

Quaternion

5.1

Generated by Doxygen 1.8.5

Mon Jul 31 2023 11:43:52

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Chapter 1

Module Index

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Chapter 2

Namespace Index

2.1 Namespace List

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Chapter 3

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Chapter 5

Module Documentation

5.1 Models

Modules

- [Utils](#)

5.1.1 Detailed Description

5.2 Utils

Modules

- [Quaternion](#)

5.2.1 Detailed Description

5.3 Quaternion

Files

- file [quat.hh](#)
Define the quaternion class.
- file [quat_inline.hh](#)
Define inline methods for the quaternion class.
- file [quat_messages.hh](#)
Define the class [QuatMessages](#), the class that specifies the message IDs used in the quaternion model.
- file [quat.cc](#)
Define basic methods for the quaternion class.
- file [quat_from_mat.cc](#)
Define `left_quat_from_transformation()`, which computes the parent-to-child left quaternion from the input transformation matrix.
- file [quat_messages.cc](#)
Implement the class [QuatMessages](#).
- file [quat_norm.cc](#)
Define quaternion normalization methods.
- file [quat_to_eigenrot.cc](#)
Define `Quaternion::left_quat_to_eigen_rotation`, which computes the eigen rotation corresponding to a quaternion.
- file [quat_to_mat.cc](#)
Define `Quaternion::left_quat_to_transformation`, which computes the parent- to-child transformation matrix from the parent-to-child left quaternion.

Namespaces

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

Data Structures

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

Macros

- `#define` [PATH](#) "utils/quaternion/"

Variables

- static char const * [QuatMessages::undefined](#)
Issued an undefined behaviour is encountered.
- static char const * [QuatMessages::invalid_entry](#)
Issued when function input is invalid.

5.3.1 Detailed Description

5.3.2 Macro Definition Documentation

5.3.2.1 `#define PATH "utils/quaternion/"`

Definition at line 37 of file quat_messages.cc.

5.3.3 Variable Documentation

5.3.3.1 `char const * QuatMessages::invalid_entry` `[static]`

Initial value:

```
=  
    "utils/quaternion/" "invalid_entry"
```

Issued when function input is invalid.

trick_units(—)

Definition at line 97 of file quat_messages.hh.

5.3.3.2 `char const * QuatMessages::undefined` `[static]`

Initial value:

```
=  
    "utils/quaternion/" "undefined"
```

Issued an undefined behaviour is encountered.

trick_units(—)

Definition at line 92 of file quat_messages.hh.

Referenced by jeod::Quaternion::compute_slerp().

Chapter 6

Namespace Documentation

6.1 jeod Namespace Reference

Namespace jeod.

Data Structures

- class [Quaternion](#)
Implement quaternions to the extent needed to represent orientations.

6.1.1 Detailed Description

Namespace jeod.

Chapter 7

Data Structure Documentation

7.1 jeod::Quaternion Class Reference

Implement quaternions to the extent needed to represent orientations.

```
#include <quat.hh>
```

Public Member Functions

- [Quaternion](#) (void)
Construct a quaternion; default constructor.
- [Quaternion](#) (const double s)
Construct a pure real quaternion.
- [Quaternion](#) (const double s, const double v[3])
Construct from a scalar and a vector.
- [Quaternion](#) (const double arr[4])
Construct from a double array.
- [Quaternion](#) (const double T[3][3])
Construct a left transformation unit quaternion.
- void [set_to_zero](#) (void)
Set all components of the quaternion to zero.
- void [make_identity](#) (void)
Make the quaternion represent an identity transform.
- [operator double *](#) (void)
Make a quaternion look like a double array.
- void [copy_to](#) (double arr[4]) const
Copy a quaternion to a four vector, with the scalar part copied to arr[0] and the vector part to arr[1] to arr[3].
- void [copy_from](#) (const double arr[4])
Copy a quaternion from a four vector, with the scalar part of the quaternion in arr[0] and the vector part in arr[1] to arr[3].
- void [scale](#) (const double scale)
Scale the quaternion by a real.
- void [scale](#) (const double scale, [Quaternion](#) &quat) const
Scale the quaternion by a real, leaving original intact.
- double [norm_sq](#) (void) const
Compute the square of the norm of the quaternion.
- void [normalize](#) (void)
Normalize the quaternion, making the scalar part of the quaternion non-negative.

