- int [nu_to_anomalies](#) ()
- int [mean_anom_to_nu](#) ()

Data Fields

- double [semi_major_axis](#) {}
Semi-major-axis (a)
- double [semiparam](#) {}
Semiparameter (p)
- double [e_mag](#) {}
Magnitude of eccentricity (e)
- double [inclination](#) {}

- *Orbit inclination (i)*
- double [arg_periapsis](#) {}
- *Argument of periapsis (w)*
- double [long_asc_node](#) {}
- *Longitude of ascending node (Omega)*
- double [r_mag](#) {}
- *Magnitude of orbital radius.*
- double [vel_mag](#) {}
- *Magnitude of orbital velocity.*
- double [true_anom](#) {}
- *True Anomaly (v)*
- double [mean_anom](#) {}
- *Mean Anomaly (M)*
- double [mean_motion](#) {}
- *Mean motion of orbit (n)*
- double [orbital_anom](#) {}
- *Eccentric (E), Hyperbolic (H), or Parabolic (B) anomaly.*
- double [sin_v](#) {}
- *Sine of the true anomaly.*
- double [cos_v](#) {1.0}
- *Cosine of the true anomaly.*
- double [orb_energy](#) {}
- *Specific orbital energy.*
- double [orb_ang_momentum](#) {}
- *Specific orbital angular momentum.*

Protected Member Functions

- int [KepEqtnE](#) (double M, double e, double *E)
- int [KepEqtnH](#) (double M, double e, double *H)
- int [KepEqtnB](#) (double M, double *B)

Protected Attributes

- std::string [object_name](#)
- *Name of orbital object.*
- std::string [planet_name](#)
- *Name of planet about which the object orbits.*

Friends

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

7.1.1 Detailed Description

Represents state in terms of Keplerian orbital elements.

Definition at line 81 of file orbital_elements.hh.

7.1.2 Constructor & Destructor Documentation

7.1.2.1 OrbitalElements() [1/2]

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

7.1.2.2 ~OrbitalElements()

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

7.1.2.3 OrbitalElements() [2/2]

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

7.1.3 Member Function Documentation

7.1.3.1 from_cartesian()

```
int jeod::OrbitalElements::from_cartesian (
    double mu,
    const double pos[3],
    const double vel[3] )
```

Definition at line 120 of file orbital_elements.cc.

References [arg_periapsis](#), [e_mag](#), [inclination](#), [long_asc_node](#), [mean_motion](#), [nu_to_anomalies\(\)](#), [orb_ang_](#)↵
momentum, [orb_energy](#), [r_mag](#), [semi_major_axis](#), [semiparam](#), [true_anom](#), and [vel_mag](#).

7.1.3.2 get_object_name()

```
const std::string & jeod::OrbitalElements::get_object_name ( ) const
```

Return the object name.

Returns

Const pointer to name

Definition at line 85 of file orbital_elements.cc.

References [object_name](#).

7.1.3.3 get_planet_name()

```
const std::string & jeod::OrbitalElements::get_planet_name ( ) const
```

Return the planet name.

Returns

Const pointer to name

Definition at line 94 of file orbital_elements.cc.

References planet_name.

7.1.3.4 KepEqtnB()

```
int jeod::OrbitalElements::KepEqtnB (
    double M,
    double * B ) [protected]
```

Definition at line 874 of file orbital_elements.cc.

Referenced by mean_anom_to_nu().

7.1.3.5 KepEqtnE()

```
int jeod::OrbitalElements::KepEqtnE (
    double M,
    double e,
    double * E ) [protected]
```

Definition at line 747 of file orbital_elements.cc.

Referenced by mean_anom_to_nu().

7.1.3.6 KepEqtnH()

```
int jeod::OrbitalElements::KepEqtnH (
    double M,
    double e,
    double * H ) [protected]
```

Definition at line 802 of file orbital_elements.cc.

Referenced by mean_anom_to_nu().

7.1.3.7 mean_anom_to_nu()

```
int jeod::OrbitalElements::mean_anom_to_nu ( )
```

Definition at line 616 of file orbital_elements.cc.

References `jeod::OrbitalElementsMessages::convergence_error`, `cos_v`, `e_mag`, `KepEqtnB()`, `KepEqtnE()`, `KepEqtnH()`, `mean_anom`, `orbital_anom`, `sin_v`, and `true_anom`.

7.1.3.8 nu_to_anomalies()

```
int jeod::OrbitalElements::nu_to_anomalies ( )
```

Definition at line 543 of file orbital_elements.cc.

References `cos_v`, `e_mag`, `mean_anom`, `orbital_anom`, `sin_v`, and `true_anom`.

Referenced by `from_cartesian()`.

7.1.3.9 operator=()

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

7.1.3.10 set_object_name()

```
void jeod::OrbitalElements::set_object_name (
    const std::string & name )
```

Set the object name.

