Rotation,Nutation,andPrecessionModel

5.3

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: Implements the J2000 RNP model using the generic RNP framework . . . 79

jeod::RNPJ2000_rnp_j2000_default_data . . . 87

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: Implements the "Pathfinder" Mars RNP model using the generic RNP framework . . . 88

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Modules

- GenericRNP
- RNPJ2000
- RNPMars

6.3.1 Detailed Description

6.4 GenericRNP

Files

- file GenericRNP/include/class_declarations.hh

  Forward declarations of classes defined for JEOD 2.0 Generic RNP.
- file planet_orientation.hh

  Establish a pure virtual framework for interfacing with the DynManager to set a planet orientation, meaning the transformation information from a planet's inertial frame to it's planet fixed frame.
- file planet_rnp.hh

  Establish a framework for rotation-nutatation-precession style planet attitude models.
- file planet_rotation.hh

  Pure virtual polymorphic base class for all forms of planet rotation in th RNP model including precession, nutation, polar motion and axial rotation.
- file planet_rotation_init.hh

  Pure virtual polymorphic base class meant to be used by PlanetRotation::initialize when a large amount of data that could possibly change must be used for rotation calculation.
- file RNP_messages.hh

  Implement RNP_messages.
- file planet_orientation.cc

  Implement PlanetOrientation.
- file planet_rnp.cc

  Implement PlanetRNP.
- file planet_rotation.cc

  Implemenation for PlanetRotation.
- file RNP_messages.cc

  Implement RNP_messages.

Namespaces

- jeod

  Namespace jeod.

6.4.1 Detailed Description

6.5 RNPJ2000

Files

- file RNPJ2000/include/class_declarations.hh

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- file include/nutation_j2000.hh

  Model the nutation portion of the RNP routine for the Standard Epoch J2000 This is form of the IAU-76/FK5 RNP model, as implemented in Jeod 1.52.
- file nutation_j2000_init.hh

  Used to load data and initialize the NutationJ2000 class through NutationJ2000::initialize.
- file polar_motion_j2000.hh

  Model the polar motion portion of the RNP routine for the Standard Epoch J2000.
- file polar_motion_j2000_init.hh

  Used to load data and initialize the PolarMotionJ2000 class through PolarMotionJ2000::initialize.
- file precession_j2000.hh

  Model the precession for the RNP routine for the Standard Epoch J2000 This is a form of the IAU-76/FK5 RNP model, as implemented in Jeod 1.52.
- file include/rnp_j2000.hh

  A specific implementation of PlanetRNP, for Earth.
- file rotation_j2000.hh

  Model the axial rotation portion of the RNP routine for the Standard Epoch J2000.
- file nutation_j2000.cc

  Implementation for the NutationJ2000 class.
- file nutation_j2000_init.cc

  Implementation of NutationJ2000Init.
- file polar_motion_j2000.cc

  Implementation of PolarMotionJ2000.
- file polar_motion_j2000_init.cc

  Implementation for PolarMotionJ2000Init.
- file precession_j2000.cc

  Implementation for PrecessionJ2000.
- file rnp_j2000.cc

  Implementation for RNPJ2000.
- file rotation_j2000.cc

  Implementation of RotationJ2000.

Namespaces

- jeod

  Namespace jeod.

6.5.1 Detailed Description

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- file precession_mars.hh

  Represent the precession portion of the JPL-developed "Pathfinder" Mars orientation model.
- file include/rnp_mars.hh

  A specific implementation of PlanetRNP, for Mars.
- file rotation_mars.hh

  Represent the axial rotation portion of the JPL-developed "Pathfinder" Mars orientation model.
- file nutation_mars.cc

  Implementation for the NutationMars class.
- file precession_mars.cc

  Implementation of PrecessionMars.
- file rnp_mars.cc

  Implementation of RNPMars.
- file rotation_mars.cc

  Implementation of RotationMars.

Namespaces

- jeod

  Namespace jeod.

6.6.1 Detailed Description

Chapter 7

Namespace Documentation

7.1 jeod Namespace Reference

Namespace jeod.

Data Structures

- class NutationJ2000

  Implements the nutation portion of the J2000 RNP.
- class NutationJ2000Init

  The NutationJ2000Init contains coefficients and other data used to initalize a NutationJ2000 object.
- class NutationJ2000Init_nutation_j2000_default_data
- class NutationMars

  Implements the nutation portion of the "Pathfinder" Mars RNP model.
- class PlanetOrientation

  The generic framework for orientation models to interact with a DynManager object.
- class PlanetRNP

  The generic framework for orientation models based on the RNP paradigm.
- class PlanetRotation

  The generic base class for all planet transformations.
- class PlanetRotationInit

  The generic base class for all initializing classes for PlanetRotation derived classes.
- class PolarMotionJ2000

  Implements the polar motion portion of the J2000 RNP.
- class PolarMotionJ2000Init

  Initializes the PolarMotionJ2000 object.
- class PolarMotionJ2000Init_xpyp_daily_default_data
- class PolarMotionJ2000Init_xpyp_monthly_default_data
- class PrecessionJ2000

  Implements the precession portion of the J2000 RNP.
- class PrecessionMars

  Implements the axial rotation portion of the "Pathfinder" Mars RNP model.
- class RNPJ2000

  Implements the J2000 RNP model using the generic RNP framework.
- class RNPJ2000_rnp_j2000_default_data

- class RNPMars

  Implements the "Pathfinder" Mars RNP model using the generic RNP framework.
- class RNPMars_rnp_mars_default_data
- class RNPMessages

  Describes messages used in the RNP model.
- class RotationJ2000

  Implements the axial rotation portion of J2000 RNP.
- class RotationMars

  Implements the axial rotation portion of the "Pathfinder" Mars RNP model.

7.1.1 Detailed Description

Namespace jeod.

Chapter 8

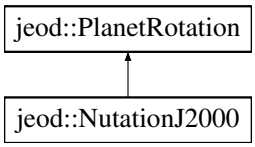
Data Structure Documentation

8.1 jeod::NutationJ2000 Class Reference

Implements the nutation portion of the J2000 RNP.

`#include <nutation_j2000.hh>`

Inheritance diagram for jeod::NutationJ2000:



Public Member Functions

- NutationJ2000 ()=default
- ~NutationJ2000 () override

  destructor
- NutationJ2000 & operator= (const NutationJ2000 &)=delete
- NutationJ2000 (const NutationJ2000 &)=delete
- void update_rotation () override

  Specific implementation of update_rotation, from the polymorphic pure virtual base class PlanetRotation.
- void initialize (PlanetRotationInit *init) override

  Initialize the various coefficients needed for the calculation of nutation.

Data Fields

- unsigned int num_coeffs {}

  The number of coefficients in the 9 arrays directly following this decleration.
- double * L_coeffs {}

  The coefficients to calculate mean anomaly of the moon.
- double * M_coeffs {}

  The coefficients to calculate mean anomaly of the sun.

- double * F_coeffs {}

  The coefficients to calculate mean argument of lattitude of the moon.
- double * D_coeffs {}

  The coefficients to calculate mean elongation from the sun.
- double * omega_coeffs {}

  The coefficients to calculate the right ascension of the ascending node of the mean mean lunar orbit.
- double * long_coeffs {}

  Zero order (in time) coefficients for calculating the nutation in longitude.
- double * long_t_coeffs {}

  The first order (in time) coefficients for calculating the nutation in longitude.
- double * obliq_coeffs {}

  Zero order coefficients for calculating the nutation in obliquity.
- double * obliq_t_coeffs {}

  First order coefficnets for calculating the nutation in obliquity.
- double nutation_in_longitude {}

  The nutation in longitude from the last call of update.
- double nutation_in_obliquity {}

  The nutation in obliquity from the last call of update.
- double L {}

  Last calculated mean anomaly of the moon.
- double M {}

  Last calculated mean anomaly of the sun.
- double F {}

  Last calculated mean argument of latitude of the moon.
- double D {}

  Last calculated mean elongation from the sun.
- double omega {}

  Last calculated ascension of the ascending node of the mean lunar orbit.
- double epsilon_bar {}

  Last calculated mean obliqutiy of the ecliptic.
- double equa_of_equi {}

  Last calculated equations of the equinox.

Friends

- class InputProcessor
- void init_attrjeod__NutationJ2000 ()

Additional Inherited Members

8.1.1 Detailed Description

Implements the nutation portion of the J2000 RNP.

Definition at line 90 of file include/nutation_j2000.hh.

8.1.2 Constructor & Destructor Documentation

8.1.2.1 NutationJ2000() [1/2]

```
jeod::NutationJ2000::NutationJ2000 ( )  [default]
```

8.1.2.2 ~NutationJ2000()

```
jeod::NutationJ2000::~NutationJ2000 ( )  [override]
```

destructor

Definition at line 64 of file nutation_j2000.cc.

References D_coeffs, F_coeffs, L_coeffs, long_coeffs, long_t_coeffs, M_coeffs, obliq_coeffs, obliq_t_coeffs, and omega_coeffs.

8.1.2.3 NutationJ2000() [2/2]

```
jeod::NutationJ2000::NutationJ2000 (
            const NutationJ2000 &  )  [delete]
```

8.1.3 Member Function Documentation

8.1.3.1 initialize()

```
void jeod::NutationJ2000::initialize (
            PlanetRotationInit * init )  [override], [virtual]
```

Initialize the various coefficients needed for the calculation of nutation.

init must be of type NutationJ2000Init or a fail message will occur

Parameters

in	*init*	NutationJ2000Init object with needed coefficients

Reimplemented from jeod::PlanetRotation.

Definition at line 173 of file nutation_j2000.cc.

References D_coeffs, F_coeffs, jeod::RNPMessages::initialization_error, L_coeffs, long_coeffs, long_t_coeffs, M_coeffs, num_coeffs, obliq_coeffs, obliq_t_coeffs, and omega_coeffs.

8.1.3.2 operator=()

```
NutationJ2000& jeod::NutationJ2000::operator= (
            const NutationJ2000 &  )  [delete]
```

8.1.3.3 update_rotation()

```
void jeod::NutationJ2000::update_rotation ( )  [override], [virtual]
```

Specific implementation of update_rotation, from the polymorphic pure virtual base class PlanetRotation.

Reimplemented from jeod::PlanetRotation.

Definition at line 81 of file nutation_j2000.cc.

References jeod::PlanetRotation::current_time, D, D_coeffs, jeod::PlanetRotation::DEGTORAD, epsilon_bar, equa_of_equi, F, F_coeffs, L, L_coeffs, long_coeffs, long_t_coeffs, M, M_coeffs, num_coeffs, nutation_in_longitude, nutation_in_obliquity, obliq_coeffs, obliq_t_coeffs, omega, omega_coeffs, and jeod::PlanetRotation::rotation.

8.1.4 Friends And Related Function Documentation

8.1.4.1 init_attrjeod__NutationJ2000

```
void init_attrjeod__NutationJ2000 ( )  [friend]
```

8.1.4.2 InputProcessor

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

Definition at line 92 of file include/nutation_j2000.hh.

8.1.5 Field Documentation

8.1.5.1 D

```
double jeod::NutationJ2000::D {}
```

Last calculated mean elongation from the sun.

trick_units(–)

Definition at line 180 of file include/nutation_j2000.hh.

Referenced by update_rotation().

8.1.5.2 D_coeffs

```
double* jeod::NutationJ2000::D_coeffs {}
```

The coefficients to calculate mean elongation from the sun.

trick_units(–)

Definition at line 117 of file include/nutation_j2000.hh.

Referenced by initialize(), update_rotation(), and ∼NutationJ2000().

8.1.5.3 epsilon_bar

```
double jeod::NutationJ2000::epsilon_bar {}
```

Last calculated mean obliqutiy of the ecliptic.

trick_units(–)

Definition at line 191 of file include/nutation_j2000.hh.

Referenced by update_rotation().

8.1.5.4 equa_of_equi

```
double jeod::NutationJ2000::equa_of_equi {}
```

Last calculated equations of the equinox.

trick_units(–)

Definition at line 196 of file include/nutation_j2000.hh.

Referenced by jeod::RotationJ2000::update_rotation(), and update_rotation().

8.1.5.5 F

```
double jeod::NutationJ2000::F {}
```

Last calculated mean argument of latitude of the moon.

trick_units(–)

Definition at line 175 of file include/nutation_j2000.hh.

Referenced by update_rotation().

8.1.5.6 F_coeffs

```
double* jeod::NutationJ2000::F_coeffs {}
```

The coefficients to calculate mean argument of lattitude of the moon.

trick_units(–)

Definition at line 112 of file include/nutation_j2000.hh.

Referenced by initialize(), update_rotation(), and ∼NutationJ2000().

8.1.5.7 L

```
double jeod::NutationJ2000::L {}
```

Last calculated mean anomaly of the moon.

trick_units(–)

Definition at line 165 of file include/nutation_j2000.hh.

Referenced by update_rotation().

8.1.5.8 L_coeffs

```
double* jeod::NutationJ2000::L_coeffs {}
```

The coefficients to calculate mean anomaly of the moon.

trick_units(–)

Definition at line 102 of file include/nutation_j2000.hh.

Referenced by initialize(), update_rotation(), and ∼NutationJ2000().

8.1.5.9 long_coeffs

```
double* jeod::NutationJ2000::long_coeffs {}
```

Zero order (in time) coefficients for calculating the nutation in longitude.

trick_units(–)

Definition at line 130 of file include/nutation_j2000.hh.

Referenced by initialize(), update_rotation(), and ∼NutationJ2000().

8.1.5.10 long_t_coeffs

```
double* jeod::NutationJ2000::long_t_coeffs {}
```

The first order (in time) coefficients for calculating the nutation in longitude.

trick_units(–)

Definition at line 136 of file include/nutation_j2000.hh.

Referenced by initialize(), update_rotation(), and ∼NutationJ2000().

8.1.5.11 M

```
double jeod::NutationJ2000::M {}
```

Last calculated mean anomaly of the sun.

trick_units(–)

Definition at line 170 of file include/nutation_j2000.hh.

Referenced by update_rotation().

8.1.5.12 M_coeffs

```
double* jeod::NutationJ2000::M_coeffs {}
```

The coefficients to calculate mean anomaly of the sun.

trick_units(–)

Definition at line 107 of file include/nutation_j2000.hh.

Referenced by initialize(), update_rotation(), and ∼NutationJ2000().

8.1.5.13 num_coeffs

```
unsigned int jeod::NutationJ2000::num_coeffs {}
```

The number of coefficients in the 9 arrays directly following this decleration.

trick_units(count)

Definition at line 97 of file include/nutation_j2000.hh.

Referenced by initialize(), and update_rotation().

8.1.5.14 nutation_in_longitude

```
double jeod::NutationJ2000::nutation_in_longitude {}
```

The nutation in longitude from the last call of update.

trick_units(–)

Definition at line 154 of file include/nutation_j2000.hh.

Referenced by update_rotation().

8.1.5.15 nutation_in_obliquity

```
double jeod::NutationJ2000::nutation_in_obliquity {}
```

The nutation in obliquity from the last call of update.

trick_units(–)

Definition at line 160 of file include/nutation_j2000.hh.

Referenced by update_rotation().

8.1.5.16 obliq_coeffs

```
double* jeod::NutationJ2000::obliq_coeffs {}
```

Zero order coefficients for calculating the nutation in obliquity.

trick_units(–)

Definition at line 142 of file include/nutation_j2000.hh.

Referenced by initialize(), update_rotation(), and ~NutationJ2000().

8.1.5.17 obliq_t_coeffs

```
double* jeod::NutationJ2000::obliq_t_coeffs {}
```

First order coefficnets for calculating the nutation in obliquity.

trick_units(–)

Definition at line 148 of file include/nutation_j2000.hh.

Referenced by initialize(), update_rotation(), and ~NutationJ2000().

8.1.5.18 omega

```
double jeod::NutationJ2000::omega {}
```

Last calculated ascension of the ascending node of the mean lunar orbit.

trick_units(–)

Definition at line 186 of file include/nutation_j2000.hh.

Referenced by update_rotation().

8.1.5.19 omega_coeffs

```
double* jeod::NutationJ2000::omega_coeffs {}
```

The coefficients to calculate the right ascension of the ascending node of the mean mean lunar orbit.

trick_units(–)

Definition at line 124 of file include/nutation_j2000.hh.

Referenced by initialize(), update_rotation(), and ~NutationJ2000().

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

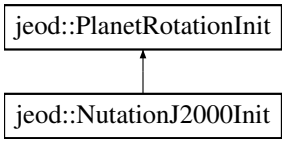
- include/nutation_j2000.hh
- nutation_j2000.cc

8.2 jeod::NutationJ2000Init Class Reference

The NutationJ2000Init contains coefficients and other data used to initalize a NutationJ2000 object.

`#include <nutation_j2000_init.hh>`

Inheritance diagram for jeod::NutationJ2000Init:



Public Member Functions

- NutationJ2000Init ()=default
- ~NutationJ2000Init () override

  Destructor.
- NutationJ2000Init & operator= (const NutationJ2000Init &)=delete
- NutationJ2000Init (const NutationJ2000Init &)=delete

Data Fields

- int num_coeffs {}

  The number of coefficients in the 9 arrays directly following this decleration.
- double * L_coeffs {}

  The coefficients to calculate mean anomaly of the moon.
- double * M_coeffs {}

  The coefficients to calculate mean anomaly of the sun.
- double * F_coeffs {}

  The coefficients to calculate mean argument of lattitude of the moon.
- double * D_coeffs {}

  The coefficients to calculate mean elongation from the sun.
- double * omega_coeffs {}

  The coefficients to calculate the right ascension of the ascending node of the mean mean lunar orbit.
- double * long_coeffs {}

  Zero order (in time) coefficients for calculating the nutation in longitude.
- double * long_t_coeffs {}

  The first order (in time) coefficients for calculating the nutation in longitude.
- double * obliq_coeffs {}

  Zero order coefficients for calculating the nutation in obliquity.
- double * obliq_t_coeffs {}

  First order coefficnets for calculating the nutation in obliquity.

