GMAT TAT-C Project

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Contents

Chapter 1

Todo List

Member Attitude::InertialToReference (const Rvector6 &centralBodyState)

is this misnamed?

Member CoverageChecker::sc

Should this be an array of spacecraft?

Member NadirPointingAttitude::InertialToReference (const Rvector6 &centralBodyState)

is this misnamed?

Member Propagator::sc

should this be an array of sc?

Member Spacecraft::AddSensor (Sensor *sensor)

- check for sensor already on list!!

Member Spacecraft::InertialToConeClock (const Rvector3 &viewVec, Real &cone, Real &clock)

- do we need to buffer states here as well??

Chapter 2

Hierarchical Index

2.1 Class Hierarchy

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

Chapter 3

Class Index

3.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

Chapter 4

File Index

4.1 File List

Here is a list of all files with brief descriptions:

Chapter 5

Class Documentation

5.1 AbsoluteDate Class Reference

`#include <AbsoluteDate.hpp>`

Public Member Functions

- AbsoluteDate ()

  class construction/destruction
- AbsoluteDate (const AbsoluteDate &copy)
- AbsoluteDate & operator= (const AbsoluteDate &copy)
- virtual ~AbsoluteDate ()
- virtual void SetGregorianDate (Integer year, Integer month, Integer day, Integer hour, Integer minute, Real second)

  Set the Gregorian date.
- virtual void SetJulianDate (Real jd)

  Set the Julian Date.
- virtual Real GetJulianDate () const

  Return the Julian Date.
- virtual Rvector6 GetGregorianDate ()

  Return the Gregorian date.
- virtual void Advance (Real stepInSec)

  Advance the time by stepInSec seconds.
- virtual AbsoluteDate * Clone () const

  Clone the AbsoluteDate.

Protected Member Functions

- Real GregorianToJulianDate (Integer year, Integer month, Integer day, Integer hour, Integer minute, Real second)

  Compute the Julian date from the input Gregorian date.

Protected Attributes

- Real currentDate

  Current date in Julian Day format.

Static Protected Attributes

- static const Integer DAYS_PER_MONTH [12]

  <static> days-per-month constant
- static const Real JD_1900 = 2415019.5

  <static> Julian date of 1900 constant

5.1.1 Detailed Description

Definition of the AbsoluteDate class. This class represents an epoch.

5.1.2 Constructor & Destructor Documentation

5.1.2.1 AbsoluteDate() [1/2]

```
AbsoluteDate::AbsoluteDate ( )
```

class construction/destruction

Default constructor

5.1.2.2 AbsoluteDate() [2/2]

```
AbsoluteDate::AbsoluteDate (
            const AbsoluteDate & copy )
```

Copy constructor

Parameters

copy	the object to copy

5.1.2.3 ~AbsoluteDate()

```
AbsoluteDate::~AbsoluteDate ( )  [virtual]
```

Destructor

5.1.3 Member Function Documentation

5.1.3.1 Advance()

```
void AbsoluteDate::Advance (
            Real stepInSec )  [virtual]
```

Advance the time by stepInSec seconds.

Advances the date by the number of seconds specified.

Parameters

stepInSec	stepsize (seconds)

5.1.3.2 Clone()

```
AbsoluteDate * AbsoluteDate::Clone ( ) const  [virtual]
```

Clone the AbsoluteDate.

This method returns a clone of the AbsoluteDate.

Returns

clone of the AbsoluteDate.

5.1.3.3 GetGregorianDate()

```
Rvector6 AbsoluteDate::GetGregorianDate ( )  [virtual]
```

Return the Gregorian date.

Returns the Gregorian date.

Returns

the Gregorian date

5.1.3.4 GetJulianDate()

```
Real AbsoluteDate::GetJulianDate ( ) const  [virtual]
```

Return the Julian Date.

Returns the Julian date.

Returns

the Julian date

5.1.3.5 GregorianToJulianDate()

```
Real AbsoluteDate::GregorianToJulianDate (
            Integer year,
            Integer month,
            Integer day,
            Integer hour,
            Integer minute,
            Real second )  [protected]
```

Compute the Julian date from the input Gregorian date.

Converts a Gregorian date to a Julian date.

Parameters

year	the year
month	the month
day	the day
hour	the hour
minute	the minute
second	the seconds

Returns

the Julian date

5.1.3.6 operator=()

```
AbsoluteDate & AbsoluteDate::operator= (
            const AbsoluteDate & copy )
```

The operator= for the AbsolutDate class.

Parameters

copy	the object to copy

5.1.3.7 SetGregorianDate()

```
void AbsoluteDate::SetGregorianDate (
             Integer year,
             Integer month,
             Integer day,
             Integer hour,
             Integer minute,
             Real second )  [virtual]
```

Set the Gregorian date.

Sets the Gregorian date.

Parameters

year	the year
month	the month
day	the day
hour	the hour
minute	the minute
second	the seconds

5.1.3.8 SetJulianDate()

```
void AbsoluteDate::SetJulianDate (
             Real jd )  [virtual]
```

Set the Julian Date.

Sets the Julian date.

Parameters

jd	the Julian date

5.1.4 Member Data Documentation

5.1.4.1 currentDate

```
Real AbsoluteDate::currentDate  [protected]
```

Current date in Julian Day format.

5.1.4.2 DAYS_PER_MONTH

```
const Integer AbsoluteDate::DAYS_PER_MONTH  [static], [protected]
```

Initial value:

```
=
   {31, 28, 31, 30, 31, 30, 31, 31, 30, 31, 30, 31}
```

<static> days-per-month constant

Implementation of the AbsoluteDate class

5.1.4.3 JD_1900

```
const Real AbsoluteDate::JD_1900 = 2415019.5  [static], [protected]
```

<static> Julian date of 1900 constant

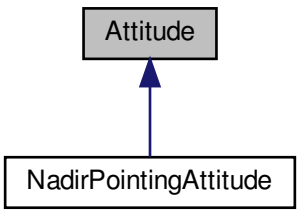
The documentation for this class was generated from the following files:

- src/AbsoluteDate.hpp
- src/AbsoluteDate.cpp

5.2 Attitude Class Reference

```
#include <Attitude.hpp>
```

Inheritance diagram for Attitude:



Public Member Functions

- Attitude ()

  class construction/destruction
- Attitude (const Attitude &copy)
- Attitude & operator= (const Attitude &copy)
- virtual ~Attitude ()
- virtual Attitude * Clone () const

  Clone the Attitude.
- virtual Rmatrix33 InertialToReference (const Rvector6 &centralBodyState)

  Converts the inertial-to-reference matrix.

5.2.1 Detailed Description

Definition of the Attitude class. This base class models the spacecraft attitude state.

5.2.2 Constructor & Destructor Documentation

5.2.2.1 Attitude() [1/2]

```
Attitude::Attitude ( )
```

class construction/destruction

Implementation of the base Attitude class Default constructor.

5.2.2.2 Attitude() [2/2]

```
Attitude::Attitude (
            const Attitude & copy )
```

Copy constructor.

Parameters

copy	the Attitude object to copy

5.2.2.3 ~Attitude()

```
Attitude::~Attitude ( )  [virtual]
```

Destructor.

5.2.3 Member Function Documentation

5.2.3.1 Clone()

```
Attitude * Attitude::Clone ( ) const  [virtual]
```

Clone the Attitude.

This method returns a clone of the Attitude.

Returns

clone of the Attitude.

5.2.3.2 InertialToReference()

```
Rmatrix33 Attitude::InertialToReference (
            const Rvector6 & centralBodyState )  [virtual]
```

Converts the inertial-to-reference matrix.

Todo is this misnamed?

This method computes the matrix that converts from inertial to the reference frame, given the input central body state

Parameters

centralBodyState	central body state

Returns

matrix from inertial to reference

Note

This method is expected to be implemented in child classes.

Reimplemented in NadirPointingAttitude.

5.2.3.3 operator=()

```
Attitude & Attitude::operator= (
            const Attitude & copy )
```

The operator= for Attitude.