- void `normalize` (`Quaternion` &quat) const
Form the normalized quaternion, leaving original intact.
- void `normalize_integ` (void)
Normalize the quaternion, but do not make the scalar part non-negative.
- void `normalize_integ` (`Quaternion` &quat) const
Form the normalized quaternion, leaving original intact.
- void `conjugate` (void)
Replace the quaternion with its conjugate.
- void `conjugate` (`Quaternion` &quat) const
Form the conjugate of a quaternion, leaving original intact.
- void `multiply` (const `Quaternion` &quat, `Quaternion` &prod) const
*Post-multiply this quaternion by another quaternion: $prod = this * quat$.*
- void `multiply` (const `Quaternion` &quat)
*Post-multiply this quaternion by another quaternion: $this = this * quat$.*
- void `conjugate_multiply` (const `Quaternion` &quat, `Quaternion` &prod) const
*Post-multiply this quaternion's conjugate by another quaternion: $prod = conj(this) * quat$.*
- void `conjugate_multiply` (const `Quaternion` &quat)
*Post-multiply this quaternion's conjugate by another quaternion: $this = conj(this) * quat$.*
- void `multiply_conjugate` (const `Quaternion` &quat, `Quaternion` &prod) const
*Post-multiply this quaternion by another's conjugate: $prod = this * conj(quat)$.*
- void `multiply_conjugate` (const `Quaternion` &quat)
*Post-multiply this quaternion by another's conjugate: $this = this * conj(quat)$.*
- void `multiply_left` (const `Quaternion` &quat, `Quaternion` &prod) const
*Pre-multiply this quaternion by another quaternion: $prod = quat * this$.*
- void `multiply_left` (const `Quaternion` &quat)
*Pre-multiply this quaternion by another quaternion: $this = quat * this$.*
- void `multiply_left_conjugate` (const `Quaternion` &quat, `Quaternion` &prod) const
*Pre-multiply this quaternion by another's conjugate: $prod = conj(quat) * this$.*
- void `multiply_left_conjugate` (const `Quaternion` &quat)
*Pre-multiply this quaternion by another's conjugate: $this = conj(quat) * this$.*
- void `multiply_vector_left` (const double vec[3], `Quaternion` &prod) const
*Pre-multiply this quaternion by a pure imaginary quaternion, the latter represented by a vector: $prod = [0, vec] * quat$.*
- void `multiply_vector_right` (const double vec[3], `Quaternion` &prod) const
*Post-multiply this quaternion by a pure imaginary quaternion, the latter represented by a vector: $prod = quat * [0, vec]$.*
- void `left_quat_from_transformation` (const double T[3][3])
Compute the parent-to-child left quaternion from the input transformation matrix.
- void `left_quat_to_transformation` (double T[3][3]) const
Compute the parent-to-child transformation matrix from the parent-to-child left quaternion.
- void `left_quat_from_eigen_rotation` (double eigen_angle, const double eigen_axis[3])
Construct the quaternion corresponding to an eigen rotation.
- void `left_quat_to_eigen_rotation` (double *eigen_angle, double eigen_axis[3]) const
Compute the eigen rotation corresponding to a quaternion.
- void `eigen_compare` (const `Quaternion` &compare_to, double *eigen_angle, double eigen_axis[3]) const
*Compute eigen decomposition of $this * conj(quat)$.*
- void `left_quat_transform` (const double vec_in[3], double vec_out[3]) const
Transform a vector.
- void `compute_left_quat_deriv` (const double ang_vel[3], `Quaternion` &qdot) const
Compute the time derivative of a left quaternion.
- void `compute_left_quat_second_deriv` (const double ang_vel[3], const double ang_acc[3], `Quaternion` &qdot) const
Compute the time derivative of a left quaternion.