Friends

- class InputProcessor
- void init_attrjeod__NutationJ2000Init ()

8.2.1 Detailed Description

The NutationJ2000Init contains coefficients and other data used to initalize a NutationJ2000 object.

Definition at line 92 of file nutation_j2000_init.hh.

8.2.2 Constructor & Destructor Documentation

8.2.2.1 NutationJ2000Init() [1/2]

```
jeod::NutationJ2000Init::NutationJ2000Init ( )  [default]
```

8.2.2.2 ~NutationJ2000Init()

```
jeod::NutationJ2000Init::~NutationJ2000Init ( )  [override]
```

Destructor.

Definition at line 55 of file nutation_j2000_init.cc.

References D_coeffs, F_coeffs, L_coeffs, long_coeffs, long_t_coeffs, M_coeffs, obliq_coeffs, obliq_t_coeffs, and omega_coeffs.

8.2.2.3 NutationJ2000Init() [2/2]

```
jeod::NutationJ2000Init::NutationJ2000Init (
            const NutationJ2000Init &  )  [delete]
```

8.2.3 Member Function Documentation

8.2.3.1 operator=()

```
NutationJ2000Init& jeod::NutationJ2000Init::operator= (
            const NutationJ2000Init &  )  [delete]
```

8.2.4 Friends And Related Function Documentation

8.2.4.1 init_attrjeod__NutationJ2000Init

```
void init_attrjeod__NutationJ2000Init ( )  [friend]
```

8.2.4.2 InputProcessor

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

Definition at line 94 of file nutation_j2000_init.hh.

8.2.5 Field Documentation

8.2.5.1 D_coeffs

```
double* jeod::NutationJ2000Init::D_coeffs {}
```

The coefficients to calculate mean elongation from the sun.

trick_units(–)

Definition at line 119 of file nutation_j2000_init.hh.

Referenced by jeod::NutationJ2000Init_nutation_j2000_default_data::initialize(), and ~NutationJ2000Init().

8.2.5.2 F_coeffs

```
double* jeod::NutationJ2000Init::F_coeffs {}
```

The coefficients to calculate mean argument of lattitude of the moon.

trick_units(–)

Definition at line 114 of file nutation_j2000_init.hh.

Referenced by jeod::NutationJ2000Init_nutation_j2000_default_data::initialize(), and ~NutationJ2000Init().

8.2.5.3 L_coeffs

```
double* jeod::NutationJ2000Init::L_coeffs {}
```

The coefficients to calculate mean anomaly of the moon.

trick_units(–)

Definition at line 104 of file nutation_j2000_init.hh.

Referenced by jeod::NutationJ2000Init_nutation_j2000_default_data::initialize(), and ~NutationJ2000Init().

8.2.5.4 long_coeffs

```
double* jeod::NutationJ2000Init::long_coeffs {}
```

Zero order (in time) coefficients for calculating the nutation in longitude.

trick_units(–)

Definition at line 132 of file nutation_j2000_init.hh.

Referenced by jeod::NutationJ2000Init_nutation_j2000_default_data::initialize(), and ~NutationJ2000Init().

8.2.5.5 long_t_coeffs

```
double* jeod::NutationJ2000Init::long_t_coeffs {}
```

The first order (in time) coefficients for calculating the nutation in longitude.

trick_units(–)

Definition at line 138 of file nutation_j2000_init.hh.

Referenced by jeod::NutationJ2000Init_nutation_j2000_default_data::initialize(), and ~NutationJ2000Init().

8.2.5.6 M_coeffs

```
double* jeod::NutationJ2000Init::M_coeffs {}
```

The coefficients to calculate mean anomaly of the sun.

trick_units(–)

Definition at line 109 of file nutation_j2000_init.hh.

Referenced by jeod::NutationJ2000Init_nutation_j2000_default_data::initialize(), and ~NutationJ2000Init().

8.2.5.7 num_coeffs

```
int jeod::NutationJ2000Init::num_coeffs {}
```

The number of coefficients in the 9 arrays directly following this decleration.

trick_units(count)

Definition at line 99 of file nutation_j2000_init.hh.

Referenced by jeod::NutationJ2000Init_nutation_j2000_default_data::initialize().

8.2.5.8 obliq_coeffs

```
double* jeod::NutationJ2000Init::obliq_coeffs {}
```

Zero order coefficients for calculating the nutation in obliquity.

trick_units(–)

Definition at line 144 of file nutation_j2000_init.hh.

Referenced by jeod::NutationJ2000Init_nutation_j2000_default_data::initialize(), and ~NutationJ2000Init().

8.2.5.9 obliq_t_coeffs

```
double* jeod::NutationJ2000Init::obliq_t_coeffs {}
```

First order coefficnets for calculating the nutation in obliquity.

trick_units(–)

Definition at line 150 of file nutation_j2000_init.hh.

Referenced by jeod::NutationJ2000Init_nutation_j2000_default_data::initialize(), and ~NutationJ2000Init().

8.2.5.10 omega_coeffs

```
double* jeod::NutationJ2000Init::omega_coeffs {}
```

The coefficients to calculate the right ascension of the ascending node of the mean mean lunar orbit.

trick_units(–)

Definition at line 126 of file nutation_j2000_init.hh.

Referenced by jeod::NutationJ2000Init_nutation_j2000_default_data::initialize(), and ~NutationJ2000Init().

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

- nutation_j2000_init.hh
- nutation_j2000_init.cc

8.3 jeod::NutationJ2000Init_nutation_j2000_default_data Class Reference

`#include <nutation_j2000.hh>`

Public Member Functions

- void initialize (NutationJ2000Init *)

8.3.1 Detailed Description

Definition at line 55 of file data/include/nutation_j2000.hh.

8.3.2 Member Function Documentation

8.3.2.1 initialize()

```
void jeod::NutationJ2000Init_nutation_j2000_default_data::initialize (
            NutationJ2000Init * NutationJ2000Init_ptr )
```

Definition at line 35 of file data_nutation_j2000.cc.

References jeod::NutationJ2000Init::D_coeffs, jeod::NutationJ2000Init::F_coeffs, jeod::NutationJ2000Init::L_coeffs, jeod::NutationJ2000Init::long_coeffs, jeod::NutationJ2000Init::long_t_coeffs, jeod::NutationJ2000Init::M_coeffs, jeod::NutationJ2000Init::num_coeffs, jeod::NutationJ2000Init::obliq_coeffs, jeod::NutationJ2000Init::obliq_t_coeffs, and jeod::NutationJ2000Init::omega_coeffs.

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

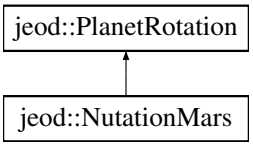
- data/include/nutation_j2000.hh
- data_nutation_j2000.cc

8.4 jeod::NutationMars Class Reference

Implements the nutation portion of the "Pathfinder" Mars RNP model.

`#include <nutation_mars.hh>`

Inheritance diagram for jeod::NutationMars:



Public Member Functions

- NutationMars ()=default
- ∼NutationMars () override

  Destructor.
- NutationMars & operator= (const NutationMars &)=delete
- NutationMars (const NutationMars &)=delete
- void update_rotation () override

  NutationMars specific implementation of update_rotation, used here to describe nutation effects in longitude and obliquity.

Data Fields

- double nutation_in_longitude {}

  The latest calculated nutation correction term in longitude.
- double nutation_in_obliquity {}

  The latest calculated nutation correction term in obliquity.
- double l_at_j2000 {}

  The (constant) obliquity angle of Mars at the J2000 epoch.
- double l_dot {}

  The (constant) simple secular change in Mars obliquity relative to the Mars mean orbit.
- double obliquity_angle {}

  The latest calculated angle of obliquity, that is, the current orbit inclination angle as measured relative to the Mars mean orbit, measured since the J2000 epoch.
- double mean_motion {}

  The mean motion of Mars, that is, the average orbit arc traversed.
- double mean_anomaly_j2000 {}

  The Mars mean anomaly at the J2000 epoch.
- double q_angle_j2000 {}

  Parameter q is a slowly varying angle defined in Konopliv 2006 as 2 times w, where w is the argument of perihelion of the Mars orbit relative to the node of the Mars equator and Mars mean orbit.
- double ∗ l_m_orig {}

  The obliquity nutation amplitude parameters.
- double ∗ psi_m_orig {}

  The longitude nutation amplitude parameters.
- double ∗ int_to_double {}

  0 to 9 cast as doubles for use in summation

Friends

- class InputProcessor
- void init_attrjeod__NutationMars ()

Additional Inherited Members

8.4.1 Detailed Description

Implements the nutation portion of the "Pathfinder" Mars RNP model.

Definition at line 94 of file nutation_mars.hh.

8.4.2 Constructor & Destructor Documentation

8.4.2.1 NutationMars() [1/2]

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

8.4.2.2 ~NutationMars()

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

Destructor.

Definition at line 63 of file nutation_mars.cc.

References I_m_orig, int_to_double, and psi_m_orig.

8.4.2.3 NutationMars() [2/2]

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

8.4.3 Member Function Documentation

8.4.3.1 operator=()

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

8.4.3.2 update_rotation()

```
void jeod::NutationMars::update_rotation ( )  [override], [virtual]
```

NutationMars specific implementation of update_rotation, used here to describe nutation effects in longitude and obliquity.

Reimplemented from jeod::PlanetRotation.

Definition at line 74 of file nutation_mars.cc.

References jeod::PlanetRotation::current_time, I_at_j2000, I_dot, I_m_orig, int_to_double, mean_anomaly_j2000, mean_motion, nutation_in_longitude, nutation_in_obliquity, obliquity_angle, psi_m_orig, q_angle_j2000, and jeod↩
::PlanetRotation::rotation.

8.4.4 Friends And Related Function Documentation

8.4.4.1 init_attrjeod__NutationMars

```
void init_attrjeod__NutationMars ( )  [friend]
```

8.4.4.2 InputProcessor

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

Definition at line 96 of file nutation_mars.hh.

8.4.5 Field Documentation

8.4.5.1 I_at_j2000

```
double jeod::NutationMars::I_at_j2000 {}
```

The (constant) obliquity angle of Mars at the J2000 epoch.

trick_units(rad)

Definition at line 111 of file nutation_mars.hh.

Referenced by jeod::RNPMars_rnp_mars_default_data::initialize(), and update_rotation().

8.4.5.2 I_dot

```
double jeod::NutationMars::I_dot {}
```

The (constant) simple secular change in Mars obliquity relative to the Mars mean orbit.

trick_units(rad/s)

Definition at line 117 of file nutation_mars.hh.

Referenced by jeod::RNPMars_rnp_mars_default_data::initialize(), and update_rotation().

8.4.5.3 I_m_orig

```
double* jeod::NutationMars::I_m_orig {}
```

The obliquity nutation amplitude parameters.

trick_units(rad)

Definition at line 147 of file nutation_mars.hh.

Referenced by jeod::RNPMars_rnp_mars_default_data::initialize(), update_rotation(), and ~NutationMars().

8.4.5.4 int_to_double

```
double* jeod::NutationMars::int_to_double {}
```

0 to 9 cast as doubles for use in summation

trick_units(–)

Definition at line 157 of file nutation_mars.hh.

Referenced by jeod::RNPMars_rnp_mars_default_data::initialize(), update_rotation(), and ~NutationMars().

8.4.5.5 mean_anomaly_j2000

```
double jeod::NutationMars::mean_anomaly_j2000 {}
```

The Mars mean anomaly at the J2000 epoch.

trick_units(rad)

Definition at line 134 of file nutation_mars.hh.

Referenced by jeod::RNPMars_rnp_mars_default_data::initialize(), and update_rotation().

8.4.5.6 mean_motion

```
double jeod::NutationMars::mean_motion {}
```

The mean motion of Mars, that is, the average orbit arc traversed.

trick_units(rad/s)

Definition at line 129 of file nutation_mars.hh.

Referenced by jeod::RNPMars_rnp_mars_default_data::initialize(), and update_rotation().

8.4.5.7 nutation_in_longitude

```
double jeod::NutationMars::nutation_in_longitude {}
```

The latest calculated nutation correction term in longitude.

trick_units(rad)

Definition at line 101 of file nutation_mars.hh.

Referenced by jeod::RotationMars::update_rotation(), jeod::PrecessionMars::update_rotation(), and update_↩ rotation().

8.4.5.8 nutation_in_obliquity

```
double jeod::NutationMars::nutation_in_obliquity {}
```

The latest calculated nutation correction term in obliquity.

trick_units(rad)

Definition at line 106 of file nutation_mars.hh.

Referenced by update_rotation().

8.4.5.9 obliquity_angle

```
double jeod::NutationMars::obliquity_angle {}
```

The latest calculated angle of obliquity, that is, the current orbit inclination angle as measured relative to the Mars mean orbit, measured since the J2000 epoch.

trick_units(rad)

Definition at line 124 of file nutation_mars.hh.

Referenced by jeod::RotationMars::update_rotation(), and update_rotation().

8.4.5.10 psi_m_orig

```
double* jeod::NutationMars::psi_m_orig {}
```

The longitude nutation amplitude parameters.

trick_units(rad)

Definition at line 152 of file nutation_mars.hh.

Referenced by jeod::RNPMars_rnp_mars_default_data::initialize(), update_rotation(), and ∼NutationMars().

8.4.5.11 q_angle_j2000

```
double jeod::NutationMars::q_angle_j2000 {}
```

Parameter q is a slowly varying angle defined in Konopliv 2006 as 2 times w, where w is the argument of perihelion of the Mars orbit relative to the node of the Mars equator and Mars mean orbit.

This data member is the value of q at the J2000 epoch.trick_units(rad)

Definition at line 142 of file nutation_mars.hh.

Referenced by jeod::RNPMars_rnp_mars_default_data::initialize(), and update_rotation().

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

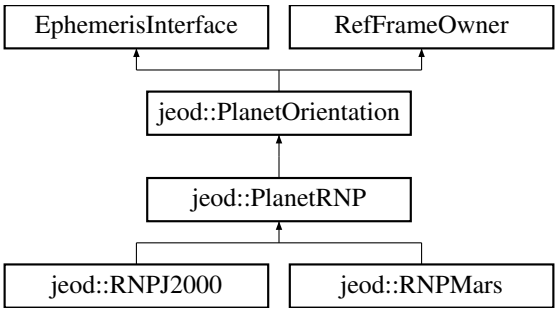
- nutation_mars.hh
- nutation_mars.cc

8.5 jeod::PlanetOrientation Class Reference

The generic framework for orientation models to interact with a DynManager object.

```
#include <planet_orientation.hh>
```

Inheritance diagram for jeod::PlanetOrientation:



Public Member Functions

- PlanetOrientation ()=default
- ~PlanetOrientation () override=default
- PlanetOrientation & operator= (const PlanetOrientation &rhs)=delete
- PlanetOrientation (const PlanetOrientation &rhs)=delete
- virtual void initialize (DynManager &dyn_manager)

  Goes to the dyn manager given and searches for the planet indicated by the user inputted name, in the given dyn manager.
- void activate () override

  Activates the PlanetOrientation model.
- void deactivate () override

  Deactivates the PlanetOrientation model.
- void ephem_initialize (EphemeridesManager &manager) override

  Implements the EphemInterface pure virtual function ephem_initialize.

- void ephem_activate (EphemeridesManager &manager) override

  Mark the model as being activate or inactive.
- void ephem_build_tree (EphemeridesManager &manager) override

  Function, for a particular ephemeris model, nominally builds the particular models portions of the reference frame tree.
- void set_name (std::string name_in)

  Setter for the name.
- std::string get_name () const override=0

  A re-declaration of the pure virtual function in order to convince trick that yes, this is a pure virtual class.

Data Fields

- bool active {true}

  Is the orientation model actively updating? Defaults to true.
- Planet * planet {}

  The planet the attitude model will be working on.
- std::string name {""}

  Name of the planet the attitude model will be working on.
- RefFrameRot * planet_rot_state {}

  The current rotational state of the planet.
- double planet_omega {}

  Nominal axial velocity of the earth.
- EphemerisOrientation orient_interface

  The ephemeris interface to the in question orientation.

Friends

- class InputProcessor
- void init_attrjeod__PlanetOrientation ()

8.5.1 Detailed Description

The generic framework for orientation models to interact with a DynManager object.

Definition at line 97 of file planet_orientation.hh.

8.5.2 Constructor & Destructor Documentation

8.5.2.1 PlanetOrientation() [1/2]

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

8.5.2.2 ~PlanetOrientation()

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

8.5.2.3 PlanetOrientation() [2/2]

```
jeod::PlanetOrientation::PlanetOrientation (
            const PlanetOrientation & rhs )  [delete]
```

8.5.3 Member Function Documentation

8.5.3.1 activate()

```
void jeod::PlanetOrientation::activate ( )  [override]
```

Activates the PlanetOrientation model.

Definition at line 114 of file planet_orientation.cc.

References active.

8.5.3.2 deactivate()

```
void jeod::PlanetOrientation::deactivate ( )  [override]
```

Deactivates the PlanetOrientation model.

Definition at line 122 of file planet_orientation.cc.

References active.