Parameters

copy	the Attitude object to copy

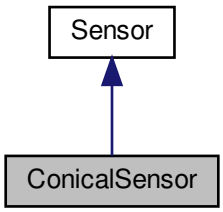
The documentation for this class was generated from the following files:

- src/Attitude.hpp
- src/Attitude.cpp

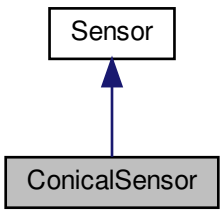
5.3 ConicalSensor Class Reference

```
#include <ConicalSensor.hpp>
```

Inheritance diagram for ConicalSensor:



Collaboration diagram for ConicalSensor:



Public Member Functions

- ConicalSensor (Real fov)

  class construction/destruction
- ConicalSensor (const ConicalSensor &copy)
- ConicalSensor & operator= (const ConicalSensor &copy)
- virtual ~ConicalSensor ()
- virtual void SetFieldOfView (Real fov)

  Set and Get the field-of-view.
- virtual Real GetFieldOfView ()
- virtual bool CheckTargetVisibility (Real viewConeAngle, Real viewClockAngle=0.0)

Protected Attributes

- Real fieldOfView

  Field-of-View (radians)

Additional Inherited Members

5.3.1 Detailed Description

Definition of the Conical Sensor class. This class models a conical sensor.

5.3.2 Constructor & Destructor Documentation

5.3.2.1 ConicalSensor() [1/2]

```
ConicalSensor::ConicalSensor (
            Real fov )
```

class construction/destruction

Implementation of the ConicalSensor class Constructor

Parameters

fov	field-of-view for the sensor (radians), sensor half-angle

5.3.2.2 ConicalSensor() [2/2]

```
ConicalSensor::ConicalSensor (
            const ConicalSensor & copy )
```

Copy constructor

Parameters

copy	object to copy

5.3.2.3 ~ConicalSensor()

```
ConicalSensor::~ConicalSensor ( )  [virtual]
```

Destructor

5.3.3 Member Function Documentation

5.3.3.1 CheckTargetVisibility()

```
bool ConicalSensor::CheckTargetVisibility (
            Real viewConeAngle,
            Real viewClockAngle = 0.0 )  [virtual]
```

Check the target visibility given the input cone and clock angles: determines whether or not the point is in the sensor FOV.

Determines whether or not the point is in the sensor FOV

Parameters

viewConeAngle	the view cone angle
viewClockAngle	the view clock angle <unused for="" this="" class>="">

Returns

true if the point is in the sensor FOV; false otherwise

Implements Sensor.

5.3.3.2 GetFieldOfView()

```
Real ConicalSensor::GetFieldOfView ( )  [virtual]
```

Returns the field-of-view for the ConicalSensor

Returns

field-of-view (radians)

5.3.3.3 operator=()

```
ConicalSensor & ConicalSensor::operator= (
            const ConicalSensor & copy )
```

The operator= for the ConicalSensor

Parameters

copy	object to copy

5.3.3.4 SetFieldOfView()

```
void ConicalSensor::SetFieldOfView (
            Real fov )  [virtual]
```

Set and Get the field-of-view.

Sets the field-of-view for the ConicalSensor

Parameters

fov	field-of-view (radians)

5.3.4 Member Data Documentation

5.3.4.1 fieldOfView

```
Real ConicalSensor::fieldOfView  [protected]
```

Field-of-View (radians)

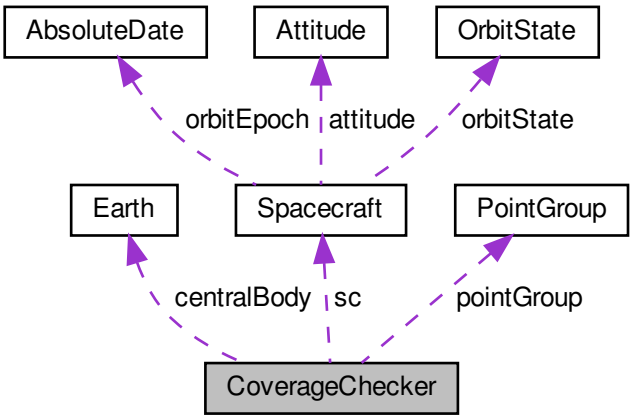
The documentation for this class was generated from the following files:

- src/ConicalSensor.hpp
- src/ConicalSensor.cpp

5.4 CoverageChecker Class Reference

`#include <CoverageChecker.hpp>`

Collaboration diagram for CoverageChecker:



Public Member Functions

- CoverageChecker (PointGroup *ptGroup, Spacecraft *sat)
  class construction/destruction
- CoverageChecker (const CoverageChecker &copy)
- CoverageChecker & operator= (const CoverageChecker &copy)
- virtual ~CoverageChecker ()
- virtual IntegerArray CheckPointCoverage (const Rvector6 &theState, Real theTime)
  Check the point coverage and return the resulting index array.
- virtual IntegerArray AccumulateCoverageData ()
  Accumulate the coverage data at the current propagated time.
- virtual IntegerArray AccumulateCoverageData (Real atTime)
  Accumulate the coverage data at the input time.
- virtual std::vector< IntervalEventReport > ProcessCoverageData ()
  Process the coverate data, create reports.
- virtual IntervalEventReport CreateNewPOIReport (Real startJd, Real endJd, Integer poiIdx)
  Create a new POI report.
- virtual void SetComputePOIGeometryData (bool flag)
  Set the flag indicating whether or not to compute POI geometry data.

Protected Member Functions

- virtual Rvector6 GetEarthFixedSatState (Real jd, const Rvector6 &scCartState)
  Get the Earth Fixed state at the input time for the input cartesian state.
- virtual bool CheckGridFeasibility (Integer ptIdx, const Rvector3 &bodyFixedState)
- virtual void CheckGridFeasibility (const Rvector3 &bodyFixedState)
  Check the grid feasibility for all points for the input body fixed state.

Protected Attributes

- PointGroup * pointGroup
  the points to use for coverage
- Spacecraft * sc
  The spacecraft object.
- Earth * centralBody
  the central body; the model of Earth's properties & rotation
- Integer timeIdx
  the number of accumulated propagation data points // ???
- std::vector< IntegerArray > timeSeriesData
  times when points are visible
- std::vector< std::vector< VisiblePOIReport > > discreteEventData
  discrete event data
- RealArray dateData
  the date of each propagation point
- IntegerArray numEventsPerPoint
  the number of propagation times when each point was visible
- std::vector< Rvector3 * > pointArray
  array of all points
- std::vector< bool > feasibilityTest
  feasibility values for each point
- bool computePOIGeometryData
  flag indicating if observer and sun geometry should be computed
- Real coverageStart
  Start time of the coverage.
- Real coverageEnd
  End time of the coverage.
- Rvector3 rangeVec
- Rvector3 bfState
- Rvector3 bodyUnit
- Rvector3 ptPos

Static Protected Attributes

- static const Real BODY_RADIUS = 6378.1363
  <static const>=""> body radius

5.4.1 Detailed Description

Definition of the coverage checker class. This class checks for point coverae and generates reports.

5.4.2 Constructor & Destructor Documentation

5.4.2.1 CoverageChecker() [1/2]

```
CoverageChecker::CoverageChecker (
            PointGroup * ptGroup,
            Spacecraft * sat )
```

class construction/destruction

Constructor

Parameters

ptGroup	pointer to the PointGroup object to use
sat	pointer to the Spacecraft object to use

This should not be set here - we should store both positions and unitized positions in the PointGroup and then access those arrays when needed <<<<<<<<<<<<<<

5.4.2.2 CoverageChecker() [2/2]

```
CoverageChecker::CoverageChecker (
            const CoverageChecker & copy )
```

Copy constructor

Parameters

copy	the object to copy

5.4.2.3 ~CoverageChecker()

```
CoverageChecker::~CoverageChecker ( )  [virtual]
```

Destructor

5.4.3 Member Function Documentation

5.4.3.1 AccumulateCoverageData() [1/2]

```
IntegerArray CoverageChecker::AccumulateCoverageData ( )  [virtual]
```

Accumulate the coverage data at the current propagated time.