Static Public Member Functions

- static void [normalize_integ](#) (double arr[4])
Normalize the quaternion, but do not make the scalar part non-negative.
- static void [compute_left_quat_deriv](#) (const double quat[4], const double ang_vel[3], double qdot[4])
Compute the time derivative of a left quaternion.
- static void [compute_left_quat_second_deriv](#) (const double quat[4], const double ang_vel[3], const double ang_acc[3], double qddot[4])
Compute the second time derivative of a left quaternion.
- static [Quaternion](#) [compute_slerp](#) ([Quaternion](#) &q1, [Quaternion](#) &q2, const double T)
Compute the minimum interpolation quaternion between a start quaternion and end quaternion.

Data Fields

- double [scalar](#)
The scalar, or real, part of the quaternion.
- double [vector](#) [3]
The vectorial, or imaginary, part of the quaternion.

Friends

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

7.1.1 Detailed Description

Implement quaternions to the extent needed to represent orientations.

Definition at line 87 of file quat.hh.

7.1.2 Constructor & Destructor Documentation

7.1.2.1 jeod::Quaternion::Quaternion (void)

Construct a quaternion; default constructor.

Definition at line 52 of file quat.cc.

References [scalar](#), and [vector](#).

7.1.2.2 jeod::Quaternion::Quaternion (const double *real_part*) `[explicit]`

Construct a pure real quaternion.

Parameters

<i>in</i>	<i>real_part</i>	Scalar
-----------	------------------	--------

Definition at line 68 of file quat.cc.

References [vector](#).

7.1.2.3 jeod::Quaternion::Quaternion (const double s, const double v[3]) `[inline]`

Construct from a scalar and a vector.

Parameters

in	<i>s</i>	Scalar part
in	<i>v</i>	Vector part

Definition at line 84 of file quat_inline.hh.

References vector.

7.1.2.4 jeod::Quaternion::Quaternion (const double *arr*[4]) [inline],[explicit]

Construct from a double array.

Parameters

in	<i>arr</i>	Quaternion source
----	------------	-----------------------------------

Definition at line 101 of file quat_inline.hh.

References copy_from().

7.1.2.5 jeod::Quaternion::Quaternion (const double *T*[3][3]) [explicit]

Construct a left transformation unit quaternion.

Parameters

in	<i>T</i>	Transformation matrix
----	----------	-----------------------

Definition at line 81 of file quat.cc.

References left_quat_from_transformation().

7.1.3 Member Function Documentation

7.1.3.1 void jeod::Quaternion::compute_left_quat_deriv (const double *ang_vel*[3], Quaternion & *qdot*) const [inline]

Compute the time derivative of a left quaternion.

Parameters

in	<i>ang_vel</i>	Angular velocity Units: r/s
out	<i>qdot</i>	Quaternion derivative

Definition at line 581 of file quat_inline.hh.

References multiply_vector_left().

7.1.3.2 void jeod::Quaternion::compute_left_quat_deriv (const double *quat*[4], const double *ang_vel*[3], double *qdot*[4]) [inline],[static]

Compute the time derivative of a left quaternion.

Parameters

in	<i>quat</i>	Quaternion as 4-vector
in	<i>ang_vel</i>	Angular velocity Units: r/s

out	<i>qdot</i>	Derivative as 4-vector
-----	-------------	------------------------

Definition at line 619 of file quat_inline.hh.

7.1.3.3 `void jeod::Quaternion::compute_left_quat_second_deriv (const double ang_vel[3], const double ang_acc[3], Quaternion & qdot) const [inline]`

Compute the time derivative of a left quaternion.

Parameters

in	<i>ang_vel</i>	Angular velocity Units: r/s
in	<i>ang_acc</i>	Angular acceleration Units: r/s2
out	<i>qdot</i>	Quaternion 2nd deriv

Definition at line 599 of file quat_inline.hh.

References `multiply_left()`.

7.1.3.4 `void jeod::Quaternion::compute_left_quat_second_deriv (const double quat[4], const double ang_vel[3], const double ang_acc[3], double qddot[4]) [inline], [static]`

Compute the second time derivative of a left quaternion.