8.5.3.3 ephem_activate()

```
void jeod::PlanetOrientation::ephem_activate (
            EphemeridesManager & manager )  [override]
```

Mark the model as being activate or inactive.

Parameters

in,out	*manager*	ephemerides manager

Definition at line 144 of file planet_orientation.cc.

8.5.3.4 ephem_build_tree()

```
void jeod::PlanetOrientation::ephem_build_tree (
            EphemeridesManager & manager )  [override]
```

Function, for a particular ephemeris model, nominally builds the particular models portions of the reference frame tree.

This implementation, by default, does nothing

Parameters

in,out	*manager*	ephemerides manager

Definition at line 156 of file planet_orientation.cc.

8.5.3.5 ephem_initialize()

```
void jeod::PlanetOrientation::ephem_initialize (
            EphemeridesManager & manager )  [override]
```

Implements the EphemInterface pure virtual function ephem_initialize.

Note that the stand alone "initialize" function MUST be called before this function. Normal operating procedure is the DynamicsManager calls this function, not the user.

Parameters

in,out	*manager*	ephemerides manager

Definition at line 135 of file planet_orientation.cc.

8.5.3.6 get_name()

```
std::string jeod::PlanetOrientation::get_name ( ) const  [override], [pure virtual]
```

A re-declaration of the pure virtual function in order to convince trick that yes, this is a pure virtual class.

Returns

Planet name.

Implemented in jeod::PlanetRNP, jeod::RNPMars, and jeod::RNPJ2000.

8.5.3.7 initialize()

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

Goes to the dyn manager given and searches for the planet indicated by the user inputted name, in the given dyn manager.

Will send a fail message if the named planet is not found. Additionally, this will register this ephemeris interface with the given DynManager, and will set up the contained EphemerisOrientation to control the named planet.

Parameters

in,out	*dyn_manager*	DynManager where the attitude will be applied

Reimplemented in jeod::RNPMars, and jeod::RNPJ2000.

Definition at line 65 of file planet_orientation.cc.

References jeod::RNPMessages::initialization_error, name, orient_interface, planet, planet_omega, and planet_rot_state.

Referenced by jeod::RNPJ2000::initialize(), and jeod::RNPMars::initialize().

8.5.3.8 operator=()

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

8.5.3.9 set_name()

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

Setter for the name.

Definition at line 167 of file planet_orientation.hh.

8.5.4 Friends And Related Function Documentation

8.5.4.1 init_attrjeod__PlanetOrientation

```
void init_attrjeod__PlanetOrientation ( )  [friend]
```

8.5.4.2 InputProcessor

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

Definition at line 100 of file planet_orientation.hh.

8.5.5 Field Documentation

8.5.5.1 active

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

Is the orientation model actively updating? Defaults to true.

trick_units(–)

Definition at line 118 of file planet_orientation.hh.

Referenced by activate(), deactivate(), jeod::RNPJ2000::ephem_update(), jeod::RNPMars::ephem_update(), jeod::RNPJ2000::update_axial_rotation(), jeod::RNPMars::update_axial_rotation(), jeod::RNPJ2000::update_↩ rnp(), and jeod::RNPMars::update_rnp().

8.5.5.2 name

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

Name of the planet the attitude model will be working on.

Planet must be found in the DynManager sent in at initializationtrick_units(–)

Definition at line 129 of file planet_orientation.hh.

Referenced by jeod::RNPJ2000_rnp_j2000_default_data::initialize(), jeod::RNPMars_rnp_mars_default_data↩ ::initialize(), and initialize().

8.5.5.3 orient_interface

```
EphemerisOrientation jeod::PlanetOrientation::orient_interface
```

The ephemeris interface to the in question orientation.

trick_units(–)

Definition at line 162 of file planet_orientation.hh.

Referenced by jeod::RNPJ2000::ephem_update(), jeod::RNPMars::ephem_update(), and initialize().

8.5.5.4 planet

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

The planet the attitude model will be working on.

trick_units(–)

Definition at line 123 of file planet_orientation.hh.

Referenced by initialize(), jeod::RNPJ2000::update_axial_rotation(), jeod::RNPMars::update_axial_rotation(), jeod::RNPJ2000::update_rnp(), and jeod::RNPMars::update_rnp().

8.5.5.5 planet_omega

```
double jeod::PlanetOrientation::planet_omega {}
```

Nominal axial velocity of the earth.

trick_units(rad/s)

Definition at line 139 of file planet_orientation.hh.

Referenced by jeod::RNPJ2000_rnp_j2000_default_data::initialize(), jeod::RNPMars_rnp_mars_default_data↩ ::initialize(), initialize(), jeod::RNPJ2000::initialize(), jeod::RNPMars::initialize(), and jeod::PlanetRNP::propagate↩ _rnp().

8.5.5.6 planet_rot_state

```
RefFrameRot* jeod::PlanetOrientation::planet_rot_state {}
```

The current rotational state of the planet.

trick_units(–)

Definition at line 134 of file planet_orientation.hh.

Referenced by initialize(), and jeod::PlanetRNP::propagate_rnp().

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

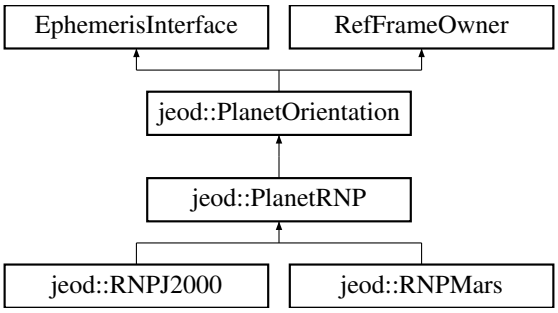
- planet_orientation.hh
- planet_orientation.cc

8.6 jeod::PlanetRNP Class Reference

The generic framework for orientation models based on the RNP paradigm.

`#include <planet_rnp.hh>`

Inheritance diagram for jeod::PlanetRNP:



Public Types

- enum RNPFidelity { FullRNP = 0, RotationOnly = 1, ConstantNP = 2 }

  Specifies the initialization fidelity of the RNP model.

Public Member Functions

- PlanetRNP ()=default
- ~PlanetRNP () override=default
- PlanetRNP & operator= (const PlanetRNP &rhs)=delete
- PlanetRNP (const PlanetRNP &rhs)=delete
- void update_rnp ()

  Invokes the calculation for all rotation models contained in the RNP, used on the last time set in each model through PlanetRotation::set_time.
- void update_axial_rotation ()

  Same as update_rnp, but only the axial_rotation will be updated.
- void propagate_rnp ()

  Multiples out the (up to) four planet rotation models (nutation, precession, polar motion and rotation), leaving out models whose pointers are NULL, and feeds it to the planet attitude found in the dyn manager given in initialize.
- std::string get_name () const override=0

  A re-declaration of the pure virtual function in order to convince trick that yes, this is a pure virtual class.

Data Fields

- PlanetRotation * nutation {}

  Pointer to the nutation model.
- PlanetRotation * precession {}

  Pointer to the precession model.
- PlanetRotation * polar_motion {}

  Pointer to the polar_motion model.
- PlanetRotation * rotation {}

  Pointer to the rotation model.
- RNPFidelity rnp_type {FullRNP}

  The fidelity of the RNP model.
- bool enable_polar {true}

  Gives the option of turning on or off polar motion.
- double NP_matrix [3][3] {IDENTITY_3X3}

  *Rotation Matrix representing: transpose(nutation->rotation) * transpose(precession->rotation)*

Protected Attributes

- double scratch_matrix [3][3] {}

  A transformation matrix used for intermediate math steps.

Friends

- class InputProcessor
- void init_attrjeod__PlanetRNP ()

8.6.1 Detailed Description

The generic framework for orientation models based on the RNP paradigm.

Definition at line 107 of file planet_rnp.hh.

8.6.2 Member Enumeration Documentation

8.6.2.1 RNPFidelity

```
enum jeod::PlanetRNP::RNPFidelity
```

Specifies the initialization fidelity of the RNP model.

Enumerator

FullRNP	Full fidelity RNP matrix. Formerly Full_Term_RNP.
RotationOnly	Identity NP matrix, then rotation calculates linearly.
ConstantNP	Once calculated NP matrix (at the start), then rotation.

Definition at line 115 of file planet_rnp.hh.

8.6.3 Constructor & Destructor Documentation

8.6.3.1 PlanetRNP() [1/2]

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

8.6.3.2 ~PlanetRNP()

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

8.6.3.3 PlanetRNP() [2/2]

```
jeod::PlanetRNP::PlanetRNP (
            const PlanetRNP & rhs )  [delete]
```

8.6.4 Member Function Documentation

8.6.4.1 get_name()

```
std::string jeod::PlanetRNP::get_name ( ) const  [override], [pure virtual]
```

A re-declaration of the pure virtual function in order to convince trick that yes, this is a pure virtual class.

Returns

Planet name.

Implements jeod::PlanetOrientation.

Implemented in jeod::RNPMars, and jeod::RNPJ2000.

8.6.4.2 operator=()

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

8.6.4.3 propagate_rnp()

```
void jeod::PlanetRNP::propagate_rnp ( )
```

Multiples out the (up to) four planet rotation models (nutation, precession, polar motion and rotation), leaving out models whose pointers are NULL, and feeds it to the planet attitude found in the dyn manager given in initialize.

Definition at line 176 of file planet_rnp.cc.

References ConstantNP, enable_polar, jeod::RNPMessages::fidelity_error, FullRNP, NP_matrix, jeod::PlanetOrientation::planet_omega, jeod::PlanetOrientation::planet_rot_state, polar_motion, rnp_type, jeod::PlanetRotation::rotation, rotation, RotationOnly, scratch_matrix, and jeod::RNPMessages::setup_error.

Referenced by update_axial_rotation(), and update_rnp().

8.6.4.4 update_axial_rotation()

```
void jeod::PlanetRNP::update_axial_rotation ( )
```

Same as update_rnp, but only the axial_rotation will be updated.

Definition at line 151 of file planet_rnp.cc.

References propagate_rnp(), rotation, jeod::RNPMessages::setup_error, and jeod::PlanetRotation::update_↩ rotation().

Referenced by jeod::RNPJ2000::ephem_update(), jeod::RNPMars::ephem_update(), jeod::RNPJ2000::update_↩ axial_rotation(), and jeod::RNPMars::update_axial_rotation().

8.6.4.5 update_rnp()

```
void jeod::PlanetRNP::update_rnp ( )
```

Invokes the calculation for all rotation models contained in the RNP, used on the last time set in each model through PlanetRotation::set_time.

Then multiplies out and updates the attitude of the planet found during initialization.

Definition at line 75 of file planet_rnp.cc.

References enable_polar, jeod::RNPMessages::fidelity_error, FullRNP, NP_matrix, nutation, polar_motion, precession, propagate_rnp(), rnp_type, jeod::PlanetRotation::rotation, rotation, jeod::RNPMessages::setup_error, and jeod::PlanetRotation::update_rotation().

Referenced by jeod::RNPJ2000::update_rnp(), and jeod::RNPMars::update_rnp().

8.6.5 Friends And Related Function Documentation

8.6.5.1 init_attrjeod__PlanetRNP

```
void init_attrjeod__PlanetRNP ( )  [friend]
```

8.6.5.2 InputProcessor

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

Definition at line 109 of file planet_rnp.hh.

8.6.6 Field Documentation

8.6.6.1 enable_polar

```
bool jeod::PlanetRNP::enable_polar {true}
```

Gives the option of turning on or off polar motion.

trick_units(–)

Definition at line 157 of file planet_rnp.hh.

Referenced by jeod::RNPJ2000_rnp_j2000_default_data::initialize(), jeod::RNPMars_rnp_mars_default_data↩ ::initialize(), propagate_rnp(), jeod::RNPMars::RNPMars(), jeod::RNPJ2000::update_rnp(), and update_rnp().

8.6.6.2 NP_matrix

```
double jeod::PlanetRNP::NP_matrix[3][3] {IDENTITY_3X3}
```

Rotation Matrix representing: transpose(nutation->rotation) * transpose(precession->rotation)

trick_units(–)

Definition at line 163 of file planet_rnp.hh.

Referenced by propagate_rnp(), and update_rnp().

8.6.6.3 nutation

```
PlanetRotation* jeod::PlanetRNP::nutation {}
```

Pointer to the nutation model.

trick_units(–)

Definition at line 132 of file planet_rnp.hh.

Referenced by jeod::RNPJ2000::RNPJ2000(), jeod::RNPMars::RNPMars(), jeod::RNPJ2000::update_rnp(), update_rnp(), and jeod::RNPMars::update_rnp().

8.6.6.4 polar_motion

```
PlanetRotation* jeod::PlanetRNP::polar_motion {}
```

Pointer to the polar_motion model.

trick_units(–)

Definition at line 142 of file planet_rnp.hh.

Referenced by propagate_rnp(), jeod::RNPJ2000::RNPJ2000(), jeod::RNPMars::RNPMars(), jeod::RNPJ2000↩ ::update_rnp(), and update_rnp().

8.6.6.5 precession

```
PlanetRotation* jeod::PlanetRNP::precession {}
```

Pointer to the precession model.

trick_units(–)

Definition at line 137 of file planet_rnp.hh.

Referenced by jeod::RNPJ2000::RNPJ2000(), jeod::RNPMars::RNPMars(), jeod::RNPJ2000::update_rnp(), update_rnp(), and jeod::RNPMars::update_rnp().

8.6.6.6 rnp_type

```
RNPFidelity jeod::PlanetRNP::rnp_type {FullRNP}
```

The fidelity of the RNP model.

trick_units(–)

Definition at line 152 of file planet_rnp.hh.

Referenced by jeod::RNPJ2000_rnp_j2000_default_data::initialize(), jeod::RNPMars_rnp_mars_default_data↩ ::initialize(), jeod::RNPJ2000::initialize(), jeod::RNPMars::initialize(), propagate_rnp(), jeod::RNPJ2000::update_↩ axial_rotation(), jeod::RNPMars::update_axial_rotation(), jeod::RNPJ2000::update_rnp(), update_rnp(), and jeod↩ ::RNPMars::update_rnp().

8.6.6.7 rotation

```
PlanetRotation* jeod::PlanetRNP::rotation {}
```

Pointer to the rotation model.

trick_units(–)

Definition at line 147 of file planet_rnp.hh.

Referenced by propagate_rnp(), jeod::RNPJ2000::RNPJ2000(), jeod::RNPMars::RNPMars(), jeod::RNPJ2000↩ ::update_axial_rotation(), jeod::RNPMars::update_axial_rotation(), update_axial_rotation(), jeod::RNPJ2000↩ ::update_rnp(), update_rnp(), and jeod::RNPMars::update_rnp().

8.6.6.8 scratch_matrix

```
double jeod::PlanetRNP::scratch_matrix[3][3] {}  [protected]
```

A transformation matrix used for intermediate math steps.

trick_units(–)

Definition at line 169 of file planet_rnp.hh.

Referenced by propagate_rnp().

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

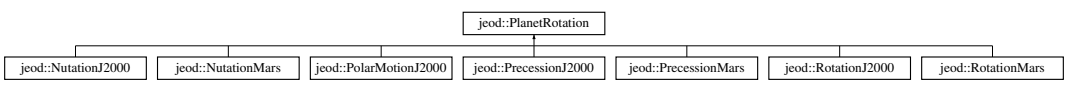
- planet_rnp.hh
- planet_rnp.cc

8.7 jeod::PlanetRotation Class Reference

The generic base class for all planet transformations.

```
#include <planet_rotation.hh>
```

Inheritance diagram for jeod::PlanetRotation:



Public Member Functions

- PlanetRotation ()=default
- virtual ~PlanetRotation ()=default
- PlanetRotation & operator= (const PlanetRotation &)=delete
- PlanetRotation (const PlanetRotation &)=delete
- virtual void update_rotation ()

  Updates the rotation of this particular object, based on the last time set in "set_time".
- virtual void initialize (PlanetRotationInit *init)

  Initializes the invoking object from an initialization object.
- virtual void update_time (double time)

  Update the time that the next update_rotation call will use.
- void get_rotation (double rot[3][3])

  Copy the last calculated rotation to 'rot'.
- void get_rotation_transpose (double rot[3][3])

  Same as get_rotation, but returns the transpose.

Data Fields

- double rotation [3][3] {IDENTITY_3X3}

  The transformation matrix outputted by the model after update is called.
- double current_time {}

  The current time the transformation matrix will be calculated from.

Protected Attributes

- double RADTODEG {180.0 / M_PI}

  Convert from radians to degrees.
- double DEGTORAD {M_PI / 180.0}

  Inverse of RADTODEG.
- double DEGTOSEC {60.0 * 60.0}

  Convert from degrees to arcseconds.
- double SECTODEG {1.0 / (60.0 * 60.0)}

  Inverse of DEGTOSEC.
- double JULIANDAYTOSEC {86400.0}

  Convert from julian day to seconds.
- double SECTOJULIANDAY {1.0 / 86400.0}

  Inverse of JULIANDAYTOSEC.
- double JULIANCENTTODAY {36525.0}

  Convert from julian centuries to julian days.
- double DAYTOJULIANCENT {1.0 / 36525.0}

  Inverse of JULIANCENTTODAY.

Friends

- class InputProcessor
- void init_attrjeod__PlanetRotation ()

8.7.1 Detailed Description

The generic base class for all planet transformations.

Definition at line 94 of file planet_rotation.hh.

8.7.2 Constructor & Destructor Documentation

8.7.2.1 PlanetRotation() [1/2]

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

8.7.2.2 ~PlanetRotation()

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

8.7.2.3 PlanetRotation() [2/2]

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

8.7.3 Member Function Documentation

8.7.3.1 get_rotation()

```
void jeod::PlanetRotation::get_rotation (
            double rot[3][3] )
```

Copy the last calculated rotation to 'rot'.