Accumulates the coverage data after the propagation update

Returns

array of indexes

5.4.3.2 AccumulateCoverageData() [2/2]

```
IntegerArray CoverageChecker::AccumulateCoverageData (
            Real atTime )  [virtual]
```

Accumulate the coverage data at the input time.

Accumulates the coverage data after the propagation update

Returns

array of indexes

5.4.3.3 CheckGridFeasibility() [1/2]

```
bool CoverageChecker::CheckGridFeasibility (
            Integer ptIdx,
            const Rvector3 & bodyFixedState )  [protected], [virtual]
```

Check the grid feasibility for the input point with the input body fixed state

Checks the grid feasibility

Parameters

ptIdx	point index
bodyFixedState	input body fixed state

Returns

output feasibility flag

5.4.3.4 CheckGridFeasibility() [2/2]

```
void CoverageChecker::CheckGridFeasibility (
            const Rvector3 & bodyFixedState )  [protected], [virtual]
```

Check the grid feasibility for all points for the input body fixed state.

Checks the grid feasibility

Parameters

bodyFixedState	input body fixed state

5.4.3.5 CheckPointCoverage()

```
IntegerArray CoverageChecker::CheckPointCoverage (
            const Rvector6 & theState,
            Real theTime )  [virtual]
```

Check the point coverage and return the resulting index array.

Checks the point coverage.

Returns

array of indexes

5.4.3.6 CreateNewPOIReport()

```
IntervalEventReport CoverageChecker::CreateNewPOIReport (
            Real startJd,
            Real endJd,
            Integer poiIdx )  [virtual]
```

Create a new POI report.

Creates a new report of coverage data.

Parameters

startJd	start Julian date for the reportSetComputePOIGeometryData
endJd	end Julian date for the report
poiIndex	POI index for the created report

Returns

report of coverage

5.4.3.7 GetEarthFixedSatState()

```
Rvector6 CoverageChecker::GetEarthFixedSatState (
            Real jd,
            const Rvector6 & scCartState )  [protected], [virtual]
```

Get the Earth Fixed state at the input time for the input cartesian state.

Returns the Earth-Fixed state at the specified time

Parameters

jd	Julian date

Returns

earth-fixed state at the input time

5.4.3.8 operator=()

```
CoverageChecker & CoverageChecker::operator= (
            const CoverageChecker & copy )
```

The operator= for the CoverageChecker object

Parameters

copy	the object to copy

5.4.3.9 ProcessCoverageData()

```
std::vector< IntervalEventReport > CoverageChecker::ProcessCoverageData ( )  [virtual]
```

Process the coverate data, create reports.

Returns an array of reports of coverage

Returns

array of reports of coverage

5.4.3.10 SetComputePOIGeometryData()

```
void CoverageChecker::SetComputePOIGeometryData (
            bool flag )  [virtual]
```

Set the flag indicating whether or not to compute POI geometry data.

Sets the flag indficating whether or not to compute the POI Geometry data

Parameters

flag	compute the POI geometry data?

5.4.4 Member Data Documentation

5.4.4.1 bfState

```
Rvector3 CoverageChecker::bfState  [protected]
```

5.4.4.2 BODY_RADIUS

```
const Real CoverageChecker::BODY_RADIUS = 6378.1363  [static], [protected]
```

<static const>=""> body radius

Implementation of the CoverageChecker class

5.4.4.3 bodyUnit

```
Rvector3 CoverageChecker::bodyUnit  [protected]
```

5.4.4.4 centralBody

```
Earth* CoverageChecker::centralBody  [protected]
```

the central body; the model of Earth's properties & rotation

5.4.4.5 computePOIGeometryData

```
bool CoverageChecker::computePOIGeometryData  [protected]
```

flag indicating if observer and sun geometry should be computed

5.4.4.6 coverageEnd

```
Real CoverageChecker::coverageEnd  [protected]
```

End time of the coverage.

5.4.4.7 coverageStart

```
Real CoverageChecker::coverageStart  [protected]
```

Start time of the coverage.

5.4.4.8 dateData

```
RealArray CoverageChecker::dateData  [protected]
```

the date of each propagation point

5.4.4.9 discreteEventData

```
std::vector<std::vector<VisiblePOIReport> > CoverageChecker::discreteEventData  [protected]
```

discrete event data

5.4.4.10 feasibilityTest

```
std::vector<bool> CoverageChecker::feasibilityTest  [protected]
```

feasibility values for each point

5.4.4.11 numEventsPerPoint

```
IntegerArray CoverageChecker::numEventsPerPoint  [protected]
```

the number of propagation times when each point was visible

5.4.4.12 pointArray

```
std::vector<Rvector3*> CoverageChecker::pointArray  [protected]
```

array of all points

5.4.4.13 pointGroup

```
PointGroup* CoverageChecker::pointGroup  [protected]
```

the points to use for coverage

5.4.4.14 ptPos

```
Rvector3 CoverageChecker::ptPos  [protected]
```

5.4.4.15 rangeVec

```
Rvector3 CoverageChecker::rangeVec  [protected]
```

local Rvectors used for Grid Feasibility calculations (for performance)

5.4.4.16 sc

```
Spacecraft* CoverageChecker::sc  [protected]
```

The spacecraft object.

Todo Should this be an array of spacecraft?

5.4.4.17 timeIdx

```
Integer CoverageChecker::timeIdx  [protected]
```

the number of accumulated propagation data points // ???

5.4.4.18 timeSeriesData

```
std::vector<IntegerArray> CoverageChecker::timeSeriesData  [protected]
```

times when points are visible

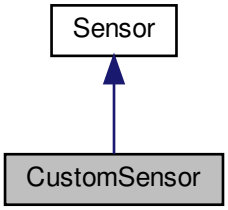
The documentation for this class was generated from the following files:

- src/CoverageChecker.hpp
- src/CoverageChecker.cpp

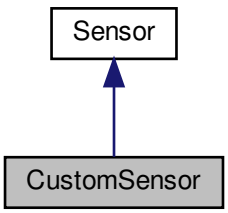
5.5 CustomSensor Class Reference

```
#include <CustomSensor.hpp>
```

Inheritance diagram for CustomSensor:



Collaboration diagram for CustomSensor:



Public Member Functions

- CustomSensor (const Rvector &coneAngleVecIn, const Rvector &clockAngleVecIn)

  class construction/destruction
- CustomSensor (const CustomSensor &copy)
- CustomSensor & operator= (const CustomSensor &copy)
- virtual ~CustomSensor ()
- bool CheckTargetVisibility (Real viewConeAngle, Real viewClockAngle)
- bool CheckRegionVisibility (const Rvector &coneAngleVec, const Rvector &clockAngleVec)

Protected Member Functions

- bool CheckTargetMaxExcursionCoordinates (Real xCoord, Real yCoord)

  class hidden methods used by constructor
- Rmatrix PointsToSegments (const Rvector &xCoords, const Rvector &yCoords)
- void ComputeExternalPoints ()
- bool RegionIsFullyContained (std::vector< IntegerArray > &adjacency)

  helper methods for checkRegionVisibility()
- void Sort (Rvector &v, bool ascending=true)

  rVector utilities
- void Sort (Rvector &v, IntegerArray &indices, bool ascending=true)
- Real Max (const Rvector &v)
- Real Min (const Rvector &v)

Protected Attributes

- Integer numFOVPoints

  data computed from constructor inputs
- Rvector coneAngleVec
- Rvector clockAngleVec
- Rvector xProjectionCoordArray

  stereographic projection of the numFOVpoints cone & clock angles
- Rvector yProjectionCoordArray
- Rmatrix segmentArray
- Integer numTestPoints

  test points computed in ComputeExternalPoints()
- Rmatrix externalPointArray
- Real maxXExcursion

  maximum and minimum values for x and y values in stereographic projection
- Real minXExcursion
- Real maxYExcursion
- Real minYExcursion

5.5.1 Detailed Description

Implementation of the CustomSensor class

5.5.2 Constructor & Destructor Documentation

5.5.2.1 CustomSensor() [1/2]

```
CustomSensor::CustomSensor (
            const Rvector & coneAngleVecIn,
            const Rvector & clockAngleVecIn )
```

class construction/destruction

Constructor

coneAngleVec and clockAngleVec contain pairs of angles that describe the sensor FOV. coneAngleVec[0] is paired with clockAngleVec[0], coneAngleVec[1] is paired with clockAngleVec[1] and so on. The last point in each arrays should be the same as the first point to ensure FOV closure.

