
oem

May 28, 2020

Contents

1	OrbitEphemerisMessage	3
2	Ephemeris Components	5
2.1	EphemerisSegment	5
2.2	HeaderSection	6
2.3	MetaDataSection	6
2.4	DataSection	7
2.5	CovarianceSection	7
3	OEM Data Types	9
3.1	State	9
3.2	Covariance	10
4	Indices and tables	11
	Python Module Index	13
	Index	15

The primary interface between the *oem* package and OEM files is the *OrbitEphemerisMessage* class. In addition, the package provides objects to represent each component of an OEM ephemeris.

OrbitEphemerisMessage

See also:

Module *Ephemeris Components*

Module *OEM Data Types*

Python representation of an Orbit Ephemeris Message.

This class provides the primary interface between the OEM module and an OEM file.

`oem.OrbitEphemerisMessage.header`
Object containing the OEM header section.

Type *HeaderSection*

Examples

The *OrbitEphemerisMessage* class can load directly from a file:

```
>>> ephemeris = OrbitEphemerisMessage.open(file_path)
```

An OEM is made up of one or more data segments available through an iterator:

```
>>> for segment in ephemeris:
...     for state in segment:
...         # Iterate through states
...         pass
...     for covariance in segment.covariances:
...         # Iterate through covariances
...         pass
```

It is also possible to iterate through the states and covariances in all segments with the *.states* and *.covariances* properties.

To determine if a particular epoch is contained in the useable time range of any of the segments in an ephemeris, use *in*:

```
>>> epoch in ephemeris
True
```

The `save_as` method enables saving of copies of an OEM in both KVN and XML formats.

```
>>> oem.save_as("new.oem", file_format="xml")
```

To convert directly between KVN and XML formats, use the `convert` class method. For example, to convert a KVN OEM to XML:

```
>>> oem.convert("input.oem", "output.oem", "xml")
```

`oem.OrbitEphemerisMessage.covariances`

Return a list of covariances in all segments.

`oem.OrbitEphemerisMessage.states`

Return a list of states in all segments.

Ephemeris Components

See also:

Module *OrbitEphemerisMessage*

Module *OEM Data Types*

2.1 EphemerisSegment

class oem.components.**EphemerisSegment** (*metadata, state_data, covariance_data=None, version='2.0'*)

Bases: object

OEM ephemeris segment.

Container for a single OEM ephemeris segment.

covariances

Return list of Covariances in this segment.

has_accel

Evaluate if segment contains acceleration data.

has_covariance

Evaluate if segment contains covariance data.

states

Return list of States in this segment.

useable_start_time

Return epoch of start of useable state data range

useable_stop_time

Return epoch of end of useable state data range

2.2 HeaderSection

class oem.components.HeaderSection (*fields*)

Bases: oem.base.KeyValueSection

OEM header section.

Container for a single OEM header section.

Examples

This class behaves similar to a dict allowing membership checks, iteration over keys, and value set/get.

```
>>> "CCSDS_OEM_VERS" in header:
True
```

```
>>> keys = [key for key in header]
```

```
>>> metadata["ORIGINATOR"] = 'ORIG_NAME'
```

```
>>> metadata["ORIGINATOR"]
'ORIG_NAME'
```

version

2.3 MetaDataSection

class oem.components.MetaDataSection (*metadata, version='2.0'*)

Bases: oem.base.KeyValueSection

OEM metadata section.

Container for a single OEM metadata section.

Examples

This class behaves similar to a dict allowing membership checks, iteration over keys, and value set/get.

```
>>> "OBJECT_NAME" in metadata:
True
```

```
>>> keys = [key for key in metadata]
```

```
>>> metadata["CENTER_NAME"] = 'Mars'
```

```
>>> metadata["CENTER_NAME"]
'Mars'
```

useable_start_time

Return epoch of start of useable state data range

useable_stop_time

Return epoch of end of useable state data range

2.4 DataSection

class oem.components.**DataSection** (*states*, *version*='2.0')

Bases: object

OEM data section.

Container for a single OEM ephemeris state data section.

has_accel

Evaluate if section contains acceleration data.

states

Return a list of States in this section.

2.5 CovarianceSection

class oem.components.**CovarianceSection** (*covariances*, *version*='2.0')

Bases: object

OEM covariance section.

Container for a single OEM covariance section.

covariances

Return a list of covariances in this section.

See also:

Module *OrbitEphemerisMessage*

Module *Ephemeris Components*

3.1 State

class `oem.components.State` (*epoch, position, velocity, acceleration=None, version='2.0'*)

Bases: `object`

Basic Cartesian state.

epoch

Epoch date and time.

Type `DateTime`

position

3-element array describing the position at epoch.

Type `ndarray`

velocity

3-element array describing the velocity at epoch.

Type `ndarray`

acceleration

3-element array describing the acceleration at epoch. If unavailable, this attribute is `None`.

Type `ndarray`

has_accel

3.2 Covariance

class oem.components.**Covariance** (*epoch, frame, matrix, version='2.0'*)

Bases: object

Basic 6x6 covariance.

epoch

Epoch date and time.

Type DateTime

frame

Reference from of this covariance.

Type str

matrix

6x6 covariance matrix.

Type ndarray

CHAPTER 4

Indices and tables

- `genindex`
- `modindex`
- `search`

O

`oem.OrbitEphemerisMessage`, 3

A

acceleration (*oem.components.State* attribute), 9

C

Covariance (*class in oem.components*), 10

covariances (in *module oem.OrbitEphemerisMessage*), 4

covariances (*oem.components.CovarianceSection* attribute), 7

covariances (*oem.components.EphemerisSegment* attribute), 5

CovarianceSection (*class in oem.components*), 7

D

DataSection (*class in oem.components*), 7

E

EphemerisSegment (*class in oem.components*), 5

epoch (*oem.components.Covariance* attribute), 10

epoch (*oem.components.State* attribute), 9

F

frame (*oem.components.Covariance* attribute), 10

H

has_accel (*oem.components.DataSection* attribute), 7

has_accel (*oem.components.EphemerisSegment* attribute), 5

has_accel (*oem.components.State* attribute), 9

has_covariance (*oem.components.EphemerisSegment* attribute), 5

header (in *module oem.OrbitEphemerisMessage*), 3

HeaderSection (*class in oem.components*), 6

M

matrix (*oem.components.Covariance* attribute), 10

MetaDataSection (*class in oem.components*), 6

O

oem.OrbitEphemerisMessage (*module*), 3

P

position (*oem.components.State* attribute), 9

S

State (*class in oem.components*), 9

states (in *module oem.OrbitEphemerisMessage*), 4

states (*oem.components.DataSection* attribute), 7

states (*oem.components.EphemerisSegment* attribute), 5

U

useable_start_time
(*oem.components.EphemerisSegment* attribute), 5

useable_start_time
(*oem.components.MetaDataSection* attribute), 6

useable_stop_time
(*oem.components.EphemerisSegment* attribute), 5

useable_stop_time
(*oem.components.MetaDataSection* attribute), 6

V

velocity (*oem.components.State* attribute), 9

version (*oem.components.HeaderSection* attribute), 6