Parameters

out	*rot*	Where the rotation matrix will be stored

Definition at line 59 of file planet_rotation.cc.

References rotation.

8.7.3.2 get_rotation_transpose()

```
void jeod::PlanetRotation::get_rotation_transpose (
            double rot[3][3] )
```

Same as get_rotation, but returns the transpose.

Parameters

out	*rot*	Where the transpose matrix will be stored

Definition at line 68 of file planet_rotation.cc.

References rotation.

8.7.3.3 initialize()

```
virtual void jeod::PlanetRotation::initialize (
            PlanetRotationInit * init )  [inline], [virtual]
```

Initializes the invoking object from an initialization object.

Parameters

in	*init*	The object that will initialize the invoking object.

Reimplemented in jeod::NutationJ2000, and jeod::PolarMotionJ2000.

Definition at line 195 of file planet_rotation.hh.

8.7.3.4 operator=()

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

8.7.3.5 update_rotation()

```
virtual void jeod::PlanetRotation::update_rotation ( )  [inline], [virtual]
```

Updates the rotation of this particular object, based on the last time set in "set_time".

Reimplemented in jeod::NutationJ2000, jeod::NutationMars, jeod::PrecessionMars, jeod::RotationMars, jeod::PolarMotionJ2000, jeod::RotationJ2000, and jeod::PrecessionJ2000.

Definition at line 171 of file planet_rotation.hh.

Referenced by jeod::PlanetRNP::update_axial_rotation(), and jeod::PlanetRNP::update_rnp().

8.7.3.6 update_time()

```
void jeod::PlanetRotation::update_time (
             double time )  [virtual]
```

Update the time that the next update_rotation call will use.

Parameters

in	*time*	Time. units and UTC/UT1/TAI etc are determined by the individual PlanetRotation model

Definition at line 50 of file planet_rotation.cc.

References current_time.

Referenced by jeod::RNPJ2000::update_axial_rotation(), jeod::RNPMars::update_axial_rotation(), jeod::RNP↩J2000::update_rnp(), and jeod::RNPMars::update_rnp().

8.7.4 Friends And Related Function Documentation

8.7.4.1 init_attrjeod__PlanetRotation

```
void init_attrjeod__PlanetRotation ( )  [friend]
```

8.7.4.2 InputProcessor

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

Definition at line 96 of file planet_rotation.hh.

8.7.5 Field Documentation

8.7.5.1 current_time

```
double jeod::PlanetRotation::current_time {}
```

The current time the transformation matrix will be calculated from.

Unitless so that models with different time scales can be used with one underlying modeltrick_units(–)

Definition at line 109 of file planet_rotation.hh.

Referenced by jeod::PrecessionJ2000::update_rotation(), jeod::RotationJ2000::update_rotation(), jeod::Polar↩MotionJ2000::update_rotation(), jeod::RotationMars::update_rotation(), jeod::PrecessionMars::update_rotation(), jeod::NutationMars::update_rotation(), jeod::NutationJ2000::update_rotation(), and update_time().

8.7.5.2 DAYTOJULIANCENT

```
double jeod::PlanetRotation::DAYTOJULIANCENT {1.0 / 36525.0}  [protected]
```

Inverse of JULIANCENTTODAY.

trick_units(–)

Definition at line 153 of file planet_rotation.hh.

8.7.5.3 DEGTORAD

```
double jeod::PlanetRotation::DEGTORAD {M_PI / 180.0}  [protected]
```

Inverse of RADTODEG.

trick_units(rad/degree)

Definition at line 123 of file planet_rotation.hh.

Referenced by jeod::PrecessionJ2000::update_rotation(), jeod::RotationJ2000::update_rotation(), and jeod::↩NutationJ2000::update_rotation().

8.7.5.4 DEGTOSEC

```
double jeod::PlanetRotation::DEGTOSEC {60.0 * 60.0}  [protected]
```

Convert from degrees to arcseconds.

trick_units(arcsecond/degree)

Definition at line 128 of file planet_rotation.hh.

Referenced by jeod::PrecessionJ2000::update_rotation().

8.7.5.5 JULIANCENTTODAY

```
double jeod::PlanetRotation::JULIANCENTTODAY {36525.0}  [protected]
```

Convert from julian centuries to julian days.

trick_units(–)

Definition at line 148 of file planet_rotation.hh.

8.7.5.6 JULIANDAYTOSEC

```
double jeod::PlanetRotation::JULIANDAYTOSEC {86400.0}  [protected]
```

Convert from julian day to seconds.

trick_units(s/day)

Definition at line 138 of file planet_rotation.hh.

8.7.5.7 RADTODEG

```
double jeod::PlanetRotation::RADTODEG {180.0 / M_PI}  [protected]
```

Convert from radians to degrees.

trick_units(degree/rad)

Definition at line 118 of file planet_rotation.hh.

8.7.5.8 rotation

```
double jeod::PlanetRotation::rotation[3][3] {IDENTITY_3X3}
```

The transformation matrix outputted by the model after update is called.

trick_units(–)

Definition at line 101 of file planet_rotation.hh.

Referenced by get_rotation(), get_rotation_transpose(), jeod::PlanetRNP::propagate_rnp(), jeod::PlanetRNP↩ ::update_rnp(), jeod::PrecessionJ2000::update_rotation(), jeod::RotationJ2000::update_rotation(), jeod::Polar↩ MotionJ2000::update_rotation(), jeod::RotationMars::update_rotation(), jeod::PrecessionMars::update_rotation(), jeod::NutationMars::update_rotation(), and jeod::NutationJ2000::update_rotation().

8.7.5.9 SECTODEG

```
double jeod::PlanetRotation::SECTODEG {1.0 / (60.0 * 60.0)}  [protected]
```

Inverse of DEGTOSEC.

trick_units(degree/arcsecond)

Definition at line 133 of file planet_rotation.hh.

8.7.5.10 SECTOJULIANDAY

```
double jeod::PlanetRotation::SECTOJULIANDAY {1.0 / 86400.0}  [protected]
```

Inverse of JULIANDAYTOSEC.

trick_units(day/s)

Definition at line 143 of file planet_rotation.hh.

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

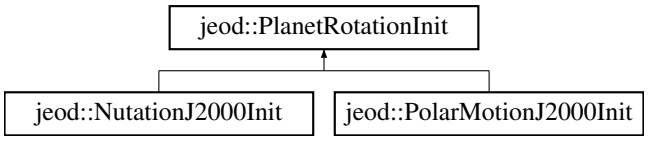
- planet_rotation.hh
- planet_rotation.cc

8.8 jeod::PlanetRotationInit Class Reference

The generic base class for all initializing classes for PlanetRotation derived classes.

```
#include <planet_rotation_init.hh>
```

Inheritance diagram for jeod::PlanetRotationInit:



Public Member Functions

- PlanetRotationInit ()=default
- virtual ~PlanetRotationInit ()=default
- PlanetRotationInit & operator= (const PlanetRotationInit &)=delete
- PlanetRotationInit (const PlanetRotationInit &)=delete

Friends

- class InputProcessor
- void init_attrjeod__PlanetRotationInit ()

8.8.1 Detailed Description

The generic base class for all initializing classes for PlanetRotation derived classes.

Definition at line 84 of file planet_rotation_init.hh.

8.8.2 Constructor & Destructor Documentation

8.8.2.1 PlanetRotationInit() [1/2]

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

8.8.2.2 ~PlanetRotationInit()

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

8.8.2.3 PlanetRotationInit() [2/2]

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

8.8.3 Member Function Documentation

8.8.3.1 operator=()

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

8.8.4 Friends And Related Function Documentation

8.8.4.1 init_attrjeod__PlanetRotationInit

```
void init_attrjeod__PlanetRotationInit ( )  [friend]
```

8.8.4.2 InputProcessor

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

Definition at line 86 of file planet_rotation_init.hh.

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

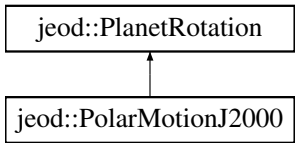
- planet_rotation_init.hh

8.9 jeod::PolarMotionJ2000 Class Reference

Implements the polar motion portion of the J2000 RNP.

```
#include <polar_motion_j2000.hh>
```

Inheritance diagram for jeod::PolarMotionJ2000:



Public Member Functions

- PolarMotionJ2000 ()=default
- ~PolarMotionJ2000 () override

  Destructor.
- PolarMotionJ2000 & operator= (const PolarMotionJ2000 &)=delete
- PolarMotionJ2000 (const PolarMotionJ2000 &)=delete
- void update_rotation () override

  PolarMotionJ2000 specific implementaiton of update_rotation from PlanetRotation.
- void initialize (PlanetRotationInit *init) override

  Initialize the coefficients of PolarMotionJ2000.

Data Fields

- double xp {}

  Current X Polar coordinate.
- double yp {}

  Current Y Polar coordinate.
- double * xp_tbl {}

  X Polar coordinate table.
- double * yp_tbl {}

  Y Polar coordinate table.
- double * polar_mjd {}

  Independent variable for the XY coordinate table.
- bool override_table {}

  If true, do no table lookup and use the currently set xp and yp.
- unsigned int last_table_index {}

  Size - 1 of xp_tbl, yp_tbl and polar_mjd (last index)
- bool warn_table {}

  Have we warned about being off the table end?

Friends

- class InputProcessor
- void init_attrjeod__PolarMotionJ2000 ()

Additional Inherited Members

8.9.1 Detailed Description

Implements the polar motion portion of the J2000 RNP.

Definition at line 89 of file polar_motion_j2000.hh.

8.9.2 Constructor & Destructor Documentation

8.9.2.1 PolarMotionJ2000() [1/2]

```
jeod::PolarMotionJ2000::PolarMotionJ2000 ( )  [default]
```

8.9.2.2 ~PolarMotionJ2000()

```
jeod::PolarMotionJ2000::~PolarMotionJ2000 ( )  [override]
```

Destructor.

Definition at line 61 of file polar_motion_j2000.cc.

References polar_mjd, xp_tbl, and yp_tbl.

8.9.2.3 PolarMotionJ2000() [2/2]

```
jeod::PolarMotionJ2000::PolarMotionJ2000 (
            const PolarMotionJ2000 &  )  [delete]
```

8.9.3 Member Function Documentation

8.9.3.1 initialize()

```
void jeod::PolarMotionJ2000::initialize (
            PlanetRotationInit * init )  [override], [virtual]
```

Initialize the coefficients of PolarMotionJ2000.

init must be of type PolarMotionJ2000Init or a fail message will occur.

Parameters

in	*init*	PolarMotionJ2000Init with needed coefficients

Reimplemented from jeod::PlanetRotation.

Definition at line 175 of file polar_motion_j2000.cc.

References jeod::RNPMessages::initialization_error, last_table_index, override_table, polar_mjd, xp, xp_tbl, yp, and yp_tbl.

8.9.3.2 operator=()

```
PolarMotionJ2000& jeod::PolarMotionJ2000::operator= (
            const PolarMotionJ2000 &  )  [delete]
```

8.9.3.3 update_rotation()

```
void jeod::PolarMotionJ2000::update_rotation ( )  [override], [virtual]
```

PolarMotionJ2000 specific implementaiton of update_rotation from PlanetRotation.

Reimplemented from jeod::PlanetRotation.

Definition at line 72 of file polar_motion_j2000.cc.

References jeod::PlanetRotation::current_time, last_table_index, override_table, polar_mjd, jeod::RNPMessages↩
::polar_motion_table_warning, jeod::PlanetRotation::rotation, warn_table, xp, xp_tbl, yp, and yp_tbl.

8.9.4 Friends And Related Function Documentation

8.9.4.1 init_attrjeod__PolarMotionJ2000

```
void init_attrjeod__PolarMotionJ2000 ( )  [friend]
```

8.9.4.2 InputProcessor

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

Definition at line 91 of file polar_motion_j2000.hh.

8.9.5 Field Documentation

8.9.5.1 last_table_index

```
unsigned int jeod::PolarMotionJ2000::last_table_index {}
```

Size - 1 of xp_tbl, yp_tbl and polar_mjd (last index)

trick_units(count)

Definition at line 126 of file polar_motion_j2000.hh.

Referenced by initialize(), and update_rotation().

8.9.5.2 override_table

```
bool jeod::PolarMotionJ2000::override_table {}
```

If true, do no table lookup and use the currently set xp and yp.

trick_units(–)

Definition at line 121 of file polar_motion_j2000.hh.

Referenced by initialize(), and update_rotation().

8.9.5.3 polar_mjd

```
double* jeod::PolarMotionJ2000::polar_mjd {}
```

Independent variable for the XY coordinate table.

trick_units(–)

Definition at line 115 of file polar_motion_j2000.hh.

Referenced by initialize(), update_rotation(), and ∼PolarMotionJ2000().

8.9.5.4 warn_table

```
bool jeod::PolarMotionJ2000::warn_table {}
```

Have we warned about being off the table end?

trick_units(–)

Definition at line 131 of file polar_motion_j2000.hh.

Referenced by update_rotation().

8.9.5.5 xp

```
double jeod::PolarMotionJ2000::xp {}
```

Current X Polar coordinate.

trick_units(rad)

Definition at line 95 of file polar_motion_j2000.hh.

Referenced by initialize(), and update_rotation().

8.9.5.6 xp_tbl

```
double* jeod::PolarMotionJ2000::xp_tbl {}
```

X Polar coordinate table.

trick_units(rad)

Definition at line 105 of file polar_motion_j2000.hh.

Referenced by initialize(), update_rotation(), and ~PolarMotionJ2000().

8.9.5.7 yp

```
double jeod::PolarMotionJ2000::yp {}
```

Current Y Polar coordinate.

trick_units(rad)

Definition at line 100 of file polar_motion_j2000.hh.

Referenced by initialize(), and update_rotation().

8.9.5.8 yp_tbl

```
double* jeod::PolarMotionJ2000::yp_tbl {}
```

Y Polar coordinate table.

trick_units(rad)

Definition at line 110 of file polar_motion_j2000.hh.

Referenced by initialize(), update_rotation(), and ~PolarMotionJ2000().

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

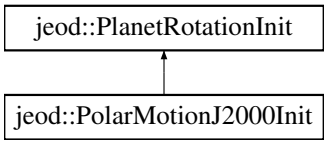
- polar_motion_j2000.hh
- polar_motion_j2000.cc

8.10 jeod::PolarMotionJ2000Init Class Reference

Initializes the PolarMotionJ2000 object.

`#include <polar_motion_j2000_init.hh>`

Inheritance diagram for jeod::PolarMotionJ2000Init:



Public Member Functions

- PolarMotionJ2000Init ()=default
- ~PolarMotionJ2000Init () override

  Destructor.
- PolarMotionJ2000Init & operator= (const PolarMotionJ2000Init &)=delete
- PolarMotionJ2000Init (const PolarMotionJ2000Init &)=delete

Data Fields

- double xp {}

  Current X Polar coordinate.
- double yp {}

  Current Y Polar coordinate.
- double * xp_tbl {}

  X Polar coordinate table.
- double * yp_tbl {}

  Y Polar coordinate table.
- double * polar_mjd {}

  Independent variable for the XY coordinate table.
- bool override_table {}

  If true, do no table lookup and use the currently set xp and yp.
- unsigned int last_table_index {}

  Size - 1 of xp_tbl, yp_tbl and polar_mjd (last index)

Friends

- class InputProcessor
- void init_attrjeod__PolarMotionJ2000Init ()

8.10.1 Detailed Description

Initializes the PolarMotionJ2000 object.

Definition at line 89 of file polar_motion_j2000_init.hh.

8.10.2 Constructor & Destructor Documentation

8.10.2.1 PolarMotionJ2000Init() [1/2]

```
jeod::PolarMotionJ2000Init::PolarMotionJ2000Init ( )  [default]
```

8.10.2.2 ~PolarMotionJ2000Init()

```
jeod::PolarMotionJ2000Init::~PolarMotionJ2000Init ( )  [override]
```

Destructor.

Definition at line 52 of file polar_motion_j2000_init.cc.

References polar_mjd, xp_tbl, and yp_tbl.

8.10.2.3 PolarMotionJ2000Init() [2/2]

```
jeod::PolarMotionJ2000Init::PolarMotionJ2000Init (
            const PolarMotionJ2000Init &  )  [delete]
```

8.10.3 Member Function Documentation

8.10.3.1 operator=()

```
PolarMotionJ2000Init& jeod::PolarMotionJ2000Init::operator= (
            const PolarMotionJ2000Init &  )  [delete]
```

8.10.4 Friends And Related Function Documentation

8.10.4.1 init_attrjeod__PolarMotionJ2000Init

```
void init_attrjeod__PolarMotionJ2000Init ( )  [friend]
```

8.10.4.2 InputProcessor

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

Definition at line 91 of file polar_motion_j2000_init.hh.

8.10.5 Field Documentation

8.10.5.1 last_table_index

```
unsigned int jeod::PolarMotionJ2000Init::last_table_index {}
```

Size - 1 of xp_tbl, yp_tbl and polar_mjd (last index)

trick_units(count)

Definition at line 128 of file polar_motion_j2000_init.hh.

Referenced by jeod::PolarMotionJ2000Init_xpyp_daily_default_data::initialize(), and jeod::PolarMotionJ2000Init_↩xpyp_monthly_default_data::initialize().

8.10.5.2 override_table

```
bool jeod::PolarMotionJ2000Init::override_table {}
```

If true, do no table lookup and use the currently set xp and yp.

trick_units(–)

Definition at line 123 of file polar_motion_j2000_init.hh.