Parameters

coneAngleVec	array of cone angles measured from +Z sensor axis (rad) if xP,yP,zP is a UNIT vector describing a FOV point, then the cone angle for the point is pi/2 - asin(zP);
clockAngleVec	array of clock angles (right ascencions) rad measured clockwise from the + X-axis. if xP,yP,zP is a UNIT vector describing a FOV point, then the clock angle for the point is atan2(y,x);

5.5.2.2 CustomSensor() [2/2]

```
CustomSensor::CustomSensor (
            const CustomSensor & copy )
```

Copy constructor

Parameters

copy	object to copy

5.5.2.3 ~CustomSensor()

```
CustomSensor::~CustomSensor ( )  [virtual]
```

5.5.3 Member Function Documentation

5.5.3.1 CheckRegionVisibility()

```
bool CustomSensor::CheckRegionVisibility (
            const Rvector & coneAngleVec,
            const Rvector & clockAngleVec )
```

5.5.3.2 CheckTargetMaxExcursionCoordinates()

```
bool CustomSensor::CheckTargetMaxExcursionCoordinates (
            Real xCoord,
            Real yCoord ) [protected]
```

class hidden methods used by constructor

5.5.3.3 CheckTargetVisibility()

```
bool CustomSensor::CheckTargetVisibility (
            Real viewConeAngle,
            Real viewClockAngle ) [virtual]
```

visibility methods Check the target visibility given the input cone and clock angles: determines whether or not the point is in the sensor FOV.

Implements Sensor.

5.5.3.4 ComputeExternalPoints()

```
void CustomSensor::ComputeExternalPoints ( ) [protected]
```

5.5.3.5 Max()

```
Real CustomSensor::Max (
            const Rvector & v ) [protected]
```

returns maximum value from an Rvector

Parameters

v	vector containing real values to select maximum from

Returns

maximum value contained in vector

5.5.3.6 Min()

```
Real CustomSensor::Min (
            const Rvector & v ) [protected]
```

returns minimum value from an Rvector

Parameters

v	vector containing real values to select minimum from

Returns

minimum value contained in vector

5.5.3.7 operator=()

```
CustomSensor & CustomSensor::operator= (
            const CustomSensor & copy )
```

operator= for CustomSensor

Parameters

copy	object to copy

5.5.3.8 PointsToSegments()

```
Rmatrix CustomSensor::PointsToSegments (
            const Rvector & xCoords,
            const Rvector & yCoords )  [protected]
```

5.5.3.9 RegionIsFullyContained()

```
bool CustomSensor::RegionIsFullyContained (
            std::vector< IntegerArray > & adjacency )  [protected]
```

helper methods for checkRegionVisibility()

5.5.3.10 Sort() [1/2]

```
void CustomSensor::Sort (
            Rvector & v,
            bool ascending = true )  [protected]
```

rVector utilities

5.5.3.11 Sort() [2/2]

```
void CustomSensor::Sort (
            Rvector & v,
            IntegerArray & indices,
            bool ascending = true )  [protected]
```

5.5.4 Member Data Documentation

5.5.4.1 clockAngleVec

```
Rvector CustomSensor::clockAngleVec  [protected]
```

5.5.4.2 coneAngleVec

```
Rvector CustomSensor::coneAngleVec  [protected]
```

5.5.4.3 externalPointArray

```
Rmatrix CustomSensor::externalPointArray  [protected]
```

5.5.4.4 maxXExcursion

```
Real CustomSensor::maxXExcursion  [protected]
```

maximum and minimum values for x and y values in stereographic projection

5.5.4.5 maxYExcursion

```
Real CustomSensor::maxYExcursion  [protected]
```

5.5.4.6 minXExcursion

```
Real CustomSensor::minXExcursion  [protected]
```

5.5.4.7 minYExcursion

```
Real CustomSensor::minYExcursion  [protected]
```

5.5.4.8 numFOVPoints

```
Integer CustomSensor::numFOVPoints  [protected]
```

data computed from constructor inputs

5.5.4.9 numTestPoints

```
Integer CustomSensor::numTestPoints  [protected]
```

test points computed in ComputeExternalPoints()

5.5.4.10 segmentArray

```
Rmatrix CustomSensor::segmentArray  [protected]
```

5.5.4.11 xProjectionCoordArray

```
Rvector CustomSensor::xProjectionCoordArray  [protected]
```

stereographic projection of the numFOVpoints cone & clock angles

5.5.4.12 yProjectionCoordArray

```
Rvector CustomSensor::yProjectionCoordArray  [protected]
```

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

- src/CustomSensor.hpp
- src/CustomSensor.cpp

5.6 Earth Class Reference

`#include <Earth.hpp>`

Public Member Functions

- Earth ()

  class construction/destruction
- Earth (const Earth &copy)
- Earth & operator= (const Earth &copy)
- virtual ~Earth ()
- virtual Rmatrix33 GetInertialToFixedRotation (Real jd)

  Get the inertial-to-fixed rotation matrix.
- virtual Real ComputeGMT (Real jd)

  Compute the Greenwich Mean Time.
- virtual Rvector3 GetBodyFixedState (Rvector3 inertialState, Real jd)

  Get the body-fixed state.
- virtual Rvector3 Convert (const Rvector3 &origValue, const std::string &fromType, const std::string &toType)

  Convert between body-fixed representations.
- virtual Rvector3 InertialToBodyFixed (const Rvector3 &inertialVector, Real jd, const std::string &toType)

  Convert the input vector from inertial to body-fixed.
- virtual Rvector3 FixedToTopocentric (const Rvector3 &inertialVector, const Real lat, const Real lon)

  COnvert the input vecgor from body-fixed to topocentric.
- virtual Rvector3 GetSunPositionInBodyCoords (Real jd, const std::string &toType)

  Get the Sun position in body coordinates.
- virtual Rmatrix33 FixedToTopo (Real gdLat, Real gdLon)

  Compute the body-fixed-to-topocentric rotaiton matrix.
- virtual Real GeocentricToGeodeticLat (Real gcLat)

  Convert geocentric latitude to geodetic latitude.
- virtual void GetEarthSunDistRaDec (Real jd, Rvector3 &rSun, Real &rtAsc, Real &decl)

  Get the Earth-Sun distance.
- Real GetRadius ()

  Get the mean equatorial radius.

Protected Attributes

- Real J2

  J2 term for Earth.
- Real mu

  Gravitational parameter of the Earth.
- Real radius

  Equatorial radius of the Earth.
- Real flattening

  Flattening of the Earth.
- Rmatrix33 rotationResult

  Local class data for performance.
- Real lastRotationTime

  Save the last computd rotation time, for performance.

5.6.1 Detailed Description

Definition of the Earth class. This class is a simple model of the Earth.

5.6.2 Constructor & Destructor Documentation

5.6.2.1 Earth() [1/2]

```
Earth::Earth ( )
```

class construction/destruction

Implementation of the Earth class Default constructor.

5.6.2.2 Earth() [2/2]

```
Earth::Earth (
            const Earth & copy )
```

Copy constructor.

Parameters

copy	the Earth object to copy

5.6.2.3 ~Earth()

```
Earth::~Earth ( )  [virtual]
```

Detructor

5.6.3 Member Function Documentation

5.6.3.1 ComputeGMT()

```
Real Earth::ComputeGMT (
            Real jd )  [virtual]
```

Compute the Greenwich Mean Time.

Returns the GMT.

Parameters

jd	the Julian date at which to compute the GMT.

Returns

GMT

5.6.3.2 Convert()

```
Rvector3 Earth::Convert (
            const Rvector3 & origValue,
            const std::string & fromType,
            const std::string & toType )  [virtual]
```

Convert between body-fixed representations.