Parameters

in	<i>quat</i>	Quaternion as 4-vector
in	<i>ang_vel</i>	Angular velocity Units: r/s
in	<i>ang_acc</i>	Angular acceleration Units: r/s2
out	<i>qddot</i>	2nd derivative as 4-vector

Definition at line 640 of file quat_inline.hh.

7.1.3.5 `Quaternion jeod::Quaternion::compute_slerp (Quaternion & q1, Quaternion & q2, const double T) [static]`

Compute the minimum interpolation quaternion between a start quaternion and end quaternion.

Parameters

in	<i>q1</i>	Starting quaternion
in	<i>q2</i>	Ending quaternion
in	<i>T</i>	Interpolation coefficient between 0.0 and 1.0 representing a rotational scale factor between the intial and final quaternion. When the <code>compute_slerp</code> method is used in a loop to rotate an object from a start and end orientation, a smaller step or change in <i>T</i> results in a smoother object rotation

Definition at line 99 of file quat.cc.

References `normalize()`, `scalar`, `QuatMessages::undefined`, and `vector`.

7.1.3.6 `void jeod::Quaternion::conjugate (void) [inline]`

Replace the quaternion with its conjugate.

Definition at line 261 of file quat_inline.hh.

References vector.

7.1.3.7 `void jeod::Quaternion::conjugate (Quaternion & quat) const` `[inline]`

Form the conjugate of a quaternion, leaving original intact.

Parameters

out	quat	Conjugated quaternion
-----	------	-----------------------

Definition at line 273 of file quat_inline.hh.

References scalar, and vector.

7.1.3.8 `void jeod::Quaternion::conjugate_multiply (const Quaternion & quat, Quaternion & prod) const` `[inline]`

Post-multiply this quaternion's conjugate by another quaternion: $prod = conj(this) * quat$.

Parameters

in	quat	Right multiplicand
out	prod	Quaternion product

Definition at line 331 of file quat_inline.hh.

References scalar, and vector.

7.1.3.9 `void jeod::Quaternion::conjugate_multiply (const Quaternion & quat)` `[inline]`

Post-multiply this quaternion's conjugate by another quaternion: $this = conj(this) * quat$.

Parameters

in	quat	Right multiplicand
----	------	--------------------

Definition at line 349 of file quat_inline.hh.

References scalar, and vector.

7.1.3.10 `void jeod::Quaternion::copy_from (const double arr[4])` `[inline]`

Copy a quaternion from a four vector, with the scalar part of the quaternion in `arr[0]` and the vector part in `arr[1]` to `arr[3]`.

Parameters

in	arr	Quaternion source
----	-----	-----------------------------------

Definition at line 155 of file quat_inline.hh.

References scalar, and vector.

Referenced by `Quaternion()`.

7.1.3.11 `void jeod::Quaternion::copy_to (double arr[4]) const` `[inline]`

Copy a quaternion to a four vector, with the scalar part copied to `arr[0]` and the vector part to `arr[1]` to `arr[3]`.

Parameters

out	arr	Copy of quaternion
-----	-----	--------------------

Definition at line 138 of file quat_inline.hh.

References scalar, and vector.

7.1.3.12 `void jeod::Quaternion::eigen_compare (const Quaternion & quat, double * eigen_angle, double eigen_axis[3]) const [inline]`

Compute eigen decomposition of this*conj(quat).

Parameters

in	quat	Quaternion to compare to
out	eigen_angle	Eigen angle Units: r
out	eigen_axis	Eigen axis

Definition at line 563 of file quat_inline.hh.

References left_quat_to_eigen_rotation(), and multiply_conjugate().

7.1.3.13 `void jeod::Quaternion::left_quat_from_eigen_rotation (double eigen_angle, const double eigen_axis[3]) [inline]`

Construct the quaternion corresponding to an eigen rotation.

Parameters

in	eigen_angle	Eigen angle Units: r
in	eigen_axis	Eigen axis

Definition at line 171 of file quat_inline.hh.

References scalar, and vector.