Referenced by jeod::PolarMotionJ2000Init_xpyp_daily_default_data::initialize(), and jeod::PolarMotionJ2000Init_↩xpyp_monthly_default_data::initialize().

8.10.5.3 polar_mjd

```
double* jeod::PolarMotionJ2000Init::polar_mjd {}
```

Independent variable for the XY coordinate table.

trick_units(–)

Definition at line 117 of file polar_motion_j2000_init.hh.

Referenced by jeod::PolarMotionJ2000Init_xpyp_daily_default_data::initialize(), jeod::PolarMotionJ2000Init_xpyp↩_monthly_default_data::initialize(), and ∼PolarMotionJ2000Init().

8.10.5.4 xp

```
double jeod::PolarMotionJ2000Init::xp {}
```

Current X Polar coordinate.

trick_units(rad)

Definition at line 97 of file polar_motion_j2000_init.hh.

8.10.5.5 xp_tbl

```
double* jeod::PolarMotionJ2000Init::xp_tbl {}
```

X Polar coordinate table.

trick_units(rad)

Definition at line 107 of file polar_motion_j2000_init.hh.

Referenced by jeod::PolarMotionJ2000Init_xpyp_daily_default_data::initialize(), jeod::PolarMotionJ2000Init_xpyp↩_monthly_default_data::initialize(), and ~PolarMotionJ2000Init().

8.10.5.6 yp

```
double jeod::PolarMotionJ2000Init::yp {}
```

Current Y Polar coordinate.

trick_units(rad)

Definition at line 102 of file polar_motion_j2000_init.hh.

8.10.5.7 yp_tbl

```
double* jeod::PolarMotionJ2000Init::yp_tbl {}
```

Y Polar coordinate table.

trick_units(rad)

Definition at line 112 of file polar_motion_j2000_init.hh.

Referenced by jeod::PolarMotionJ2000Init_xpyp_daily_default_data::initialize(), jeod::PolarMotionJ2000Init_xpyp↩_monthly_default_data::initialize(), and ~PolarMotionJ2000Init().

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

- polar_motion_j2000_init.hh
- polar_motion_j2000_init.cc

8.11 jeod::PolarMotionJ2000Init_xpyp_daily_default_data Class Reference

`#include <xpyp_daily.hh>`

Public Member Functions

- void initialize (PolarMotionJ2000Init *)

8.11.1 Detailed Description

Definition at line 55 of file xpyp_daily.hh.

8.11.2 Member Function Documentation

8.11.2.1 initialize()

```
void jeod::PolarMotionJ2000Init_xpyp_daily_default_data::initialize (
            PolarMotionJ2000Init * PolarMotionJ2000Init_ptr )
```

Definition at line 36 of file xpyp_daily.cc.

References jeod::PolarMotionJ2000Init::last_table_index, jeod::PolarMotionJ2000Init::override_table, jeod::PolarMotionJ2000Init::polar_mjd, jeod::PolarMotionJ2000Init::xp_tbl, and jeod::PolarMotionJ2000Init::yp_tbl.

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

- xpyp_daily.hh
- xpyp_daily.cc

8.12 jeod::PolarMotionJ2000Init_xpyp_monthly_default_data Class Reference

`#include <xpyp_monthly.hh>`

Public Member Functions

- void initialize (PolarMotionJ2000Init *)

8.12.1 Detailed Description

Definition at line 55 of file xpyp_monthly.hh.

8.12.2 Member Function Documentation

8.12.2.1 initialize()

```
void jeod::PolarMotionJ2000Init_xpyp_monthly_default_data::initialize (
            PolarMotionJ2000Init * PolarMotionJ2000Init_ptr )
```

Definition at line 36 of file xpyp_monthly.cc.

References jeod::PolarMotionJ2000Init::last_table_index, jeod::PolarMotionJ2000Init::override_table, jeod::Polar↩ MotionJ2000Init::polar_mjd, jeod::PolarMotionJ2000Init::xp_tbl, and jeod::PolarMotionJ2000Init::yp_tbl.

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

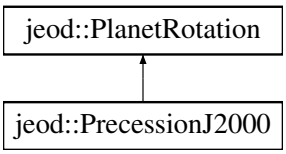
- xpyp_monthly.hh
- xpyp_monthly.cc

8.13 jeod::PrecessionJ2000 Class Reference

Implements the precession portion of the J2000 RNP.

```
#include <precession_j2000.hh>
```

Inheritance diagram for jeod::PrecessionJ2000:



Public Member Functions

- PrecessionJ2000 ()=default
- ~PrecessionJ2000 () override=default
- PrecessionJ2000 & operator= (const PrecessionJ2000 &)=delete
- PrecessionJ2000 (const PrecessionJ2000 &)=delete
- void update_rotation () override

  Precession J2000 specific implementation of update_rotation, inherited from Planetrotation.

Friends

- class InputProcessor
- void init_attrjeod__PrecessionJ2000 ()

Additional Inherited Members

8.13.1 Detailed Description

Implements the precession portion of the J2000 RNP.

Definition at line 89 of file precession_j2000.hh.

8.13.2 Constructor & Destructor Documentation

8.13.2.1 PrecessionJ2000() [1/2]

```
jeod::PrecessionJ2000::PrecessionJ2000 ( )  [default]
```

8.13.2.2 ~PrecessionJ2000()

```
jeod::PrecessionJ2000::~PrecessionJ2000 ( )  [override], [default]
```

8.13.2.3 PrecessionJ2000() [2/2]

```
jeod::PrecessionJ2000::PrecessionJ2000 (
            const PrecessionJ2000 &  )  [delete]
```

8.13.3 Member Function Documentation

8.13.3.1 operator=()

```
PrecessionJ2000& jeod::PrecessionJ2000::operator= (
            const PrecessionJ2000 &  )  [delete]
```

8.13.3.2 update_rotation()

```
void jeod::PrecessionJ2000::update_rotation ( )  [override], [virtual]
```

Precession J2000 specific implementation of update_rotation, inherited from Planetrotation.

Reimplemented from jeod::PlanetRotation.

Definition at line 49 of file precession_j2000.cc.

References jeod::PlanetRotation::current_time, jeod::PlanetRotation::DEGTORAD, jeod::PlanetRotation::DEGTOSEC, and jeod::PlanetRotation::rotation.

8.13.4 Friends And Related Function Documentation

8.13.4.1 init_attrjeod__PrecessionJ2000

```
void init_attrjeod__PrecessionJ2000 ( )  [friend]
```

8.13.4.2 InputProcessor

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

Definition at line 91 of file precession_j2000.hh.

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

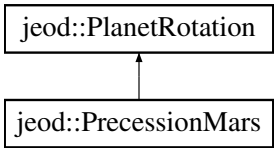
- precession_j2000.hh
- precession_j2000.cc

8.14 jeod::PrecessionMars Class Reference

Implements the axial rotation portion of the "Pathfinder" Mars RNP model.

```
#include <precession_mars.hh>
```

Inheritance diagram for jeod::PrecessionMars:



Public Member Functions

- PrecessionMars ()=default
- ~PrecessionMars () override=default
- PrecessionMars & operator= (const PrecessionMars &)=delete
- PrecessionMars (const PrecessionMars &)=delete
- void update_rotation () override

  PrecessionMars specific implementation of update_rotation, to calculate precession.
- void compute_fixed_matrices ()

  Calculate constant rotation matrices resulting from N and J.

Data Fields

- NutationMars * nutation {}

  Pointer to the Mars nutation object, used to access nutation in longitude information.
- double psi_at_j2000 {}

  The (constant) precession angle of Mars at the J2000 epoch.
- double psi_dot {}

  The (constant) simple precession rate of Mars.
- double psi_precess {}

  The most recent calculated value of the precession angle for Mars, measured since J2000 epoch.
- double N {}

  The (constant) angle from the J2000 vernal equinox to the node of the Mars mean orbit and ICRF x-y plane.
- double J {}

  The (constant) inclination of the Mars mean orbit relative to the ICRF x-y plane.

Private Attributes

- double NJ_matrix [3][3] {}

  The (constant) rotation matrix calculated from N and J.

Friends

- class InputProcessor
- void init_attrjeod__PrecessionMars ()

Additional Inherited Members

8.14.1 Detailed Description

Implements the axial rotation portion of the "Pathfinder" Mars RNP model.

Definition at line 96 of file precession_mars.hh.

8.14.2 Constructor & Destructor Documentation

8.14.2.1 PrecessionMars() [1/2]

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

8.14.2.2 ~PrecessionMars()

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

8.14.2.3 PrecessionMars() [2/2]

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

8.14.3 Member Function Documentation

8.14.3.1 compute_fixed_matrices()

```
void jeod::PrecessionMars::compute_fixed_matrices ( )
```

Calculate constant rotation matrices resulting from N and J.

Definition at line 109 of file precession_mars.cc.

References J, N, and NJ_matrix.

Referenced by jeod::RNPMars::initialize().

8.14.3.2 operator=()

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

8.14.3.3 update_rotation()

```
void jeod::PrecessionMars::update_rotation ( )  [override], [virtual]
```

PrecessionMars specific implementation of update_rotation, to calculate precession.

Reimplemented from jeod::PlanetRotation.

Definition at line 62 of file precession_mars.cc.

References jeod::PlanetRotation::current_time, NJ_matrix, nutation, jeod::NutationMars::nutation_in_longitude, psi_at_j2000, psi_dot, psi_precess, jeod::PlanetRotation::rotation, and jeod::RNPMessages::setup_error.

8.14.4 Friends And Related Function Documentation

8.14.4.1 init_attrjeod__PrecessionMars

```
void init_attrjeod__PrecessionMars ( )  [friend]
```

8.14.4.2 InputProcessor

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

Definition at line 98 of file precession_mars.hh.

8.14.5 Field Documentation

8.14.5.1 J

```
double jeod::PrecessionMars::J {}
```

The (constant) inclination of the Mars mean orbit relative to the ICRF x-y plane.

trick_units(rad)

Definition at line 133 of file precession_mars.hh.

Referenced by compute_fixed_matrices(), and jeod::RNPMars_rnp_mars_default_data::initialize().

8.14.5.2 N

```
double jeod::PrecessionMars::N {}
```

The (constant) angle from the J2000 vernal equinox to the node of the Mars mean orbit and ICRF x-y plane.

trick_units(rad)

Definition at line 127 of file precession_mars.hh.

Referenced by compute_fixed_matrices(), and jeod::RNPMars_rnp_mars_default_data::initialize().

8.14.5.3 NJ_matrix

```
double jeod::PrecessionMars::NJ_matrix[3][3] {}  [private]
```

The (constant) rotation matrix calculated from N and J.

trick_units(–)

Definition at line 140 of file precession_mars.hh.

Referenced by compute_fixed_matrices(), and update_rotation().

8.14.5.4 nutation

```
NutationMars* jeod::PrecessionMars::nutation {}
```

Pointer to the Mars nutation object, used to access nutation in longitude information.

Will be NULL (automatically) if anything but Full_Term_RNP is set in the RNPMars object.trick_units(–)

Definition at line 105 of file precession_mars.hh.

Referenced by jeod::RNPMars::initialize(), and update_rotation().

8.14.5.5 psi_at_j2000

```
double jeod::PrecessionMars::psi_at_j2000 {}
```

The (constant) precession angle of Mars at the J2000 epoch.

trick_units(rad)

Definition at line 110 of file precession_mars.hh.

Referenced by jeod::RNPMars_rnp_mars_default_data::initialize(), and update_rotation().

8.14.5.6 psi_dot

```
double jeod::PrecessionMars::psi_dot {}
```

The (constant) simple precession rate of Mars.

trick_units(rad/s)

Definition at line 115 of file precession_mars.hh.

Referenced by jeod::RNPMars_rnp_mars_default_data::initialize(), and update_rotation().

8.14.5.7 psi_precess

```
double jeod::PrecessionMars::psi_precess {}
```

The most recent calculated value of the precession angle for Mars, measured since J2000 epoch.

trick_units(rad)

Definition at line 121 of file precession_mars.hh.

Referenced by update_rotation().

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

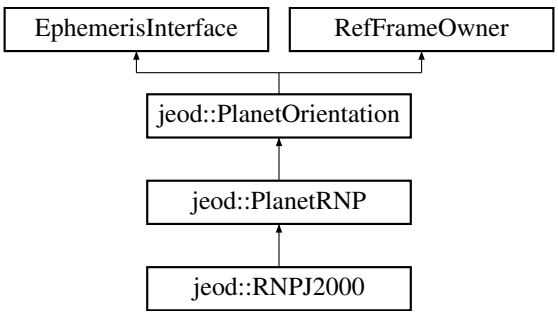
- precession_mars.hh
- precession_mars.cc

8.15 jeod::RNPJ2000 Class Reference

Implements the J2000 RNP model using the generic RNP framework.

```
#include <rnp_j2000.hh>
```

Inheritance diagram for jeod::RNPJ2000:



Public Member Functions

- RNPJ2000 ()

  default constructor.
- ~RNPJ2000 () override=default
- RNPJ2000 & operator= (const RNPJ2000 &)=delete
- RNPJ2000 (const RNPJ2000 &)=delete
- void initialize (DynManager &manager) override

  Apply the various options, including fidelity of RNP and if polar motion is enabled or not, then call the base class initializer.
- void update_rnp (const TimeTT &time_tt, TimeGMST &time_gmst, const TimeUT1 &time_ut1)

  Updates the complete RNP and supplies it to the Dynamics Manager.
- void update_axial_rotation (TimeGMST &time_gmst)

  Updates the axial rotation portion of RNP and supplies the entire RNP to the Dynamics Manager.
- double timestamp () const override
- std::string get_name () const override

  A re-declaration of the pure virtual function in order to convince trick that yes, this is a pure virtual class.
- void ephem_update () override

Data Fields

- RotationJ2000 RJ2000

  Earth J2000 rotation model.
- NutationJ2000 NJ2000

  Earth J2000 nutation model.
- PrecessionJ2000 PJ2000

  Earth J2000 precession model.
- PolarMotionJ2000 PMJ2000

  Earth J2000 polar motion model.
- std::string internal_name {"RNPJ2000"}

  The hard coded internal name to be returned on calling the overridden EphemerisInterface function "get_name".

Private Member Functions

- void get_dyn_time_ptr (TimeGMST &gmst)

Private Attributes

- TimeGMST * gmst_ptr {}

  Pointer to the TimeGMST used to update this object when ephem_update is invoked.
- TimeDyn * time_dyn_ptr {}

  Pointer to the TimeDyn object, used to time stamp the reference frame when it is being updated.
- double last_updated_time_full {}

  The last update time, when updated through update_rnp, for the RNP, referencing TimeDyn.seconds .
- bool never_updated_full {true}

  Indicates that last_updated_time_full has never been populated, and that the update must be done regardless of given time.
- double last_updated_time_rotational {}

  The last update time, when updated through update_axial_rotation, referencing TimeDyn.seconds .
- bool never_updated_rotational {true}

  Indicates that last_updated_time_rotational has never been populated, and that the update must be done regardless of given time.

Friends

- class InputProcessor
- void init_attrjeod__RNPJ2000 ()

Additional Inherited Members

8.15.1 Detailed Description

Implements the J2000 RNP model using the generic RNP framework.

Definition at line 100 of file include/rnp_j2000.hh.

8.15.2 Constructor & Destructor Documentation

8.15.2.1 RNPJ2000() [1/2]

```
jeod::RNPJ2000::RNPJ2000 ( )
```

default constructor.

Initialize all data

Definition at line 73 of file rnp_j2000.cc.

References NJ2000, jeod::PlanetRNP::nutation, PJ2000, PMJ2000, jeod::PlanetRNP::polar_motion, jeod::PlanetRNP::precession, RJ2000, and jeod::PlanetRNP::rotation.

8.15.2.2 ~RNPJ2000()

```
jeod::RNPJ2000::~RNPJ2000 ( )  [override], [default]
```

8.15.2.3 RNPJ2000() [2/2]

```
jeod::RNPJ2000::RNPJ2000 (
            const RNPJ2000 &  )  [delete]
```

8.15.3 Member Function Documentation

8.15.3.1 ephem_update()

```
void jeod::RNPJ2000::ephem_update ( )  [override]
```

Definition at line 302 of file rnp_j2000.cc.

References jeod::PlanetOrientation::active, gmst_ptr, jeod::PlanetOrientation::orient_interface, jeod::RNP↩ Messages::setup_error, and jeod::PlanetRNP::update_axial_rotation().

8.15.3.2 get_dyn_time_ptr()

```
void jeod::RNPJ2000::get_dyn_time_ptr (
             TimeGMST & gmst )  [private]
```

Definition at line 326 of file rnp_j2000.cc.

References jeod::RNPMessages::setup_error, and time_dyn_ptr.

Referenced by update_axial_rotation(), and update_rnp().

8.15.3.3 get_name()

```
std::string jeod::RNPJ2000::get_name ( ) const  [override], [virtual]
```

A re-declaration of the pure virtual function in order to convince trick that yes, this is a pure virtual class.

Returns

Planet name.

Implements jeod::PlanetRNP.

Definition at line 289 of file rnp_j2000.cc.

References internal_name.

8.15.3.4 initialize()

```
void jeod::RNPJ2000::initialize (
             DynManager & dyn_manager )  [override], [virtual]
```

Apply the various options, including fidelity of RNP and if polar motion is enabled or not, then call the base class initializer.