Parameters

in	<i>name</i>	Orbital object name
----	-------------	---------------------

Definition at line 59 of file orbital_elements.cc.

References `object_name`.

7.1.3.11 set_planet_name()

```
void jeod::OrbitalElements::set_planet_name (
    const std::string & name )
```

Set the planet name.

Parameters

in	<i>name</i>	Name of planet about which the object orbits
----	-------------	--

Definition at line 72 of file orbital_elements.cc.

References planet_name.

7.1.3.12 to_cartesian()

```
int jeod::OrbitalElements::to_cartesian (
    double mu,
    double pos[3],
    double vel[3] )
```

Definition at line 382 of file orbital_elements.cc.

References arg_periapsis, cos_v, jeod::OrbitalElementsMessages::domain_error, e_mag, inclination, long_asc_↵, node, semiparam, and sin_v.

7.1.4 Friends And Related Function Documentation

7.1.4.1 init_attrjeod__OrbitalElements

```
void init_attrjeod__OrbitalElements ( ) [friend]
```

7.1.4.2 InputProcessor

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

Definition at line 83 of file orbital_elements.hh.

7.1.5 Field Documentation

7.1.5.1 arg_periapsis

```
double jeod::OrbitalElements::arg_periapsis {}
```

Argument of periapsis (w)

trick_units(rad)

Definition at line 105 of file orbital_elements.hh.

Referenced by from_cartesian(), and to_cartesian().

7.1.5.2 cos_v

```
double jeod::OrbitalElements::cos_v {1.0}
```

Cosine of the true anomaly.

trick_units(-)

Definition at line 144 of file orbital_elements.hh.

Referenced by mean_anom_to_nu(), nu_to_anomalies(), and to_cartesian().

7.1.5.3 e_mag

```
double jeod::OrbitalElements::e_mag {}
```

Magnitude of eccentricity (e)

trick_units(-)

Definition at line 97 of file orbital_elements.hh.

Referenced by from_cartesian(), mean_anom_to_nu(), nu_to_anomalies(), and to_cartesian().

7.1.5.4 inclination

```
double jeod::OrbitalElements::inclination {}
```

Orbit inclination (i)

trick_units(rad)

Definition at line 101 of file orbital_elements.hh.

Referenced by from_cartesian(), and to_cartesian().

7.1.5.5 long_asc_node

```
double jeod::OrbitalElements::long_asc_node {}
```

Longitude of ascending node (Omega)

trick_units(rad)

Definition at line 109 of file orbital_elements.hh.

Referenced by from_cartesian(), and to_cartesian().

7.1.5.6 mean_anom

```
double jeod::OrbitalElements::mean_anom {}
```

Mean Anomaly (M)

trick_units(rad)

Definition at line 127 of file orbital_elements.hh.

Referenced by mean_anom_to_nu(), and nu_to_anomalies().

7.1.5.7 mean_motion

```
double jeod::OrbitalElements::mean_motion {}
```

Mean motion of orbit (n)

trick_units(rad/s)

Definition at line 131 of file orbital_elements.hh.

Referenced by from_cartesian().

7.1.5.8 object_name

```
std::string jeod::OrbitalElements::object_name [protected]
```

Name of orbital object.

trick_units(-)

Definition at line 158 of file orbital_elements.hh.

Referenced by get_object_name(), and set_object_name().

7.1.5.9 orb_ang_momentum

```
double jeod::OrbitalElements::orb_ang_momentum {}
```

Specific orbital angular momentum.

trick_units(m2/s)

Definition at line 152 of file orbital_elements.hh.

Referenced by from_cartesian().

7.1.5.10 orb_energy

```
double jeod::OrbitalElements::orb_energy {}
```

Specific orbital energy.

trick_units(m2/s2)

Definition at line 148 of file orbital_elements.hh.

Referenced by from_cartesian().

7.1.5.11 orbital_anom

```
double jeod::OrbitalElements::orbital_anom {}
```

Eccentric (E), Hyperbolic (H), or Parabolic (B) anomaly.

trick_units(rad)

Definition at line 135 of file orbital_elements.hh.

Referenced by mean_anom_to_nu(), and nu_to_anomalies().

7.1.5.12 planet_name

```
std::string jeod::OrbitalElements::planet_name [protected]
```

Name of planet about which the object orbits.

trick_units(-)

Definition at line 162 of file orbital_elements.hh.

Referenced by get_planet_name(), and set_planet_name().

7.1.5.13 r_mag

```
double jeod::OrbitalElements::r_mag {}
```

Magnitude of orbital radius.

trick_units(m)

Definition at line 115 of file orbital_elements.hh.

Referenced by from_cartesian().