7.1.3.14 `void jeod::Quaternion::left_quat_from_transformation (const double T[3][3])`

Compute the parent-to-child left quaternion from the input transformation matrix.

Assumptions and Limitations

- Matrix is orthonormal.

Parameters

in	T	Transformation matrix
----	---	-----------------------

Definition at line 118 of file quat_from_mat.cc.

References scalar, and vector.

Referenced by Quaternion().

7.1.3.15 `void jeod::Quaternion::left_quat_to_eigen_rotation (double * eigen_angle, double eigen_axis[3]) const`

Compute the eigen rotation corresponding to a quaternion.

Assumptions and Limitations

- [Quaternion](#) is normalized.

Parameters

out	<i>eigen_angle</i>	Eigen angle Units: r
out	<i>eigen_axis</i>	Eigen axis

Definition at line 49 of file quat_to_eigenrot.cc.

References scalar, and vector.

Referenced by `eigen_compare()`.

7.1.3.16 void jeod::Quaternion::left_quat_to_transformation (double *T*[3][3]) const

Compute the parent-to-child transformation matrix from the parent-to-child left quaternion.

Assumptions and Limitations

- [Quaternion](#) is normalized.

Parameters

out	<i>T</i>	Transformation matrix
-----	----------	-----------------------

Definition at line 84 of file quat_to_mat.cc.

References scalar, and vector.

7.1.3.17 void jeod::Quaternion::left_quat_transform (const double *vec_in*[3], double *vec_out*[3]) const [inline]

Transform a vector.

Parameters

in	<i>vec_in</i>	Vector to be transformed
out	<i>vec_out</i>	Transformed vector

Definition at line 536 of file quat_inline.hh.

References scalar, and vector.

7.1.3.18 void jeod::Quaternion::make_identity (void) [inline]

Make the quaternion represent an identity transform.

Definition at line 124 of file quat_inline.hh.

References scalar, and vector.

7.1.3.19 void jeod::Quaternion::multiply (const Quaternion & *quat*, Quaternion & *prod*) const [inline]

Post-multiply this quaternion by another quaternion: `prod = this * quat`.

Parameters

in	<i>quat</i>	Right multiplicand
out	<i>prod</i>	Quaternion product

Definition at line 289 of file quat_inline.hh.

References scalar, and vector.

7.1.3.20 void jeod::Quaternion::multiply (const Quaternion & quat) [inline]

Post-multiply this quaternion by another quaternion: this = this * quat.

Parameters

in	<i>quat</i>	Right multiplicand
----	-------------	--------------------

Definition at line 307 of file quat_inline.hh.

References scalar, and vector.

7.1.3.21 void jeod::Quaternion::multiply_conjugate (const Quaternion & quat, Quaternion & prod) const [inline]

Post-multiply this quaternion by another's conjugate: prod = this * conj(quat).

Parameters

in	<i>quat</i>	Right multiplicand
out	<i>prod</i>	Quaternion product

Definition at line 373 of file quat_inline.hh.

References scalar, and vector.

Referenced by eigen_compare().

7.1.3.22 void jeod::Quaternion::multiply_conjugate (const Quaternion & quat) [inline]

Post-multiply this quaternion by another's conjugate: this = this * conj(quat).

Parameters

in	<i>quat</i>	Right multiplicand
----	-------------	--------------------

Definition at line 391 of file quat_inline.hh.

References scalar, and vector.

7.1.3.23 void jeod::Quaternion::multiply_left (const Quaternion & quat, Quaternion & prod) const [inline]

Pre-multiply this quaternion by another quaternion: prod = quat * this.

Parameters

in	<i>quat</i>	Left multiplicand
out	<i>prod</i>	Quaternion product

Definition at line 415 of file quat_inline.hh.

References scalar, and vector.

Referenced by compute_left_quat_second_deriv().

7.1.3.24 `void jeod::Quaternion::multiply_left (const Quaternion & quat)` `[inline]`

Pre-multiply this quaternion by another quaternion: $\text{this} = \text{quat} * \text{this}$.