Note that this function will still run even if the active flag is set to false. Additionally, note that this function does not update the rotation matrix between inertial and planet fixed. It only sets up the object to work with the DynManager. update_rnp must be called to update the RNP matrix. This function will also cache of TimeGMST from the given TimeManager

Parameters

in,out	*dyn_manager*	DynManager where the planet attitude to be updated is contained

Reimplemented from jeod::PlanetOrientation.

Definition at line 95 of file rnp_j2000.cc.

References jeod::PlanetRNP::ConstantNP, jeod::PlanetRNP::FullRNP, jeod::PlanetOrientation::initialize(), NJ2000, jeod::RotationJ2000::nutation, jeod::PlanetOrientation::planet_omega, jeod::RotationJ2000::planet_rotational_velocity, RJ2000, jeod::PlanetRNP::rnp_type, jeod::PlanetRNP::RotationOnly, and jeod::RotationJ2000::use_full_rnp.

8.15.3.5 operator=()

```
RNPJ2000& jeod::RNPJ2000::operator= (
            const RNPJ2000 &  )  [delete]
```

8.15.3.6 timestamp()

```
double jeod::RNPJ2000::timestamp ( ) const  [override]
```

Definition at line 284 of file rnp_j2000.cc.

References last_updated_time_rotational.

8.15.3.7 update_axial_rotation()

```
void jeod::RNPJ2000::update_axial_rotation (
            TimeGMST & time_gmst )
```

Updates the axial rotation portion of RNP and supplies the entire RNP to the Dynamics Manager.

Parameters

in	*time_gmst*	current time in the GMST time standard Units: The

Definition at line 231 of file rnp_j2000.cc.

References jeod::PlanetOrientation::active, jeod::PlanetRNP::FullRNP, get_dyn_time_ptr(), last_updated_time_rotational, never_updated_rotational, jeod::PlanetOrientation::planet, jeod::PlanetRNP::rnp_type, jeod::PlanetRNP::rotation, time_dyn_ptr, jeod::PlanetRNP::update_axial_rotation(), and jeod::PlanetRotation::update_time().

8.15.3.8 update_rnp()

```
void jeod::RNPJ2000::update_rnp (
             const TimeTT & time_tt,
             TimeGMST & time_gmst,
             const TimeUT1 & time_ut1 )
```

Updates the complete RNP and supplies it to the Dynamics Manager.

Parameters

in	*time_tt*	The current time in the TT time standard
in	*time_gmst*	current time in the GMST time standard Units: The
in	*time_ut1*	current time in the UT1 time standard Units: The

Definition at line 133 of file rnp_j2000.cc.

References jeod::PlanetOrientation::active, jeod::PlanetRNP::enable_polar, jeod::PlanetRNP::FullRNP, get_dyn_time_ptr(), gmst_ptr, last_updated_time_full, last_updated_time_rotational, never_updated_full, never_updated_rotational, jeod::PlanetRNP::nutation, jeod::PlanetOrientation::planet, jeod::PlanetRNP::polar_motion, jeod::PlanetRNP::precession, jeod::PlanetRNP::rnp_type, jeod::PlanetRNP::rotation, time_dyn_ptr, jeod::PlanetRNP::update_rnp(), and jeod::PlanetRotation::update_time().

8.15.4 Friends And Related Function Documentation

8.15.4.1 init_attrjeod__RNPJ2000

```
void init_attrjeod__RNPJ2000 ( )  [friend]
```

8.15.4.2 InputProcessor

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

Definition at line 102 of file include/rnp_j2000.hh.

8.15.5 Field Documentation

8.15.5.1 gmst_ptr

```
TimeGMST* jeod::RNPJ2000::gmst_ptr {}  [private]
```

Pointer to the TimeGMST used to update this object when ephem_update is invoked.

trick_units(–)

Definition at line 172 of file include/rnp_j2000.hh.

Referenced by ephem_update(), and update_rnp().

8.15.5.2 internal_name

```
std::string jeod::RNPJ2000::internal_name {"RNPJ2000"}
```

The hard coded internal name to be returned on calling the overridden EphemerisInterface function "get_name".

trick_units(–)

Definition at line 160 of file include/rnp_j2000.hh.

Referenced by get_name().

8.15.5.3 last_updated_time_full

```
double jeod::RNPJ2000::last_updated_time_full {}  [private]
```

The last update time, when updated through update_rnp, for the RNP, referencing TimeDyn.seconds .

If the time from time_dyn_ptr is the same as this update time, then the RNP will not be updated. This is to prevent unnecessary updating.trick_units(s)

Definition at line 187 of file include/rnp_j2000.hh.

Referenced by update_rnp().

8.15.5.4 last_updated_time_rotational

```
double jeod::RNPJ2000::last_updated_time_rotational {}  [private]
```

The last update time, when updated through update_axial_rotation, referencing TimeDyn.seconds .

If the time from time_dyn_ptr is the same as this update time, then the R component of RNP will not be updated. This is to prevent unnecessary updating.trick_units(s)

Definition at line 202 of file include/rnp_j2000.hh.

Referenced by timestamp(), update_axial_rotation(), and update_rnp().

8.15.5.5 never_updated_full

```
bool jeod::RNPJ2000::never_updated_full {true}  [private]
```

Indicates that last_updated_time_full has never been populated, and that the update must be done regardless of given time.

trick_units(–)

Definition at line 193 of file include/rnp_j2000.hh.

Referenced by update_rnp().

8.15.5.6 never_updated_rotational

```
bool jeod::RNPJ2000::never_updated_rotational {true}  [private]
```

Indicates that last_updated_time_rotational has never been populated, and that the update must be done regardless of given time.

trick_units(–)

Definition at line 208 of file include/rnp_j2000.hh.

Referenced by update_axial_rotation(), and update_rnp().

8.15.5.7 NJ2000

```
NutationJ2000 jeod::RNPJ2000::NJ2000
```

Earth J2000 nutation model.

trick_units(–)

Definition at line 112 of file include/rnp_j2000.hh.

Referenced by initialize(), and RNPJ2000().

8.15.5.8 PJ2000

```
PrecessionJ2000 jeod::RNPJ2000::PJ2000
```

Earth J2000 precession model.

trick_units(–)

Definition at line 117 of file include/rnp_j2000.hh.

Referenced by RNPJ2000().

8.15.5.9 PMJ2000

`PolarMotionJ2000 jeod::RNPJ2000::PMJ2000`

Earth J2000 polar motion model.

trick_units(–)

Definition at line 122 of file include/rnp_j2000.hh.

Referenced by RNPJ2000().

8.15.5.10 RJ2000

`RotationJ2000 jeod::RNPJ2000::RJ2000`

Earth J2000 rotation model.

trick_units(–)

Definition at line 107 of file include/rnp_j2000.hh.

Referenced by initialize(), and RNPJ2000().

8.15.5.11 time_dyn_ptr

`TimeDyn* jeod::RNPJ2000::time_dyn_ptr {} [private]`

Pointer to the TimeDyn object, used to time stamp the reference frame when it is being updated.

trick_units(–)

Definition at line 178 of file include/rnp_j2000.hh.

Referenced by get_dyn_time_ptr(), update_axial_rotation(), and update_rnp().

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

- include/rnp_j2000.hh
- rnp_j2000.cc

8.16 jeod::RNPJ2000_rnp_j2000_default_data Class Reference

`#include <rnp_j2000.hh>`

Public Member Functions

- void initialize (RNPJ2000 *)

8.16.1 Detailed Description

Definition at line 55 of file data/include/rnp_j2000.hh.

8.16.2 Member Function Documentation

8.16.2.1 initialize()

```
void jeod::RNPJ2000_rnp_j2000_default_data::initialize (
            RNPJ2000 * RNPJ2000_ptr )
```

Definition at line 36 of file data_rnp_j2000.cc.

References jeod::PlanetRNP::enable_polar, jeod::PlanetRNP::FullRNP, jeod::PlanetOrientation::name, jeod::PlanetOrientation::planet_omega, and jeod::PlanetRNP::rnp_type.

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

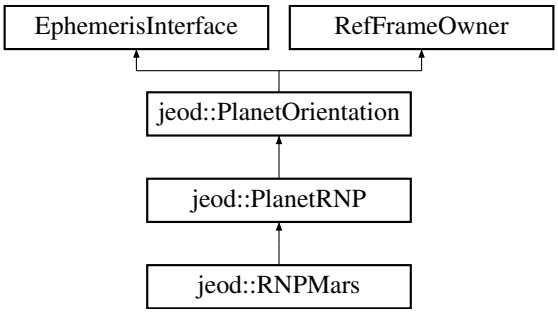
- data/include/rnp_j2000.hh
- data_rnp_j2000.cc

8.17 jeod::RNPMars Class Reference

Implements the "Pathfinder" Mars RNP model using the generic RNP framework.

```
#include <rnp_mars.hh>
```

Inheritance diagram for jeod::RNPMars:



Public Member Functions

- RNPMars ()

  Default constructor.
- ~RNPMars () override=default
- RNPMars & operator= (const RNPMars &)=delete
- RNPMars (const RNPMars &)=delete
- void initialize (DynManager &manager) override

  Perform setup of the object, then call the base class initializer.
- void update_rnp (TimeTT &time_tt)

  Update the complete RNP and supply it to the Dynamics Manager.
- void update_axial_rotation (TimeTT &time_tt)

  Update rotation portion of RNP and supply RNP to dynamics manager.
- double timestamp () const override

  Return the last time at which the RNP was updated.
- std::string get_name () const override

  Return the internal name of the object.
- void ephem_update () override

  Define 'alias' to call axial update function, for polymorphism.

Data Fields

- RotationMars RMars

  "Pathfinder" Mars rotation model.
- NutationMars NMars

  "Pathfinder" Mars nutation model.
- PrecessionMars PMars

  "Pathfinder" Mars precession model.
- std::string internal_name {"RNPMars"}

  The hard coded internal name to be returned on calling the overridden EphemerisInterface function "get_name".

Private Member Functions

- void get_dyn_time_ptr (TimeTT &time_tt)

  Get simulation time via a two-step pointer trail.

Private Attributes

- TimeTT * tt_ptr {}

  Pointer to the TimeTT used to update this object when ephem_update is invoked.
- TimeDyn * time_dyn_ptr {}

  Pointer to the TimeDyn object, used to time stamp the reference frame when it is being updated.
- double last_updated_time_full {}

  The last update time for the RNP, when updated through update_rnp.
- bool never_updated_full {true}

  Indicates that last_updated_time_full has never been populated, and that the update must be done regardless of given time.
- double last_updated_time_rotational {}

  The last rotational update time, when updated through update_axial_rotation, referencing TimeDyn.seconds.
- bool never_updated_rotational {true}

  Indicates that last_updated_time_rotational has never been populated, and that the update must be done regardless of given time.

Friends

- class InputProcessor
- void init_attrjeod__RNPMars ()

Additional Inherited Members

8.17.1 Detailed Description

Implements the "Pathfinder" Mars RNP model using the generic RNP framework.

Definition at line 101 of file include/rnp_mars.hh.

8.17.2 Constructor & Destructor Documentation

8.17.2.1 RNPMars() [1/2]

```
jeod::RNPMars::RNPMars ( )
```

Default constructor.

Definition at line 68 of file rnp_mars.cc.

References jeod::PlanetRNP::enable_polar, NMars, jeod::PlanetRNP::nutation, PMars, jeod::PlanetRNP::polar_motion, jeod::PlanetRNP::precession, RMars, and jeod::PlanetRNP::rotation.

8.17.2.2 ~RNPMars()

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

8.17.2.3 RNPMars() [2/2]

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

8.17.3 Member Function Documentation

8.17.3.1 ephem_update()

```
void jeod::RNPMars::ephem_update ( )  [override]
```

Define 'alias' to call axial update function, for polymorphism.

Definition at line 251 of file rnp_mars.cc.

References jeod::PlanetOrientation::active, jeod::PlanetOrientation::orient_interface, jeod::RNPMessages::setup_error, tt_ptr, and jeod::PlanetRNP::update_axial_rotation().

8.17.3.2 get_dyn_time_ptr()

```
void jeod::RNPMars::get_dyn_time_ptr (
             TimeTT & time_tt )  [private]
```

Get simulation time via a two-step pointer trail.

Parameters

in	*time_tt*	Current TT time

Definition at line 275 of file rnp_mars.cc.

References jeod::RNPMessages::setup_error, and time_dyn_ptr.

Referenced by update_axial_rotation(), and update_rnp().

8.17.3.3 get_name()

```
std::string jeod::RNPMars::get_name ( ) const  [override], [virtual]
```

Return the internal name of the object.

Implements jeod::PlanetRNP.

Definition at line 243 of file rnp_mars.cc.

References internal_name.

8.17.3.4 initialize()

```
void jeod::RNPMars::initialize (
             DynManager & dyn_manager )  [override], [virtual]
```

Perform setup of the object, then call the base class initializer.

Parameters

in,out	*dyn_manager*	Ref to dynamics manager

Reimplemented from jeod::PlanetOrientation.

Definition at line 87 of file rnp_mars.cc.

References jeod::PrecessionMars::compute_fixed_matrices(), jeod::PlanetRNP::ConstantNP, jeod::PlanetRNP::↩ FullRNP, jeod::PlanetOrientation::initialize(), NMars, jeod::PrecessionMars::nutation, jeod::RotationMars::nutation, jeod::PlanetOrientation::planet_omega, jeod::RotationMars::planet_rotational_velocity, PMars, RMars, jeod::↩ PlanetRNP::rnp_type, jeod::PlanetRNP::RotationOnly, and jeod::RotationMars::use_full_rnp.

8.17.3.5 operator=()

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

8.17.3.6 timestamp()

```
double jeod::RNPMars::timestamp ( ) const  [override]
```

Return the last time at which the RNP was updated.

Definition at line 235 of file rnp_mars.cc.

References last_updated_time_rotational.

8.17.3.7 update_axial_rotation()

```
void jeod::RNPMars::update_axial_rotation (
            TimeTT & time_tt )
```

Update rotation portion of RNP and supply RNP to dynamics manager.

Parameters

in	*time↩ _tt*	Current TT time

Definition at line 182 of file rnp_mars.cc.

References jeod::PlanetOrientation::active, jeod::PlanetRNP::FullRNP, get_dyn_time_ptr(), last_updated_time_↩

rotational, never_updated_rotational, jeod::PlanetOrientation::planet, jeod::PlanetRNP::rnp_type, jeod::PlanetRNP::rotation, time_dyn_ptr, jeod::PlanetRNP::update_axial_rotation(), and jeod::PlanetRotation::update_time().

8.17.3.8 update_rnp()

```
void jeod::RNPMars::update_rnp (
             TimeTT & time_tt )
```

Update the complete RNP and supply it to the Dynamics Manager.

Parameters

in	*time_tt*	Current Terrestrial Time

Definition at line 119 of file rnp_mars.cc.

References jeod::PlanetOrientation::active, jeod::PlanetRNP::FullRNP, get_dyn_time_ptr(), last_updated_time_full, last_updated_time_rotational, never_updated_full, never_updated_rotational, jeod::PlanetRNP::nutation, jeod::PlanetOrientation::planet, jeod::PlanetRNP::precession, jeod::PlanetRNP::rnp_type, jeod::PlanetRNP::rotation, time_dyn_ptr, tt_ptr, jeod::PlanetRNP::update_rnp(), and jeod::PlanetRotation::update_time().

8.17.4 Friends And Related Function Documentation

8.17.4.1 init_attrjeod__RNPMars

```
void init_attrjeod__RNPMars ( )  [friend]
```

8.17.4.2 InputProcessor

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

Definition at line 103 of file include/rnp_mars.hh.

8.17.5 Field Documentation

8.17.5.1 internal_name

```
std::string jeod::RNPMars::internal_name {"RNPMars"}
```

The hard coded internal name to be returned on calling the overridden EphemerisInterface function "get_name".

trick_units(–)

Definition at line 124 of file include/rnp_mars.hh.

Referenced by get_name().

8.17.5.2 last_updated_time_full

```
double jeod::RNPMars::last_updated_time_full {}  [private]
```

The last update time for the RNP, when updated through update_rnp.

References TimeDyn.seconds. If the time from time_dyn_ptr is the same as this update time, then the RNP will not be updated; prevents unnecessary updating.trick_units(s)

Definition at line 145 of file include/rnp_mars.hh.

Referenced by update_rnp().

8.17.5.3 last_updated_time_rotational

```
double jeod::RNPMars::last_updated_time_rotational {}  [private]
```

The last rotational update time, when updated through update_axial_rotation, referencing TimeDyn.seconds.

If the time from time_dyn_ptr matches this update time, then the R component of the RNP will not be updated; prevents unnecessary updating.trick_units(s)

Definition at line 159 of file include/rnp_mars.hh.

Referenced by timestamp(), update_axial_rotation(), and update_rnp().

8.17.5.4 never_updated_full

```
bool jeod::RNPMars::never_updated_full {true}  [private]
```

Indicates that last_updated_time_full has never been populated, and that the update must be done regardless of given time.

trick_units(–)

Definition at line 151 of file include/rnp_mars.hh.

Referenced by update_rnp().

8.17.5.5 never_updated_rotational

```
bool jeod::RNPMars::never_updated_rotational {true}  [private]
```

Indicates that last_updated_time_rotational has never been populated, and that the update must be done regardless of given time.

trick_units(–)

Definition at line 165 of file include/rnp_mars.hh.

Referenced by update_axial_rotation(), and update_rnp().

8.17.5.6 NMars

```
NutationMars jeod::RNPMars::NMars
```

"Pathfinder" Mars nutation model.

trick_units(–)

Definition at line 113 of file include/rnp_mars.hh.