Conversion method between body fixed representations. Valid values for &origvalue are "Cartesian", "Spherical", and "Ellipsoid"

Parameters

origValue	data in given representation
fromType	representation from which to convert
toType	representation to which to convert

Returns

Converted state from the specified "from" representation to the specified "to" representation

5.6.3.3 FixedToTopo()

```
Rmatrix33 Earth::FixedToTopo (
            Real gdLat,
            Real gdLon )  [virtual]
```

Compute the body-fixed-to-topocentric rotaiton matrix.

Returns the rotation matrix to convert from body-fixed to topocentric.

Parameters

gdLat	the geodetic latitude
gdLon	the geodetic longitude

Returns

the rotation matrix from body-fixed to topocentric

5.6.3.4 FixedToTopocentric()

```
Rvector3 Earth::FixedToTopocentric (
            const Rvector3 & bodyFixedVector,
            const Real lat,
            const Real lon )  [virtual]
```

COnvert the input vecgor from body-fixed to topocentric.

Converts the input vector from body-fixed to topocentric

Parameters

bodyFixedVector	input vector in body-fixed
lat	latitude
lon	longitude

Returns

vector in topocentric coordinates

5.6.3.5 GeocentricToGeodeticLat()

```
Real Earth::GeocentricToGeodeticLat (
            Real gcLat )  [virtual]
```

Convert geocentric latitude to geodetic latitude.

Converts from a geocentric latitude to a geodetic latitude.

Parameters

gcLat	the geocentric latitude

Returns

the geodetic latitude

5.6.3.6 GetBodyFixedState()

```
Rvector3 Earth::GetBodyFixedState (
            Rvector3 inertialState,
            Real jd )  [virtual]
```

Get the body-fixed state.

Returns the body-fixed state given the inertial stat and the time.

Parameters

inertialState	the inertial state.
jd	the Julian date at which to compute the body-fixed state.

Returns

body-fixed state

5.6.3.7 GetEarthSunDistRaDec()

```
void Earth::GetEarthSunDistRaDec (
            Real jd,
            Rvector3 & rSun,
            Real & rtAsc,
            Real & decl )  [virtual]
```

Get the Earth-Sun distance.

Returns the Earth-Sun distance.

Parameters

jd	[in] the Julian data at which to compute the distance
rSun	[out] the Earth-to-Sun vector
rtAsc	[out] right ascension
decl	[out] declination

5.6.3.8 GetInertialToFixedRotation()

```
Rmatrix33 Earth::GetInertialToFixedRotation (
            Real jd )  [virtual]
```

Get the inertial-to-fixed rotation matrix.

Returns the inertial-to-fixed rotation matrix.

Parameters

jd	the Julian date at which to compute the rotation matrix.

Returns

inertial-to-fixed rotation matrix

5.6.3.9 GetRadius()

```
Real Earth::GetRadius ( )
```

Get the mean equatorial radius.

Returns the mean equatorial radius.

Returns

the mean equatorial radius

5.6.3.10 GetSunPositionInBodyCoords()

```
Rvector3 Earth::GetSunPositionInBodyCoords (
            Real jd,
            const std::string & toType )  [virtual]
```

Get the Sun position in body coordinates.

Computes sun position in body coordinates returning position in requested representation.

Parameters

jd	Julian date
toType	Output representation. Valid values for are "Cartesian", "Spherical", and "Ellipsoid"

Returns

Sun position in body coordinates in requested representation

5.6.3.11 InertialToBodyFixed()

```
Rvector3 Earth::InertialToBodyFixed (
            const Rvector3 & inertialVector,
```

```
            Real jd,
            const std::string & toType )  [virtual]
```

Convert the input vector from inertial to body-fixed.

Conversion method between inertial and body fixed representations. Valid values for &toType are "Cartesian", "Spherical", and "Ellipsoid"

Parameters

inertialVector	intertial Cartesian vector
jd	Julian date associated with <inertialVector>
toType	representation to which to convert

Returns

Converted state from the inertial Cartesian input to the specified "to" representation

5.6.3.12 operator=()

```
Earth & Earth::operator= (
            const Earth & copy )
```

The operator= for the Earth.

Parameters

copy	the Earth object to copy

5.6.4 Member Data Documentation

5.6.4.1 flattening

```
Real Earth::flattening  [protected]
```

Flattening of the Earth.

5.6.4.2 J2

```
Real Earth::J2  [protected]
```

J2 term for Earth.

5.6.4.3 lastRotationTime

```
Real Earth::lastRotationTime  [protected]
```

Save the last computd rotation time, for performance.

5.6.4.4 mu

```
Real Earth::mu  [protected]
```

Gravitational parameter of the Earth.

5.6.4.5 radius

```
Real Earth::radius  [protected]
```

Equatorial radius of the Earth.

5.6.4.6 rotationResult

```
Rmatrix33 Earth::rotationResult  [protected]
```

Local class data for performance.

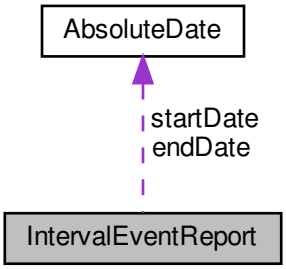
The documentation for this class was generated from the following files:

- src/Earth.hpp
- src/Earth.cpp

5.7 IntervalEventReport Class Reference

```
#include <IntervalEventReport.hpp>
```

Collaboration diagram for IntervalEventReport:



Public Member Functions

- IntervalEventReport ()
  class construction/destruction
- IntervalEventReport (const IntervalEventReport &copy)
- IntervalEventReport & operator= (const IntervalEventReport &copy)
- virtual ~IntervalEventReport ()
- virtual void SetStartDate (const AbsoluteDate &toDate)
  Set the start date.
- virtual void SetEndDate (const AbsoluteDate &toDate)
  Set the end date.
- virtual const AbsoluteDate & GetStartDate ()
  Get the start date.
- virtual const AbsoluteDate & GetEndDate ()
  Get the end date.
- virtual void SetPOIIndex (Integer toIdx)
  Set the POI index.
- virtual Integer GetPOIIndex ()
  Get the POI index.
- void AddPOIEvent (const VisiblePOIReport &theReport)
  Add a POI event.
- virtual std::vector< VisiblePOIReport > GetPOIEvents ()
  Get an array of POI event reports.
- void SetAllPOIEvents (std::vector< VisiblePOIReport >)
  Set all of the POI events at once.

Protected Attributes

- Integer poiIndex
  Index of point of interest.
- AbsoluteDate startDate
  Start date of the interval event.
- AbsoluteDate endDate
  End date of the interval event.
- std::vector< VisiblePOIReport > discretePOIEvents
  Vector of discrete event reports (VisiblePOIReports)

5.7.1 Detailed Description

Definition of the Interval Event Report class.

5.7.2 Constructor & Destructor Documentation

5.7.2.1 IntervalEventReport() [1/2]

```
IntervalEventReport::IntervalEventReport ( )
```

class construction/destruction

Implementation of the Interval Event Report class. Constructs IntervalEventReport instance (default constructor).

Parameters

<details>	A message providing the details of the exception.

5.7.2.2 IntervalEventReport() [2/2]

```
IntervalEventReport::IntervalEventReport (
            const IntervalEventReport & copy )
```

Constructs IntervalEventReport instance (copy constructor).

Parameters

be	The instance that is copied.

5.7.2.3 ~IntervalEventReport()

```
IntervalEventReport::~IntervalEventReport ( )  [virtual]
```

Destructs IntervalEventReport instance

5.7.3 Member Function Documentation

5.7.3.1 AddPOIEvent()

```
void IntervalEventReport::AddPOIEvent (
            const VisiblePOIReport & theReport )
```

Add a POI event.

Appends a VisiblePOIReport to the discrtePOIEvents std::vector

Parameters

VisiblePOIReport	report.

5.7.3.2 GetEndDate()

```
const AbsoluteDate & IntervalEventReport::GetEndDate ( )  [virtual]
```

Get the end date.

Returns the end date for the report.

Returns

The end time for the report.

5.7.3.3 GetPOIEvents()

```
std::vector< VisiblePOIReport > IntervalEventReport::GetPOIEvents ( )  [virtual]
```

Get an array of POI event reports.