Parameters

<i>in</i>	<i>quat</i>	Left multiplicand
-----------	-------------	-------------------

Definition at line 433 of file quat_inline.hh.

References scalar, and vector.

7.1.3.25 `void jeod::Quaternion::multiply_left_conjugate (const Quaternion & quat, Quaternion & prod) const`
`[inline]`

Pre-multiply this quaternion by another's conjugate: $\text{prod} = \text{conj}(\text{quat}) * \text{this}$.

Parameters

<i>in</i>	<i>quat</i>	Left multiplicand
<i>out</i>	<i>prod</i>	Quaternion product

Definition at line 457 of file quat_inline.hh.

References scalar, and vector.

7.1.3.26 `void jeod::Quaternion::multiply_left_conjugate (const Quaternion & quat)` `[inline]`

Pre-multiply this quaternion by another's conjugate: $\text{this} = \text{conj}(\text{quat}) * \text{this}$.

Parameters

<i>in</i>	<i>quat</i>	Left multiplicand
-----------	-------------	-------------------

Definition at line 475 of file quat_inline.hh.

References scalar, and vector.

7.1.3.27 `void jeod::Quaternion::multiply_vector_left (const double vec[3], Quaternion & prod) const` `[inline]`

Pre-multiply this quaternion by a pure imaginary quaternion, the latter represented by a vector: $\text{prod} = [0, \text{vec}] * \text{quat}$.

Parameters

<i>in</i>	<i>vec</i>	Right multiplicand
<i>out</i>	<i>prod</i>	Quaternion product

Definition at line 500 of file quat_inline.hh.

References scalar, and vector.

Referenced by `compute_left_quat_deriv()`.

7.1.3.28 `void jeod::Quaternion::multiply_vector_right (const double vec[3], Quaternion & prod) const` `[inline]`

Post-multiply this quaternion by a pure imaginary quaternion, the latter represented by a vector: $\text{prod} = \text{quat} * [0, \text{vec}]$.

Parameters

<i>in</i>	<i>vec</i>	Right multiplicand
<i>out</i>	<i>prod</i>	Quaternion product

Definition at line 519 of file quat_inline.hh.

References scalar, and vector.

7.1.3.29 `double jeod::Quaternion::norm_sq (void) const` `[inline]`

Compute the square of the norm of the quaternion.

Returns

Square of the norm of the quaternion

Definition at line 221 of file `quat_inline.hh`.

References `scalar`, and `vector`.

Referenced by `normalize()`, and `normalize_integ()`.

7.1.3.30 `void jeod::Quaternion::normalize (void)`

Normalize the quaternion, making the scalar part of the quaternion non-negative.

Definition at line 48 of file `quat_norm.cc`.

References `norm_sq()`, `scalar`, and `scale()`.

Referenced by `compute_slerp()`, and `normalize()`.

7.1.3.31 `void jeod::Quaternion::normalize (Quaternion & quat) const` `[inline]`

Form the normalized quaternion, leaving original intact.

Parameters

<code>out</code>	<code>quat</code>	Normalized quaternion
------------------	-------------------	-----------------------

Definition at line 234 of file `quat_inline.hh`.

References `normalize()`.

7.1.3.32 `void jeod::Quaternion::normalize_integ (void)`

Normalize the quaternion, but do not make the scalar part non-negative.

Definition at line 82 of file `quat_norm.cc`.

References `norm_sq()`, and `scale()`.

Referenced by `normalize_integ()`.

7.1.3.33 `void jeod::Quaternion::normalize_integ (Quaternion & quat) const` `[inline]`

Form the normalized quaternion, leaving original intact.

Parameters

<code>out</code>	<code>quat</code>	Normalized quaternion
------------------	-------------------	-----------------------

Definition at line 248 of file `quat_inline.hh`.

References `normalize_integ()`.

7.1.3.34 `void jeod::Quaternion::normalize_integ (double quat[4])` `[static]`

Normalize the quaternion, but do not make the scalar part non-negative.

Parameters

<i>quat</i>	Quaternion to be normalized.
-------------	------------------------------

Definition at line 106 of file quat_norm.cc.