Referenced by jeod::RNPMars_rnp_mars_default_data::initialize(), initialize(), and RNPMars().

8.17.5.7 PMars

```
PrecessionMars jeod::RNPMars::PMars
```

"Pathfinder" Mars precession model.

trick_units(–)

Definition at line 118 of file include/rnp_mars.hh.

Referenced by jeod::RNPMars_rnp_mars_default_data::initialize(), initialize(), and RNPMars().

8.17.5.8 RMars

```
RotationMars jeod::RNPMars::RMars
```

"Pathfinder" Mars rotation model.

trick_units(–)

Definition at line 108 of file include/rnp_mars.hh.

Referenced by jeod::RNPMars_rnp_mars_default_data::initialize(), initialize(), and RNPMars().

8.17.5.9 time_dyn_ptr

```
TimeDyn* jeod::RNPMars::time_dyn_ptr {}  [private]
```

Pointer to the TimeDyn object, used to time stamp the reference frame when it is being updated.

trick_units(–)

Definition at line 137 of file include/rnp_mars.hh.

Referenced by get_dyn_time_ptr(), update_axial_rotation(), and update_rnp().

8.17.5.10 tt_ptr

```
TimeTT* jeod::RNPMars::tt_ptr {}  [private]
```

Pointer to the TimeTT used to update this object when ephem_update is invoked.

trick_units(–)

Definition at line 131 of file include/rnp_mars.hh.

Referenced by ephem_update(), and update_rnp().

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

- include/rnp_mars.hh
- rnp_mars.cc

8.18 jeod::RNPMars_rnp_mars_default_data Class Reference

```
#include <rnp_mars.hh>
```

Public Member Functions

- void initialize (RNPMars *)

8.18.1 Detailed Description

Definition at line 55 of file data/include/rnp_mars.hh.

8.18.2 Member Function Documentation

8.18.2.1 initialize()

```
void jeod::RNPMars_rnp_mars_default_data::initialize (
            RNPMars * RNPMars_ptr )
```

Definition at line 42 of file data_rnp_mars.cc.

References jeod::PlanetRNP::enable_polar, jeod::PlanetRNP::FullRNP, jeod::NutationMars::I_at_j2000, jeod::NutationMars::I_dot, jeod::NutationMars::I_m_orig, jeod::NutationMars::int_to_double, jeod::PrecessionMars::J, jeod::NutationMars::mean_anomaly_j2000, jeod::NutationMars::mean_motion, jeod::PrecessionMars::N, jeod::PlanetOrientation::name, jeod::RNPMars::NMars, jeod::RotationMars::phi_at_j2000, jeod::PlanetOrientation::planet_omega, jeod::RNPMars::PMars, jeod::PrecessionMars::psi_at_j2000, jeod::PrecessionMars::psi_dot, jeod::NutationMars::psi_m_orig, jeod::NutationMars::q_angle_j2000, jeod::RNPMars::RMars, and jeod::PlanetRNP::rnp_type.

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

- data/include/rnp_mars.hh
- data_rnp_mars.cc

8.19 jeod::RNPMessages Class Reference

Describes messages used in the RNP model.

`#include <RNP_messages.hh>`

Public Member Functions

- RNPMessages ()=delete
- RNPMessages (const RNPMessages &rhs)=delete
- RNPMessages & operator= (const RNPMessages &rhs)=delete

Static Public Attributes

- static const char * initialization_error = "environment/RNP/" "initialization_error"

  Indicates an error during initialization.
- static const char * fidelity_error = "environment/RNP/" "fidelity_error"

  Indicates a mismatch between the requested fidelity and what is available to the model.
- static const char * setup_error = "environment/RNP/" "setup_error"

  Indicates an error during setup of the RNP model.
- static const char * polar_motion_table_warning = "environment/RNP/" "polar_motion_table_warning"

  Indicates a problem with the interpolation table commonly found in polar motion implementations.

Friends

- class InputProcessor
- void init_attrjeod__RNPMessages ()

8.19.1 Detailed Description

Describes messages used in the RNP model.

Definition at line 85 of file RNP_messages.hh.

8.19.2 Constructor & Destructor Documentation

8.19.2.1 RNPMessages() [1/2]

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

8.19.2.2 RNPMessages() [2/2]

```
jeod::RNPMessages::RNPMessages (
            const RNPMessages & rhs )  [delete]
```

8.19.3 Member Function Documentation

8.19.3.1 operator=()

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

8.19.4 Friends And Related Function Documentation

8.19.4.1 init_attrjeod__RNPMessages

```
void init_attrjeod__RNPMessages ( )  [friend]
```

8.19.4.2 InputProcessor

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

Definition at line 87 of file RNP_messages.hh.

8.19.5 Field Documentation

8.19.5.1 fidelity_error

```
char const * jeod::RNPMessages::fidelity_error = "environment/RNP/" "fidelity_error"  [static]
```

Indicates a mismatch between the requested fidelity and what is available to the model.

trick_units(–)

Definition at line 101 of file RNP_messages.hh.

Referenced by jeod::PlanetRNP::propagate_rnp(), and jeod::PlanetRNP::update_rnp().

8.19.5.2 initialization_error

```
char const * jeod::RNPMessages::initialization_error = "environment/RNP/" "initialization_↩
error"  [static]
```

Indicates an error during initialization.

trick_units(–)

Definition at line 95 of file RNP_messages.hh.

Referenced by jeod::PlanetOrientation::initialize(), jeod::PolarMotionJ2000::initialize(), and jeod::NutationJ2000↩
::initialize().

8.19.5.3 polar_motion_table_warning

```
char const * jeod::RNPMessages::polar_motion_table_warning = "environment/RNP/" "polar_motion↩
_table_warning"  [static]
```

Indicates a problem with the interpolation table commonly found in polar motion implementations.

trick_units(–)

Definition at line 114 of file RNP_messages.hh.

Referenced by jeod::PolarMotionJ2000::update_rotation().

8.19.5.4 setup_error

```
char const * jeod::RNPMessages::setup_error = "environment/RNP/" "setup_error"  [static]
```

Indicates an error during setup of the RNP model.

trick_units(–)

Definition at line 106 of file RNP_messages.hh.

Referenced by jeod::RNPJ2000::ephem_update(), jeod::RNPMars::ephem_update(), jeod::RNPJ2000::get_dyn↩_time_ptr(), jeod::RNPMars::get_dyn_time_ptr(), jeod::PlanetRNP::propagate_rnp(), jeod::PlanetRNP::update↩_axial_rotation(), jeod::PlanetRNP::update_rnp(), jeod::RotationJ2000::update_rotation(), jeod::RotationMars↩::update_rotation(), and jeod::PrecessionMars::update_rotation().

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

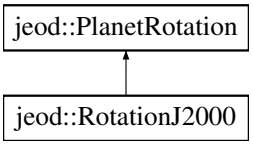
- RNP_messages.hh
- RNP_messages.cc

8.20 jeod::RotationJ2000 Class Reference

Implements the axial rotation portion of J2000 RNP.

```
#include <rotation_j2000.hh>
```

Inheritance diagram for jeod::RotationJ2000:



Public Member Functions

- RotationJ2000 ()=default
- ~RotationJ2000 () override=default
- RotationJ2000 & operator= (const RotationJ2000 &)=delete
- RotationJ2000 (const RotationJ2000 &)=delete
- void update_rotation () override

  J2000 specific implementation of update_rotation, from PlanetRotation.

Data Fields

- double planet_rotational_velocity {}

  The nominal axial rotational velocity of the earth.
- NutationJ2000 * nutation {}

  Pointer to the J2000 nutation object, used for get obliquity information out.
- bool use_full_rnp {true}

  Tells the rotation object if it should use a full blown rotation formulation, or just use the time passed multiplied by the rotational velocity.
- double theta_gast {}

  The last theta_gast (angle the earth had axially rotated) calculated.
- double GMST {}

  GMST, currently saved for logging purposes.

Friends

- class InputProcessor
- void init_attrjeod__RotationJ2000 ()

Additional Inherited Members

8.20.1 Detailed Description

Implements the axial rotation portion of J2000 RNP.

Definition at line 91 of file rotation_j2000.hh.

8.20.2 Constructor & Destructor Documentation

8.20.2.1 RotationJ2000() [1/2]

```
jeod::RotationJ2000::RotationJ2000 ( )  [default]
```

8.20.2.2 ~RotationJ2000()

```
jeod::RotationJ2000::~RotationJ2000 ( )  [override], [default]
```

8.20.2.3 RotationJ2000() [2/2]

```
jeod::RotationJ2000::RotationJ2000 (
            const RotationJ2000 &  )  [delete]
```

8.20.3 Member Function Documentation

8.20.3.1 operator=()

```
RotationJ2000& jeod::RotationJ2000::operator= (
            const RotationJ2000 &  )  [delete]
```

8.20.3.2 update_rotation()

```
void jeod::RotationJ2000::update_rotation ( )  [override], [virtual]
```

J2000 specific implementation of update_rotation, from PlanetRotation.

For axial rotation

Reimplemented from jeod::PlanetRotation.

Definition at line 61 of file rotation_j2000.cc.

References jeod::PlanetRotation::current_time, jeod::PlanetRotation::DEGTORAD, jeod::NutationJ2000::equa↩
_of_equi, nutation, planet_rotational_velocity, jeod::PlanetRotation::rotation, jeod::RNPMessages::setup_error, theta_gast, and use_full_rnp.

8.20.4 Friends And Related Function Documentation

8.20.4.1 init_attrjeod__RotationJ2000

```
void init_attrjeod__RotationJ2000 ( )  [friend]
```

8.20.4.2 InputProcessor

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

Definition at line 93 of file rotation_j2000.hh.

8.20.5 Field Documentation

8.20.5.1 GMST

```
double jeod::RotationJ2000::GMST {}
```

GMST, currently saved for logging purposes.

trick_units(–)

Definition at line 125 of file rotation_j2000.hh.

8.20.5.2 nutation

```
NutationJ2000* jeod::RotationJ2000::nutation {}
```

Pointer to the J2000 nutation object, used for get obliquity information out.

Will be NULL (automatically) if anything but Full_Term_RNP is set in the RNPJ2000 objecttrick_units(–)

Definition at line 105 of file rotation_j2000.hh.

Referenced by jeod::RNPJ2000::initialize(), and update_rotation().

8.20.5.3 planet_rotational_velocity

```
double jeod::RotationJ2000::planet_rotational_velocity {}
```

The nominal axial rotational velocity of the earth.

trick_units(rad/s)

Definition at line 97 of file rotation_j2000.hh.

Referenced by jeod::RNPJ2000::initialize(), and update_rotation().

8.20.5.4 theta_gast

```
double jeod::RotationJ2000::theta_gast {}
```

The last theta_gast (angle the earth had axially rotated) calculated.

trick_units(rad)

Definition at line 120 of file rotation_j2000.hh.

Referenced by update_rotation().

8.20.5.5 use_full_rnp

```
bool jeod::RotationJ2000::use_full_rnp {true}
```

Tells the rotation object if it should use a full blown rotation formulation, or just use the time passed multiplied by the rotational velocity.

Used with the different intialization options for the main RNP classtrick_units(–)

Definition at line 114 of file rotation_j2000.hh.

Referenced by jeod::RNPJ2000::initialize(), and update_rotation().

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

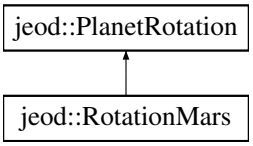
- rotation_j2000.hh
- rotation_j2000.cc

8.21 jeod::RotationMars Class Reference

Implements the axial rotation portion of the "Pathfinder" Mars RNP model.

`#include <rotation_mars.hh>`

Inheritance diagram for jeod::RotationMars:



Public Member Functions

- RotationMars ()=default
- ~RotationMars () override=default
- RotationMars & operator= (const RotationMars &)=delete
- RotationMars (const RotationMars &)=delete
- void update_rotation () override

  RotationMars specific implementation of update_rotation, for axial rotation.

Data Fields

- double planet_rotational_velocity {}

  The Mars average axial rotational velocity.
- NutationMars * nutation {}

  Pointer to the Mars nutation object, used to access nutation in longitude information.
- bool use_full_rnp {true}

  Tells the rotation object if it should use a full blown rotation formulation, or if it should just use the time passed multiplied by the rotational velocity.
- double phi_at_j2000 {}

  The (constant) rotated angle of Mars at the J2000 epoch.
- double phi_spin {}

  The most recent calculated value of the rotation angle for Mars, measured since J2000 epoch.

Friends

- class InputProcessor
- void init_attrjeod__RotationMars ()

Additional Inherited Members

8.21.1 Detailed Description

Implements the axial rotation portion of the "Pathfinder" Mars RNP model.

Definition at line 96 of file rotation_mars.hh.

8.21.2 Constructor & Destructor Documentation

8.21.2.1 RotationMars() [1/2]

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

8.21.2.2 ~RotationMars()

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

8.21.2.3 RotationMars() [2/2]

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

8.21.3 Member Function Documentation

8.21.3.1 operator=()

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

8.21.3.2 update_rotation()

```
void jeod::RotationMars::update_rotation ( )  [override], [virtual]
```

RotationMars specific implementation of update_rotation, for axial rotation.

Reimplemented from jeod::PlanetRotation.

Definition at line 62 of file rotation_mars.cc.

References jeod::PlanetRotation::current_time, nutation, jeod::NutationMars::nutation_in_longitude, jeod::↩ NutationMars::obliquity_angle, phi_at_j2000, phi_spin, planet_rotational_velocity, jeod::PlanetRotation::rotation, jeod::RNPMessages::setup_error, and use_full_rnp.

8.21.4 Friends And Related Function Documentation

8.21.4.1 init_attrjeod__RotationMars

```
void init_attrjeod__RotationMars ( )  [friend]
```

8.21.4.2 InputProcessor

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

Definition at line 98 of file rotation_mars.hh.

8.21.5 Field Documentation

8.21.5.1 nutation

```
NutationMars* jeod::RotationMars::nutation {}
```

Pointer to the Mars nutation object, used to access nutation in longitude information.

Will be NULL (automatically) if anything but Full_Term_RNP is set in the RNPMars object.trick_units(–)

Definition at line 110 of file rotation_mars.hh.

Referenced by jeod::RNPMars::initialize(), and update_rotation().

8.21.5.2 phi_at_j2000

```
double jeod::RotationMars::phi_at_j2000 {}
```

The (constant) rotated angle of Mars at the J2000 epoch.

trick_units(rad)

Definition at line 123 of file rotation_mars.hh.

Referenced by jeod::RNPMars_rnp_mars_default_data::initialize(), and update_rotation().

8.21.5.3 phi_spin

```
double jeod::RotationMars::phi_spin {}
```

The most recent calculated value of the rotation angle for Mars, measured since J2000 epoch.

trick_units(rad)

Definition at line 129 of file rotation_mars.hh.

Referenced by update_rotation().

8.21.5.4 planet_rotational_velocity

```
double jeod::RotationMars::planet_rotational_velocity {}
```

The Mars average axial rotational velocity.

trick_units(rad/s)

Definition at line 103 of file rotation_mars.hh.

Referenced by jeod::RNPMars::initialize(), and update_rotation().

8.21.5.5 use_full_rnp

```
bool jeod::RotationMars::use_full_rnp {true}
```

Tells the rotation object if it should use a full blown rotation formulation, or if it should just use the time passed multiplied by the rotational velocity.

Used with the different intialization options for the main RNP class.trick_units(–)

Definition at line 118 of file rotation_mars.hh.

Referenced by jeod::RNPMars::initialize(), and update_rotation().

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

- rotation_mars.hh
- rotation_mars.cc

Chapter 9

File Documentation

9.1 class_declarations.hh File Reference

Forward declarations of classes defined for JEOD 2.0 Generic RNP.

Namespaces

- jeod

  Namespace jeod.

9.1.1 Detailed Description

Forward declarations of classes defined for JEOD 2.0 Generic RNP.

9.2 class_declarations.hh File Reference

Forward declarations of classes defined for JEOD 2.0 J2000 RNP.

Namespaces

- jeod

  Namespace jeod.

9.2.1 Detailed Description

Forward declarations of classes defined for JEOD 2.0 J2000 RNP.

9.3 data_nutation_j2000.cc File Reference

```
#include "environment/RNP/GenericRNP/include/planet_rotation_init.hh"
#include "environment/RNP/RNPJ2000/include/nutation_j2000_init.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "../include/nutation_j2000.hh"
```

Namespaces

- jeod

  Namespace jeod.

Macros

- #define JEOD_FRIEND_CLASS NutationJ2000Init_nutation_j2000_default_data

9.3.1 Macro Definition Documentation

9.3.1.1 JEOD_FRIEND_CLASS

```
#define JEOD_FRIEND_CLASS NutationJ2000Init_nutation_j2000_default_data
```

Definition at line 21 of file data_nutation_j2000.cc.

9.4 data_rnp_j2000.cc File Reference

```
#include "environment/RNP/GenericRNP/include/planet_rnp.hh"
#include "environment/RNP/RNPJ2000/include/rnp_j2000.hh"
#include "utils/named_item/include/named_item.hh"
#include "utils/ref_frames/include/ref_frame_interface.hh"
#include "../include/rnp_j2000.hh"
```

Namespaces

- jeod

  Namespace jeod.

Macros

- #define JEOD_FRIEND_CLASS RNPJ2000_rnp_j2000_default_data

9.4.1 Macro Definition Documentation

9.4.1.1 JEOD_FRIEND_CLASS

```
#define JEOD_FRIEND_CLASS RNPJ2000_rnp_j2000_default_data
```

Definition at line 21 of file data_rnp_j2000.cc.