Returns the vector of VisiblePOIReports

Returns

The vector of VisiblePOIReports

5.7.3.4 GetPOIIndex()

```
Integer IntervalEventReport::GetPOIIndex ( )  [virtual]
```

Get the POI index.

Returns the POI Index for the report.

Returns

<toIdx> Index for the report

5.7.3.5 GetStartDate()

```
const AbsoluteDate & IntervalEventReport::GetStartDate ( )  [virtual]
```

Get the start date.

Returns the start date for the report.

Returns

The start time for the report.

5.7.3.6 operator=()

```
IntervalEventReport & IntervalEventReport::operator= (
            const IntervalEventReport & copy )
```

IntervalEventReport operator=.

Parameters

be	The instance that is copied.

5.7.3.7 SetAllPOIEvents()

```
void IntervalEventReport::SetAllPOIEvents (
            std::vector< VisiblePOIReport > theEvents )
```

Set all of the POI events at once.

Sets the entire discrtePOIEvents std::vector

Parameters

std::vector<VisiblePOIReport>.	

5.7.3.8 SetEndDate()

```
void IntervalEventReport::SetEndDate (
            const AbsoluteDate & toDate )  [virtual]
```

Set the end date.

Sets the end date for the report.

Parameters

toDate	The end time for the report.

5.7.3.9 SetPOIIndex()

```
void IntervalEventReport::SetPOIIndex (
            Integer toIdx )  [virtual]
```

Set the POI index.

Sets the POI Index for the report.

Parameters

<toIdx>	Index for the report

5.7.3.10 SetStartDate()

```
void IntervalEventReport::SetStartDate (
            const AbsoluteDate & toDate )  [virtual]
```

Set the start date.

Sets the start date for the report.

Parameters

toDate	The start time for the report.

5.7.4 Member Data Documentation

5.7.4.1 discretePOIEvents

```
std::vector<VisiblePOIReport> IntervalEventReport::discretePOIEvents  [protected]
```

Vector of discrete event reports (VisiblePOIReports)

5.7.4.2 endDate

```
AbsoluteDate IntervalEventReport::endDate  [protected]
```

End date of the interval event.

5.7.4.3 poiIndex

```
Integer IntervalEventReport::poiIndex  [protected]
```

Index of point of interest.

5.7.4.4 startDate

```
AbsoluteDate IntervalEventReport::startDate  [protected]
```

Start date of the interval event.

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

- src/IntervalEventReport.hpp
- src/IntervalEventReport.cpp

5.8 KeyValueStatistics Class Reference

```
#include <KeyValueStatistics.hpp>
```

Public Member Functions

- KeyValueStatistics (Real minVal, Real maxVal, Real avgVal)

  class construction/destruction
- KeyValueStatistics (const KeyValueStatistics &copy)
- KeyValueStatistics & operator= (const KeyValueStatistics &copy)
- virtual ~KeyValueStatistics ()
- virtual Real GetMinValue ()
- virtual Real GetMaxValue ()
- virtual Real GetAvgValue ()

Protected Attributes

- Real minValue

  Minimum value.
- Real maxValue

  Maximum value.
- Real avgValue

  Average value.

5.8.1 Detailed Description

Definition of the KeyValueStatistics class.

5.8.2 Constructor & Destructor Documentation

5.8.2.1 KeyValueStatistics() [1/2]

```
KeyValueStatistics::KeyValueStatistics (
            Real minVal,
            Real maxVal,
            Real avgVal )
```

class construction/destruction

Implementation of KeyValueStatistics class. Default constructor.

5.8.2.2 KeyValueStatistics() [2/2]

```
KeyValueStatistics::KeyValueStatistics (
            const KeyValueStatistics & copy )
```

Copy constructor.

Parameters

copy	the object to copy

5.8.2.3 ~KeyValueStatistics()

```
KeyValueStatistics::~KeyValueStatistics ( )  [virtual]
```

Destructor.

5.8.3 Member Function Documentation

5.8.3.1 GetAvgValue()

```
Real KeyValueStatistics::GetAvgValue ( )  [virtual]
```

Returns the average value.

Returns

the average value

5.8.3.2 GetMaxValue()

```
Real KeyValueStatistics::GetMaxValue ( )  [virtual]
```

Returns the maximum value.

Returns

the maximum value

5.8.3.3 GetMinValue()

```
Real KeyValueStatistics::GetMinValue ( )  [virtual]
```

Returns the minimum value.

Returns

the minimum value

5.8.3.4 operator=()

```
KeyValueStatistics & KeyValueStatistics::operator= (
            const KeyValueStatistics & copy )
```

The operator= for the KeyValueStatistics class.

Parameters

copy	the object to copy

5.8.4 Member Data Documentation

5.8.4.1 avgValue

```
Real KeyValueStatistics::avgValue  [protected]
```

Average value.

5.8.4.2 maxValue

```
Real KeyValueStatistics::maxValue  [protected]
```

Maximum value.

5.8.4.3 minValue

```
Real KeyValueStatistics::minValue  [protected]
```

Minimum value.

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

- src/KeyValueStatistics.hpp
- src/KeyValueStatistics.cpp

5.9 LinearAlgebra Class Reference

```
#include <LinearAlgebra.hpp>
```

Static Public Member Functions

- static void LineSegmentIntersect (const Rmatrix &XY1, const Rmatrix &XY2, std::vector< IntegerArray > &adjacency, Rmatrix &matrixX, Rmatrix &matrixY, Rmatrix &distance1To2, Rmatrix &distance2To1, std::vector< IntegerArray > &parallelAdjacency, std::vector< IntegerArray > &coincidentAdjacency)

  Set the Gregorian date.

5.9.1 Detailed Description

Definition of the LinearAlgebra class. NOTE: This is a static class: No instances of this class may be declared.

5.9.2 Member Function Documentation

5.9.2.1 LineSegmentIntersect()

```
void LinearAlgebra::LineSegmentIntersect (
            const Rmatrix & XY1,
            const Rmatrix & XY2,
            std::vector< IntegerArray > & adjacency,
            Rmatrix & matrixX,
            Rmatrix & matrixY,
            Rmatrix & distance1To2,
            Rmatrix & distance2To1,
            std::vector< IntegerArray > & parallelAdjacency,
            std::vector< IntegerArray > & coincidentAdjacency )  [static]
```

Set the Gregorian date.

Implementation of the LinearAlgebra class This method finds the 2D Cartesian Coordinates of intersection points between the set of line segments given in XY1 and XY2

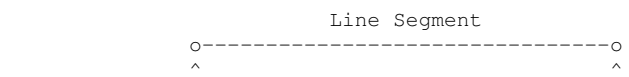
Parameters

XY1	array of line segments - each line is (x1, y1, x2, y2) where (x1,y1) is the start point and (x2,y2) is the end
XY2	array of line segments - each line is (x1, y1, x2, y2) where (x1,y1) is the start point and (x2,y2) is the end
adjacency	[output] entry (i,j) is 1 if line segments XY1(i,∗) and XY2(j,∗)intersect; 0 otherwise
matrixX	[output] entry (i,j) is the X coordinate of the intersection point between line segments XY1(i,∗) and XY2(j,∗)
matrixY	[output] entry (i,j) is the Y coordinate of the intersection point between line segments XY1(i,∗) and XY2(j,∗)
distance1To2	[output] entry (i,j) is the normalized distance from the start point of the line segment XY1(i,∗) to the intersection point with XY2(j,∗)
distance2To1	[output] entry (i,j) is the normalized distance from the start point of the line segment XY1(j,∗) to the intersection point with XY2(i,∗)
parallelAdjacency	[output] entry (i,j) is 1 if line segments XY1(i,∗) and XY2(j,∗) are parallel; 0 otherwise
coincidentAdjacency	[output] entry (i,j) is 1 if line segments XY1(i,∗) and XY2(j,∗) are coincident; 0 otherwise

Note

Notes from original MATLAB: function out = lineSegmentIntersect(XY1,XY2) LINESEGMENTINTERSECT Intersections of line segments. OUT = LINESEGMENTINTERSECT(XY1,XY2) finds the 2D Cartesian Coordinates of intersection points between the set of line segments given in XY1 and XY2.