7.1.3.35 jeod::Quaternion::operator double * (void) [inline]

Make a quaternion look like a double array.

Definition at line 134 of file quat.hh.

References scalar.

7.1.3.36 void jeod::Quaternion::scale (const double *fact*) [inline]

Scale the quaternion by a real.

Parameters

<i>in</i>	<i>fact</i>	Scale factor
-----------	-------------	--------------

Definition at line 192 of file quat_inline.hh.

References scalar, and vector.

Referenced by normalize(), and normalize_integ().

7.1.3.37 void jeod::Quaternion::scale (const double *fact*, Quaternion & *quat*) const [inline]

Scale the quaternion by a real, leaving original intact.

Parameters

<i>in</i>	<i>fact</i>	Scale factor
<i>out</i>	<i>quat</i>	Scaled quaternion

Definition at line 206 of file quat_inline.hh.

References scalar, and vector.

7.1.3.38 void jeod::Quaternion::set_to_zero (void) [inline]

Set all components of the quaternion to zero.

Definition at line 112 of file quat_inline.hh.

References scalar, and vector.

7.1.4 Friends And Related Function Documentation

7.1.4.1 void init_attrjeod__Quaternion () [friend]

7.1.4.2 friend class InputProcessor [friend]

Definition at line 89 of file quat.hh.

7.1.5 Field Documentation

7.1.5.1 `double jeod::Quaternion::scalar`

The scalar, or real, part of the quaternion.

`trick_units(-)`

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

Referenced by `compute_slerp()`, `conjugate()`, `conjugate_multiply()`, `copy_from()`, `copy_to()`, `left_quat_from_eigen_rotation()`, `left_quat_from_transformation()`, `left_quat_to_eigen_rotation()`, `left_quat_to_transformation()`, `left_quat_transform()`, `make_identity()`, `multiply()`, `multiply_conjugate()`, `multiply_left()`, `multiply_left_conjugate()`, `multiply_vector_left()`, `multiply_vector_right()`, `norm_sq()`, `normalize()`, `operator double *()`, `Quaternion()`, `scale()`, and `set_to_zero()`.

7.1.5.2 `double jeod::Quaternion::vector[3]`

The vectorial, or imaginary, part of the quaternion.

`trick_units(-)`

Definition at line 102 of file `quat.hh`.

Referenced by `compute_slerp()`, `conjugate()`, `conjugate_multiply()`, `copy_from()`, `copy_to()`, `left_quat_from_eigen_rotation()`, `left_quat_from_transformation()`, `left_quat_to_eigen_rotation()`, `left_quat_to_transformation()`, `left_quat_transform()`, `make_identity()`, `multiply()`, `multiply_conjugate()`, `multiply_left()`, `multiply_left_conjugate()`, `multiply_vector_left()`, `multiply_vector_right()`, `norm_sq()`, `Quaternion()`, `scale()`, and `set_to_zero()`.

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

- [quat.hh](#)
- [quat_inline.hh](#)
- [quat.cc](#)
- [quat_from_mat.cc](#)
- [quat_norm.cc](#)
- [quat_to_eigenrot.cc](#)
- [quat_to_mat.cc](#)

7.2 QuatMessages Class Reference

Specifies the message IDs used in the orbital elements model.

```
#include <quat_messages.hh>
```

Static Public Attributes

- static char const * [undefined](#)
Issued an undefined behaviour is encountered.
- static char const * [invalid_entry](#)
Issued when function input is invalid.

Private Member Functions

- [QuatMessages](#) (void)
- [QuatMessages](#) (const [QuatMessages](#) &)
- [QuatMessages](#) & `operator=` (const [QuatMessages](#) &)

Friends

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

7.2.1 Detailed Description

Specifies the message IDs used in the orbital elements model.

Definition at line 80 of file quat_messages.hh.