9.5 data_rnp_mars.cc File Reference

```
#include <cmath>
#include "environment/RNP/GenericRNP/include/planet_rnp.hh"
#include "environment/RNP/GenericRNP/include/planet_rotation.hh"
#include "environment/RNP/RNPMars/include/rnp_mars.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/named_item/include/named_item.hh"
#include "../include/rnp_mars.hh"
```

Namespaces

- jeod

  Namespace jeod.

Macros

- #define JEOD_FRIEND_CLASS RNPMars_rnp_mars_default_data

9.5.1 Macro Definition Documentation

9.5.1.1 JEOD_FRIEND_CLASS

```
#define JEOD_FRIEND_CLASS RNPMars_rnp_mars_default_data
```

Definition at line 23 of file data_rnp_mars.cc.

9.6 nutation_j2000.cc File Reference

Implementation for the NutationJ2000 class.

```
#include <cmath>
#include <cstddef>
#include "environment/RNP/GenericRNP/include/RNP_messages.hh"
#include "utils/math/include/matrix3x3.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/nutation_j2000.hh"
#include "../include/nutation_j2000_init.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.6.1 Detailed Description

Implementation for the NutationJ2000 class.

9.7 nutation_j2000.hh File Reference

Data Structures

- class jeod::NutationJ2000Init_nutation_j2000_default_data

Namespaces

- jeod

  Namespace jeod.

9.8 nutation_j2000.hh File Reference

Model the nutation portion of the RNP routine for the Standard Epoch J2000 This is form of the IAU-76/FK5 RNP model, as implemented in Jeod 1.52.

```
#include "environment/RNP/GenericRNP/include/planet_rotation.hh"
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class jeod::NutationJ2000

  Implements the nutation portion of the J2000 RNP.

Namespaces

- jeod

  Namespace jeod.

9.8.1 Detailed Description

Model the nutation portion of the RNP routine for the Standard Epoch J2000 This is form of the IAU-76/FK5 RNP model, as implemented in Jeod 1.52.

9.9 nutation_j2000_init.cc File Reference

Implementation of NutationJ2000Init.

```
#include <cstddef>
#include "utils/memory/include/jeod_alloc.hh"
#include "../include/nutation_j2000_init.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.9.1 Detailed Description

Implementation of NutationJ2000Init.

9.10 nutation_j2000_init.hh File Reference

Used to load data and initialize the NutationJ2000 class through NutationJ2000::initialize.

```
#include "environment/RNP/GenericRNP/include/planet_rotation_init.hh"
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class jeod::NutationJ2000Init

  The NutationJ2000Init contains coefficients and other data used to initalize a NutationJ2000 object.

Namespaces

- jeod

  Namespace jeod.

9.10.1 Detailed Description

Used to load data and initialize the NutationJ2000 class through NutationJ2000::initialize.

9.11 nutation_mars.cc File Reference

Implementation for the NutationMars class.

```
#include <cmath>
#include <cstddef>
#include "environment/RNP/GenericRNP/include/RNP_messages.hh"
#include "utils/math/include/matrix3x3.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/nutation_mars.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.11.1 Detailed Description

Implementation for the NutationMars class.

9.12 nutation_mars.hh File Reference

Represent the nutation portion of the JPL-developed "Pathfinder" Mars orientation model.

```
#include "environment/RNP/GenericRNP/include/planet_rotation.hh"
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class jeod::NutationMars

  Implements the nutation portion of the "Pathfinder" Mars RNP model.

Namespaces

- jeod

  Namespace jeod.

9.12.1 Detailed Description

Represent the nutation portion of the JPL-developed "Pathfinder" Mars orientation model.

9.13 planet_orientation.cc File Reference

Implement PlanetOrientation.

```
#include <cstddef>
#include "dynamics/dyn_manager/include/dyn_manager.hh"
#include "environment/planet/include/planet.hh"
#include "utils/math/include/matrix3x3.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/RNP_messages.hh"
#include "../include/planet_orientation.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.13.1 Detailed Description

Implement PlanetOrientation.

9.14 planet_orientation.hh File Reference

Establish a pure virtual framework for interfacing with the DynManager to set a planet orientation, meaning the transformation information from a planet's inertial frame to it's planet fixed frame.

```
#include <string>
#include <utility>
#include "environment/ephemerides/ephem_interface/include/ephem_interface.↩
hh"
#include "environment/ephemerides/ephem_item/include/ephem_orient.hh"
#include "utils/ref_frames/include/ref_frame_interface.hh"
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class jeod::PlanetOrientation

  The generic framework for orientation models to interact with a DynManager object.

Namespaces

- jeod

  Namespace jeod.

9.14.1 Detailed Description

Establish a pure virtual framework for interfacing with the DynManager to set a planet orientation, meaning the transformation information from a planet's inertial frame to it's planet fixed frame.

9.15 planet_rnp.cc File Reference

Implement PlanetRNP.

```
#include <cstddef>
#include "dynamics/dyn_manager/include/dyn_manager.hh"
#include "environment/planet/include/planet.hh"
#include "utils/math/include/matrix3x3.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/RNP_messages.hh"
#include "../include/planet_rnp.hh"
#include "../include/planet_rotation.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.15.1 Detailed Description

Implement PlanetRNP.

9.16 planet_rnp.hh File Reference

Establish a framework for rotation-nutatation-precession style planet attitude models.

```
#include "utils/sim_interface/include/jeod_class.hh"
#include "planet_orientation.hh"
#include "utils/math/include/macro_def.hh"
#include "utils/math/include/macro_undef.hh"
```

Data Structures

- class jeod::PlanetRNP

  The generic framework for orientation models based on the RNP paradigm.

Namespaces

- jeod

  Namespace jeod.

9.16.1 Detailed Description

Establish a framework for rotation-nutatation-precession style planet attitude models.

9.17 planet_rotation.cc File Reference

Implemenation for PlanetRotation.

```
#include "utils/math/include/matrix3x3.hh"
#include "../include/planet_rotation.hh"
#include "../include/planet_rotation_init.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.17.1 Detailed Description

Implemenation for PlanetRotation.

9.18 planet_rotation.hh File Reference

Pure virtual polymorphic base class for all forms of planet rotation in th RNP model including precession, nutation, polar motion and axial rotation.

```
#include <cmath>
#include "utils/sim_interface/include/jeod_class.hh"
#include "utils/math/include/macro_def.hh"
#include "utils/math/include/macro_undef.hh"
```

Data Structures

- class jeod::PlanetRotation

  The generic base class for all planet transformations.

Namespaces

- jeod

  Namespace jeod.

9.18.1 Detailed Description

Pure virtual polymorphic base class for all forms of planet rotation in th RNP model including precession, nutation, polar motion and axial rotation.

9.19 planet_rotation_init.hh File Reference

Pure virtual polymorphic base class meant to be used by PlanetRotation::initialize when a large amount of data that could possibly change must be used for rotation calculation.

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

Data Structures

- class jeod::PlanetRotationInit

  The generic base class for all initializing classes for PlanetRotation derived classes.

Namespaces

- jeod

  Namespace jeod.

9.19.1 Detailed Description

Pure virtual polymorphic base class meant to be used by PlanetRotation::initialize when a large amount of data that could possibly change must be used for rotation calculation.

9.20 polar_motion_j2000.cc File Reference

Implementation of PolarMotionJ2000.

```
#include <cstddef>
#include "environment/RNP/GenericRNP/include/RNP_messages.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/polar_motion_j2000.hh"
#include "../include/polar_motion_j2000_init.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.20.1 Detailed Description

Implementation of PolarMotionJ2000.

9.21 polar_motion_j2000.hh File Reference

Model the polar motion portion of the RNP routine for the Standard Epoch J2000.

```
#include "environment/RNP/GenericRNP/include/planet_rotation.hh"
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class jeod::PolarMotionJ2000

  Implements the polar motion portion of the J2000 RNP.

Namespaces

- jeod

  Namespace jeod.

9.21.1 Detailed Description

Model the polar motion portion of the RNP routine for the Standard Epoch J2000.

This is a form of the IAU-76/FK5 RNP model, as implemented in Jeod 1.52

9.22 polar_motion_j2000_init.cc File Reference

Implementation for PolarMotionJ2000Init.

```
#include <cstddef>
#include "utils/memory/include/jeod_alloc.hh"
#include "../include/polar_motion_j2000_init.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.22.1 Detailed Description

Implementation for PolarMotionJ2000Init.

9.23 polar_motion_j2000_init.hh File Reference

Used to load data and initialize the PolarMotionJ2000 class through PolarMotionJ2000::initialize.

```
#include "environment/RNP/GenericRNP/include/planet_rotation_init.hh"
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class jeod::PolarMotionJ2000Init

  Initializes the PolarMotionJ2000 object.

Namespaces

- jeod

  Namespace jeod.

9.23.1 Detailed Description

Used to load data and initialize the PolarMotionJ2000 class through PolarMotionJ2000::initialize.

9.24 precession_j2000.cc File Reference

Implementation for PrecessionJ2000.

```
#include "../include/precession_j2000.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.24.1 Detailed Description

Implementation for PrecessionJ2000.

9.25 precession_j2000.hh File Reference

Model the precession for the RNP routine for the Standard Epoch J2000 This is a form of the IAU-76/FK5 RNP model, as implemented in Jeod 1.52.

```
#include "environment/RNP/GenericRNP/include/planet_rotation.hh"
#include "utils/sim_interface/include/jeod_class.hh"
```

Data Structures

- class jeod::PrecessionJ2000

  Implements the precession portion of the J2000 RNP.

Namespaces

- jeod

  Namespace jeod.

9.25.1 Detailed Description

Model the precession for the RNP routine for the Standard Epoch J2000 This is a form of the IAU-76/FK5 RNP model, as implemented in Jeod 1.52.

9.26 precession_mars.cc File Reference

Implementation of PrecessionMars.

```
#include <cstddef>
#include "environment/RNP/GenericRNP/include/RNP_messages.hh"
#include "utils/math/include/matrix3x3.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/precession_mars.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.26.1 Detailed Description

Implementation of PrecessionMars.

9.27 precession_mars.hh File Reference

Represent the precession portion of the JPL-developed "Pathfinder" Mars orientation model.

```
#include "environment/RNP/GenericRNP/include/planet_rotation.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "nutation_mars.hh"
```

Data Structures

- class jeod::PrecessionMars

  Implements the axial rotation portion of the "Pathfinder" Mars RNP model.

Namespaces

- jeod

  Namespace jeod.

9.27.1 Detailed Description

Represent the precession portion of the JPL-developed "Pathfinder" Mars orientation model.

9.28 rnp_j2000.cc File Reference

Implementation for RNPJ2000.

```
#include <cstddef>
#include "environment/planet/include/planet.hh"
#include "environment/time/include/time_dyn.hh"
#include "environment/time/include/time_gmst.hh"
#include "environment/time/include/time_manager.hh"
#include "environment/time/include/time_tt.hh"
#include "environment/time/include/time_ut1.hh"
#include "utils/math/include/matrix3x3.hh"
#include "utils/math/include/numerical.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "../include/rnp_j2000.hh"
#include "environment/RNP/GenericRNP/include/RNP_messages.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.28.1 Detailed Description

Implementation for RNPJ2000.

9.29 rnp_j2000.hh File Reference

Data Structures

- class jeod::RNPJ2000_rnp_j2000_default_data

Namespaces

- jeod

  Namespace jeod.

9.30 rnp_j2000.hh File Reference

A specific implementation of PlanetRNP, for Earth.

```
#include "environment/RNP/GenericRNP/include/planet_rnp.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "nutation_j2000.hh"
#include "polar_motion_j2000.hh"
#include "precession_j2000.hh"
#include "rotation_j2000.hh"
```

Data Structures

- class jeod::RNPJ2000

  Implements the J2000 RNP model using the generic RNP framework.

Namespaces

- jeod

  Namespace jeod.

9.30.1 Detailed Description

A specific implementation of PlanetRNP, for Earth.

This is a form of the IAU-76/FK5 RNP model, as implemented in Jeod 1.52

9.31 rnp_mars.cc File Reference

Implementation of RNPMars.

```
#include <cstddef>
#include "environment/RNP/GenericRNP/include/RNP_messages.hh"
#include "environment/planet/include/planet.hh"
#include "environment/time/include/time_dyn.hh"
#include "environment/time/include/time_manager.hh"
#include "environment/time/include/time_tt.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/rnp_mars.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.31.1 Detailed Description

Implementation of RNPMars.

9.32 rnp_mars.hh File Reference

Data Structures

- class jeod::RNPMars_rnp_mars_default_data

Namespaces

- jeod

  Namespace jeod.

9.33 rnp_mars.hh File Reference

A specific implementation of PlanetRNP, for Mars.

```
#include "environment/RNP/GenericRNP/include/planet_rnp.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "nutation_mars.hh"
#include "precession_mars.hh"
#include "rotation_mars.hh"
```

Data Structures

- class jeod::RNPMars

  Implements the "Pathfinder" Mars RNP model using the generic RNP framework.

Namespaces

- jeod

  Namespace jeod.

9.33.1 Detailed Description

A specific implementation of PlanetRNP, for Mars.

This is a form of the JPL-developed "Pathfinder" Mars orientation model.

9.34 RNP_messages.cc File Reference

Implement RNP_messages.

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

Namespaces

- jeod

  Namespace jeod.

Macros

- #define MAKE_RNP_MESSAGE_CODE(id) JEOD_MAKE_MESSAGE_CODE(RNPMessages, "environment/R↩ NP/", id)

9.34.1 Detailed Description

Implement RNP_messages.

9.34.2 Macro Definition Documentation

9.34.2.1 MAKE_RNP_MESSAGE_CODE

```
#define MAKE_RNP_MESSAGE_CODE(
              id ) JEOD_MAKE_MESSAGE_CODE(RNPMessages, "environment/RNP/", id)
```

Definition at line 45 of file RNP_messages.cc.

9.35 RNP_messages.hh File Reference

Implement RNP_messages.

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

Data Structures

- class jeod::RNPMessages

  Describes messages used in the RNP model.

Namespaces

- jeod

  Namespace jeod.

9.35.1 Detailed Description

Implement RNP_messages.

9.36 rotation_j2000.cc File Reference

Implementation of RotationJ2000.

```
#include <cmath>
#include <cstddef>
#include "environment/RNP/GenericRNP/include/RNP_messages.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/rotation_j2000.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.36.1 Detailed Description

Implementation of RotationJ2000.

9.37 rotation_j2000.hh File Reference

Model the axial rotation portion of the RNP routine for the Standard Epoch J2000.

```
#include "environment/RNP/GenericRNP/include/planet_rotation.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "nutation_j2000.hh"
```

Data Structures

- class jeod::RotationJ2000

  Implements the axial rotation portion of J2000 RNP.

Namespaces

- jeod

  Namespace jeod.

9.37.1 Detailed Description

Model the axial rotation portion of the RNP routine for the Standard Epoch J2000.

This is a form of the IAU-76/FK5 RNP model, as implemented in Jeod 1.52

9.38 rotation_mars.cc File Reference

Implementation of RotationMars.

```
#include <cmath>
#include <cstddef>
#include "environment/RNP/GenericRNP/include/RNP_messages.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/rotation_mars.hh"
```

Namespaces

- jeod

  Namespace jeod.

9.38.1 Detailed Description

Implementation of RotationMars.

9.39 rotation_mars.hh File Reference

Represent the axial rotation portion of the JPL-developed "Pathfinder" Mars orientation model.

```
#include "environment/RNP/GenericRNP/include/planet_rotation.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "nutation_mars.hh"
```

Data Structures

- class jeod::RotationMars

  Implements the axial rotation portion of the "Pathfinder" Mars RNP model.

Namespaces

- jeod

  Namespace jeod.

9.39.1 Detailed Description

Represent the axial rotation portion of the JPL-developed "Pathfinder" Mars orientation model.

9.40 xpyp_daily.cc File Reference

```
#include "environment/RNP/GenericRNP/include/planet_rotation_init.hh"
#include "environment/RNP/RNPJ2000/include/polar_motion_j2000_init.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "../include/xpyp_daily.hh"
```

Namespaces

- jeod

  Namespace jeod.

Macros

- #define JEOD_FRIEND_CLASS PolarMotionJ2000Init_xpyp_daily_default_data

9.40.1 Macro Definition Documentation

9.40.1.1 JEOD_FRIEND_CLASS

```
#define JEOD_FRIEND_CLASS PolarMotionJ2000Init_xpyp_daily_default_data
```

Definition at line 22 of file xpyp_daily.cc.

9.41 xpyp_daily.hh File Reference

Data Structures

- class jeod::PolarMotionJ2000Init_xpyp_daily_default_data

Namespaces

- jeod

  Namespace jeod.

9.42 xpyp_monthly.cc File Reference

```
#include "environment/RNP/GenericRNP/include/planet_rotation_init.hh"
#include "environment/RNP/RNPJ2000/include/polar_motion_j2000_init.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "../include/xpyp_monthly.hh"
```

Namespaces

- jeod

  Namespace jeod.

Macros

- #define JEOD_FRIEND_CLASS PolarMotionJ2000Init_xpyp_monthly_default_data

9.42.1 Macro Definition Documentation

9.42.1.1 JEOD_FRIEND_CLASS

```
#define JEOD_FRIEND_CLASS PolarMotionJ2000Init_xpyp_monthly_default_data
```

Definition at line 22 of file xpyp_monthly.cc.

9.43 xpyp_monthly.hh File Reference

Data Structures

- class jeod::PolarMotionJ2000Init_xpyp_monthly_default_data

Namespaces

- jeod

  Namespace jeod.

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