7.1.5.14 semi_major_axis

```
double jeod::OrbitalElements::semi_major_axis {}
```

Semi-major-axis (a)

trick_units(m)

Definition at line 89 of file orbital_elements.hh.

Referenced by from_cartesian().

7.1.5.15 semiparam

```
double jeod::OrbitalElements::semiparam {}
```

Semiparameter (p)

trick_units(m)

Definition at line 93 of file orbital_elements.hh.

Referenced by from_cartesian(), and to_cartesian().

7.1.5.16 sin_v

```
double jeod::OrbitalElements::sin_v {}
```

Sine of the true anomaly.

trick_units(-)

Definition at line 140 of file orbital_elements.hh.

Referenced by mean_anom_to_nu(), nu_to_anomalies(), and to_cartesian().

7.1.5.17 true_anom

```
double jeod::OrbitalElements::true_anom {}
```

True Anomaly (v)

trick_units(rad)

Definition at line 123 of file orbital_elements.hh.

Referenced by from_cartesian(), mean_anom_to_nu(), and nu_to_anomalies().

7.1.5.18 vel_mag

```
double jeod::OrbitalElements::vel_mag {}
```

Magnitude of orbital velocity.

trick_units(m/s)

Definition at line 119 of file orbital_elements.hh.

Referenced by from_cartesian().

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

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

7.2 jeod::OrbitalElementsMessages Class Reference

Specifies the message IDs used in the orbital elements model.

```
#include <orbital_elements_messages.hh>
```

Public Member Functions

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

Static Public Attributes

- static const char * [domain_error](#) = "utils/orbital_elements/" "domain_error"
Issued when a value / set of values is invalid.
- static const char * [convergence_error](#) = "utils/orbital_elements/" "convergence_error"
Issued when a numeric search fails to converge.

Friends

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

7.2.1 Detailed Description

Specifies the message IDs used in the orbital elements model.

Definition at line 81 of file orbital_elements_messages.hh.

7.2.2 Constructor & Destructor Documentation

7.2.2.1 [OrbitalElementsMessages](#)() [1/2]

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

7.2.2.2 [OrbitalElementsMessages](#)() [2/2]

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

7.2.3 Member Function Documentation

7.2.3.1 [operator=](#)()

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

7.2.4 Friends And Related Function Documentation

7.2.4.1 [init_attrjeod__OrbitalElementsMessages](#)

```
void init_attrjeod__OrbitalElementsMessages ( ) [friend]
```


7.2.4.2 InputProcessor

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

Definition at line 83 of file orbital_elements_messages.hh.

7.2.5 Field Documentation

7.2.5.1 convergence_error

```
const char * jeod::OrbitalElementsMessages::convergence_error = "utils/orbital_elements/"  
"convergence_error" [static]
```

Issued when a numeric search fails to converge.

trick_units(-)

Definition at line 93 of file orbital_elements_messages.hh.

Referenced by jeod::OrbitalElements::mean_anom_to_nu().

7.2.5.2 domain_error

```
const char * jeod::OrbitalElementsMessages::domain_error = "utils/orbital_elements/" "domain_↵  
error" [static]
```

Issued when a value / set of values is invalid.

trick_units(-)

Definition at line 88 of file orbital_elements_messages.hh.

Referenced by jeod::OrbitalElements::to_cartesian().

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

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

Chapter 8

File Documentation

8.1 orbital_elements.cc File Reference

Define methods for the OrbitalElements class.

```
#include <cmath>
#include <cstdlib>
#include "utils/math/include/vector3.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/orbital_elements.hh"
#include "../include/orbital_elements_messages.hh"
```

Namespaces

- [jeod](#)

Namespace jeod.

8.1.1 Detailed Description

Define methods for the OrbitalElements class.

8.2 orbital_elements.hh File Reference

Orbital elements class definition.

```
#include <string>
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class [jeod::OrbitalElements](#)
Represents state in terms of Keplerian orbital elements.

Namespaces

- [jeod](#)
Namespace jeod.

8.2.1 Detailed Description

Orbital elements class definition.

8.3 orbital_elements_messages.cc File Reference

Implement the class OrbitalElementsMessages.

```
#include "../include/orbital_elements_messages.hh"
```

Namespaces

- [jeod](#)
Namespace jeod.

Macros

- #define [PATH](#) "utils/orbital_elements/"

8.3.1 Detailed Description

Implement the class OrbitalElementsMessages.

8.4 orbital_elements_messages.hh File Reference

Define the class OrbitalElementsMessages, the class that specifies the message IDs used in the orbital elements model.

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

Data Structures

- class [jeod::OrbitalElementsMessages](#)
Specifies the message IDs used in the orbital elements model.

Namespaces

- [jeod](#)
Namespace jeod.

8.4.1 Detailed Description

Define the class `OrbitalElementsMessages`, the class that specifies the message IDs used in the orbital elements model.

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