7.2.2 Constructor & Destructor Documentation

7.2.2.1 `QuatMessages::QuatMessages (void) [private]`

7.2.2.2 `QuatMessages::QuatMessages (const QuatMessages &) [private]`

7.2.3 Member Function Documentation

7.2.3.1 `QuatMessages& QuatMessages::operator= (const QuatMessages &) [private]`

7.2.4 Friends And Related Function Documentation

7.2.4.1 `void init_attrjeod__QuatMessages () [friend]`

7.2.4.2 `friend class InputProcessor [friend]`

Definition at line 83 of file quat_messages.hh.

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

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

Chapter 8

File Documentation

8.1 quat.cc File Reference

Define basic methods for the quaternion class.

```
#include "utils/math/include/vector3.hh"
#include "utils/math/include/numerical.hh"
#include "../include/quat.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/quat_messages.hh"
#include <cmath>
#include <fstream>
#include <iomanip>
```

Namespaces

- [jeod](#)

Namespace jeod.

8.1.1 Detailed Description

Define basic methods for the quaternion class.

Definition in file [quat.cc](#).

8.2 quat.hh File Reference

Define the quaternion class.

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

Data Structures

- class [jeod::Quaternion](#)

Implement quaternions to the extent needed to represent orientations.

Namespaces

- [jeod](#)

Namespace jeod.

8.2.1 Detailed Description

Define the quaternion class.

Definition in file [quat.hh](#).

8.3 quat_from_mat.cc File Reference

Define `left_quat_from_transformation()`, which computes the parent-to-child left quaternion from the input transformation matrix.

```
#include <cmath>
#include "../include/quat.hh"
```

Namespaces

- [jeod](#)

Namespace jeod.

8.3.1 Detailed Description

Define `left_quat_from_transformation()`, which computes the parent-to-child left quaternion from the input transformation matrix.

Definition in file [quat_from_mat.cc](#).

8.4 quat_inline.hh File Reference

Define inline methods for the quaternion class.

```
#include <cmath>
#include "quat.hh"
#include "utils/math/include/vector3.hh"
```

Namespaces

- [jeod](#)

Namespace jeod.

8.4.1 Detailed Description

Define inline methods for the quaternion class.

Definition in file [quat_inline.hh](#).

8.5 quat_messages.cc File Reference

Implement the class [QuatMessages](#).

```
#include "../include/quat_messages.hh"
```

Macros

- `#define` [PATH](#) "utils/quaternion/"

8.5.1 Detailed Description

Implement the class [QuatMessages](#).

Definition in file [quat_messages.cc](#).

8.6 quat_messages.hh File Reference

Define the class [QuatMessages](#), the class that specifies the message IDs used in the quaternion model.

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

Data Structures

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

8.6.1 Detailed Description

Define the class [QuatMessages](#), the class that specifies the message IDs used in the quaternion model.

Definition in file [quat_messages.hh](#).

8.7 quat_norm.cc File Reference

Define quaternion normalization methods.

```
#include <cmath>
#include "../include/quat.hh"
```

Namespaces

- [jeod](#)
Namespace jeod.

8.7.1 Detailed Description

Define quaternion normalization methods.

Definition in file [quat_norm.cc](#).

8.8 quat_to_eigenrot.cc File Reference

Define Quaternion::left_quat_to_eigen_rotation, which computes the eigen rotation corresponding to a quaternion.

```
#include <cmath>
#include "utils/math/include/vector3.hh"
#include "../include/quat.hh"
```

Namespaces

- [jeod](#)

Namespace jeod.

8.8.1 Detailed Description

Define Quaternion::left_quat_to_eigen_rotation, which computes the eigen rotation corresponding to a quaternion.

Definition in file [quat_to_eigenrot.cc](#).

8.9 quat_to_mat.cc File Reference

Define Quaternion::left_quat_to_transformation, which computes the parent- to-child transformation matrix from the parent-to-child left quaternion.

```
#include "utils/math/include/vector3.hh"
#include "../include/quat.hh"
```

Namespaces

- [jeod](#)

Namespace jeod.

8.9.1 Detailed Description

Define Quaternion::left_quat_to_transformation, which computes the parent- to-child transformation matrix from the parent-to-child left quaternion.

Definition in file [quat_to_mat.cc](#).

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