XY1 and XY2 are N1x4 and N2x4 matrices. Rows correspond to line segments. Each row is of the form [x1 y1 x2 y2] where (x1,y1) is the start point and (x2,y2) is the end point of a line segment:



(x1,y1) (x2,y2)

OUT is a structure with fields:

'intAdjacencyMatrix' : N1xN2 indicator matrix where the entry (i,j) is 1 if line segments XY1(i,:) and XY2(j,:) intersect.

'intMatrixX' : N1xN2 matrix where the entry (i,j) is the X coordinate of the intersection point between line segments XY1(i,:) and XY2(j,:).

'intMatrixY' : N1xN2 matrix where the entry (i,j) is the Y coordinate of the intersection point between line segments XY1(i,:) and XY2(j,:).

'intNormalizedDistance1To2' : N1xN2 matrix where the (i,j) entry is the normalized distance from the start point of line segment XY1(i,:) to the intersection point with XY2(j,:).

'intNormalizedDistance2To1' : N1xN2 matrix where the (i,j) entry is the normalized distance from the start point of line segment XY1(j,:) to the intersection point with XY2(i,:).

'parAdjacencyMatrix' : N1xN2 indicator matrix where the (i,j) entry is 1 if line segments XY1(i,:) and XY2(j,:) are parallel.

'coincAdjacencyMatrix' : N1xN2 indicator matrix where the (i,j) entry is 1 if line segments XY1(i,:) and XY2(j,:) are coincident.

Version: 1.00, April 03, 2010 Version: 1.10, April 10, 2010 Author: U. Murat Erdem

CHANGELOG:

Ver. 1.00: -Initial release.

Ver. 1.10:

- Changed the input parameters. Now the function accepts two sets of line segments. The intersection analysis is done between these sets and not in the same set.
- Changed and added fields of the output. Now the analysis provides more information about the intersections and line segments.
- Performance tweaks.

I opted not to call this 'curve intersect' because it would be misleading unless you accept that curves are pairwise linear constructs. I tried to put emphasis on speed by vectorizing the code as much as possible. There should still be enough room to optimize the code but I left those out for the sake of clarity. The math behind is given in: http://local.wasp.uwa.edu.au/~pbourke/geometry/lineline2d/ If you really are interested in squeezing as much horse power as possible out of this code I would advise to remove the argument checks and tweak the creation of the OUT a little bit.

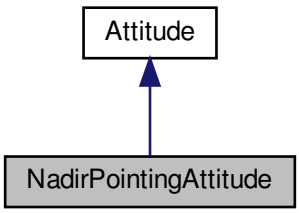
The documentation for this class was generated from the following files:

- src/LinearAlgebra.hpp
- src/LinearAlgebra.cpp

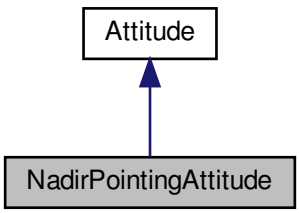
5.10 NadirPointingAttitude Class Reference

`#include <NadirPointingAttitude.hpp>`

Inheritance diagram for NadirPointingAttitude:



Collaboration diagram for NadirPointingAttitude:



Public Member Functions

- NadirPointingAttitude ()

  class construction/destruction
- NadirPointingAttitude (const NadirPointingAttitude &copy)
- NadirPointingAttitude & operator= (const NadirPointingAttitude &copy)
- virtual ~NadirPointingAttitude ()
- virtual Rmatrix33 InertialToReference (const Rvector6 &centralBodyState)

  Converts the inertial-to-reference matrix.

Protected Attributes

- Rvector3 centralBodyFixedPos

  Local class data for performance.
- Rvector3 centralBodyFixedVel
- Rvector3 zHat
- Rvector3 xHat
- Rvector3 yHat
- Rmatrix33 R_fixed_to_nadir
- Rmatrix33 R_fixed_to_nadir_transposed

5.10.1 Detailed Description

Definition of the NadirPointingAttitude class. This class models the spacecraft attitude state.

5.10.2 Constructor & Destructor Documentation

5.10.2.1 NadirPointingAttitude() [1/2]

```
NadirPointingAttitude::NadirPointingAttitude ( )
```

class construction/destruction

Implementation of the base NadirPointingAttitude class Default constructor.

5.10.2.2 NadirPointingAttitude() [2/2]

```
NadirPointingAttitude::NadirPointingAttitude (
            const NadirPointingAttitude & copy )
```

Copy constructor.

Parameters

copy	the NadirPointingAttitude object to copy

5.10.2.3 ~NadirPointingAttitude()

```
NadirPointingAttitude::~NadirPointingAttitude ( )  [virtual]
```

Destructor.

5.10.3 Member Function Documentation

5.10.3.1 InertialToReference()

```
Rmatrix33 NadirPointingAttitude::InertialToReference (
            const Rvector6 & centralBodyState )  [virtual]
```

Converts the inertial-to-reference matrix.

Todo is this misnamed?

This method computes the matrix that converts from inertial to the reference frame, given the input central body state

Parameters

centralBodyState	central body state

Returns

matrix from body to inertial

Reimplemented from Attitude.

5.10.3.2 operator=()

```
NadirPointingAttitude & NadirPointingAttitude::operator= (
            const NadirPointingAttitude & copy )
```

The operator= for NadirPointingAttitude.

Parameters

copy	the NadirPointingAttitude object to copy

5.10.4 Member Data Documentation

5.10.4.1 centralBodyFixedPos

```
Rvector3 NadirPointingAttitude::centralBodyFixedPos  [protected]
```

Local class data for performance.

5.10.4.2 centralBodyFixedVel

```
Rvector3 NadirPointingAttitude::centralBodyFixedVel  [protected]
```

5.10.4.3 R_fixed_to_nadir

```
Rmatrix33 NadirPointingAttitude::R_fixed_to_nadir  [protected]
```

5.10.4.4 R_fixed_to_nadir_transposed

```
Rmatrix33 NadirPointingAttitude::R_fixed_to_nadir_transposed  [protected]
```

5.10.4.5 xHat

```
Rvector3 NadirPointingAttitude::xHat  [protected]
```

5.10.4.6 yHat

```
Rvector3 NadirPointingAttitude::yHat  [protected]
```

5.10.4.7 zHat

```
Rvector3 NadirPointingAttitude::zHat  [protected]
```

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

- src/NadirPointingAttitude.hpp
- src/NadirPointingAttitude.cpp

5.11 OrbitState Class Reference

```
#include <OrbitState.hpp>
```

Public Member Functions

- OrbitState ()

  class construction/destruction
- OrbitState (const OrbitState &copy)
- OrbitState & operator= (const OrbitState &copy)
- virtual ~OrbitState ()
- virtual void SetKeplerianState (Real SMA, Real ECC, Real INC, Real RAAN, Real AOP, Real TA)

  Set the Keplerian State elements.
- virtual void SetKeplerianVectorState (const Rvector6 &kepl)

  Set the Kerlerian state vector.
- virtual void SetCartesianState (const Rvector6 &cart)

  Set the Cartesian state.
- virtual void SetGravityParameter (Real toGrav)

  Set the gravity parameter.
- virtual Rvector6 GetKeplerianState ()

  Return the Keplerian state.
- virtual Rvector6 GetCartesianState ()

  Return the Cartesian state.
- virtual OrbitState * Clone () const

  Clone the OrbitState object.

Protected Member Functions

- Rvector6 ConvertKeplerianToCartesian (Real a, Real e, Real i, Real Om, Real om, Real nu)

  State conversion methods.
- Rvector6 ConvertCartesianToKeplerian (const Rvector6 &cart)

Protected Attributes

- Rvector6 currentState

  Current state in cartesian format.
- Real mu

  Gravitational parameter for the central body.

5.11.1 Detailed Description

Definition of the OrbitState class. This class computes and converts Cartesian and Keplerian states.

5.11.2 Constructor & Destructor Documentation

5.11.2.1 OrbitState() [1/2]

```
OrbitState::OrbitState ( )
```

class construction/destruction

Implementation of the OrbitState class Default constructor.

5.11.2.2 OrbitState() [2/2]

```
OrbitState::OrbitState (
            const OrbitState & copy )
```

Copy constructor.

Parameters

copy	the OrbitState object to copy

5.11.2.3 ~OrbitState()

```
OrbitState::~OrbitState ( )  [virtual]
```

Destructor.

5.11.3 Member Function Documentation

5.11.3.1 Clone()

```
OrbitState * OrbitState::Clone ( ) const  [virtual]
```

Clone the OrbitState object.

This method returns a clone of the OrbitState.

Returns

clone of the OrbitState.

5.11.3.2 ConvertCartesianToKeplerian()

```
Rvector6 OrbitState::ConvertCartesianToKeplerian (
            const Rvector6 & cart )  [protected]
```

Converts the cartesian state to a keplerian state.

Parameters

cart	cartesian state

Returns

the keplerian state as a 6-element vector

5.11.3.3 ConvertKeplerianToCartesian()

```
Rvector6 OrbitState::ConvertKeplerianToCartesian (
            Real a,
            Real e,
            Real i,
            Real Om,
            Real om,
            Real nu )  [protected]
```

State conversion methods.

Converts the keplerian state to a cartesian state.

Parameters

a	semimajor axis
e	eccentricity
i	inclination
Om	right ascension of the ascending node
om	argument of periapsis
nu	true anomaly

Returns

the cartesian state as a 6-element vector

5.11.3.4 GetCartesianState()

```
Rvector6 OrbitState::GetCartesianState ( )  [virtual]
```

Return the Cartesian state.

Returns the cartesian state as a 6-element vector

Returns

cartesian state

5.11.3.5 GetKeplerianState()

```
Rvector6 OrbitState::GetKeplerianState ( )  [virtual]
```

Return the Keplerian state.

Returns the keplerian state as a 6-element vector

Returns

keplerian state

5.11.3.6 operator=()

```
OrbitState & OrbitState::operator= (
            const OrbitState & copy )
```

The operator= for OrbitState.

Parameters

copy	the OrbitState object to copy

5.11.3.7 SetCartesianState()

```
void OrbitState::SetCartesianState (
            const Rvector6 & cart )  [virtual]
```

Set the Cartesian state.

Sets the cartesian state, as a 6-element vector.

Parameters

cart	cartesian state (units should be consistent with gravParam)

5.11.3.8 SetGravityParameter()

```
void OrbitState::SetGravityParameter (
            Real toGrav )  [virtual]
```

Set the gravity parameter.

Sets the gravity parameter.

Parameters

toGrav	gravity parameter

5.11.3.9 SetKeplerianState()

```
void OrbitState::SetKeplerianState (
            Real SMA,
            Real ECC,
            Real INC,
            Real RAAN,
            Real AOP,
            Real TA )  [virtual]
```

Set the Keplerian State elements.

Sets the keplerian state, element by element.

Parameters

SMA	semimajor axis
ECC	eccentricity
INC	inclination
RAAN	right ascension of the ascending node
AOP	argument of periapsis
TA	true anomaly

5.11.3.10 SetKeplerianVectorState()

```
void OrbitState::SetKeplerianVectorState (
            const Rvector6 & kepl )  [virtual]
```

Set the Kerlerian state vector.

Sets the keplerian state, as a 6-element vector.

Parameters

kepl	keplerian state

5.11.4 Member Data Documentation

5.11.4.1 currentState

```
Rvector6 OrbitState::currentState  [protected]
```

Current state in cartesian format.

5.11.4.2 mu

```
Real OrbitState::mu  [protected]
```

Gravitational parameter for the central body.

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

- src/OrbitState.hpp
- src/OrbitState.cpp

5.12 PointGroup Class Reference

```
#include <PointGroup.hpp>
```

Public Member Functions

- PointGroup ()
  class construction/destruction
- PointGroup (const PointGroup &copy)
- PointGroup & operator= (const PointGroup &copy)
- virtual ~PointGroup ()
- virtual void AddUserDefinedPoints (const RealArray &lats, const RealArray &lons)
  Add user defined points to the group.
- virtual void AddHelicalPointsByNumPoints (Integer numGridPoints)
  Compute and add the specified number of user-defined points.
- virtual void AddHelicalPointsByAngle (Real angleBetweenPoints)
- virtual Rvector3 * GetPointPositionVector (Integer idx)
  Get point position for given index.
- virtual void GetLatAndLon (Integer idx, Real &theLat, Real &theLon)
  Get the latitude and longitude for the given index.
- virtual Integer GetNumPoints ()
  Get the number of points.
- virtual void GetLatLonVectors (RealArray &lats, RealArray &lons)
  Get the latitude and longitude vectors.
- virtual void SetLatLonBounds (Real latUp, Real latLow, Real lonUp, Real lonLow)
  Set the latitude and longitude bounds values.

Protected Member Functions

- bool CheckHasPoints ()

  Protected methods for managing points.
- void AccumulatePoints (Real lat1, Real lon1)
- void ComputeTestPoints (const std::string &modelName, Integer numGridPts)
- void ComputeHelicalPoints (Integer numReqPts)

Protected Attributes

- RealArray lat

  Latitude coordinates of grid points.
- RealArray lon

  Longitude coordinates of grid points.
- std::vector< Rvector3 * > coords
- Integer numPoints

  num of points
- Integer numRequestedPoints

  Number of points requested in the point algorithm.
- Real latUpper

  Upper bound on allowable latitude -pi/2 <= latUpper <= pi/2.
- Real latLower

  Upper bound on allowable latitude -pi/2 <= latLower <= pi/2.
- Real lonUpper

  Upper bound on allowable longitude.
- Real lonLower

  Upper bound on allowable longitude.

5.12.1 Detailed Description

Definition of the PointGroup class. This class stores latitudes, longitudes, and coordinates for points that are either set on input or computed in the class based on an input number or angle.

5.12.2 Constructor & Destructor Documentation

5.12.2.1 PointGroup() [1/2]

```
PointGroup::PointGroup ( )
```

class construction/destruction

Default constructor for the PointGroup class.

5.12.2.2 PointGroup() [2/2]

```
PointGroup::PointGroup (
            const PointGroup & copy )
```

Copy constructor for the PointGroup class.

Parameters

copy	PointGroup object to copy

5.12.2.3 ~PointGroup()

```
PointGroup::~PointGroup ( )  [virtual]
```

Destructor for the PointGroup class.

5.12.3 Member Function Documentation

5.12.3.1 AccumulatePoints()

```
void PointGroup::AccumulatePoints (
            Real lat1,
            Real lon1 )  [protected]
```

Adds a point with the specified latitude and longitude. The coordinates are computed from the input latitude and longitude.

Parameters

lat1	latitude for the point to add
lon1	longitude for the point to add

5.12.3.2 AddHelicalPointsByAngle()

```
void PointGroup::AddHelicalPointsByAngle (
            Real angleBetweenPoints )  [virtual]
```

Compute and add points to the list of points, based on the input angle

Computes and adds points to the list of points, based on the input angle.

Parameters

angleBetweenPoints	angle between points

5.12.3.3 AddHelicalPointsByNumPoints()

```
void PointGroup::AddHelicalPointsByNumPoints (
            Integer numGridPoints )  [virtual]
```

Compute and add the specified number of user-defined points.

Computes and adds the specified number of user-defined points to the list of points.

Parameters

numGridPoints	number of grid points to add

5.12.3.4 AddUserDefinedPoints()

```
void PointGroup::AddUserDefinedPoints (
            const RealArray & lats,
            const RealArray & lons )  [virtual]
```

Add user defined points to the group.

Adds user-defined points to the list of points, given the input latitudes and longitudes.

Parameters

lats	list of latitudes for the points to add
lons	list of longitudes for the points to add

5.12.3.5 CheckHasPoints()

```
bool PointGroup::CheckHasPoints ( )  [protected]
```

Protected methods for managing points.

Checks to see if there are any ponts set or computed

Returns

true if there are points; false otherwise

5.12.3.6 ComputeHelicalPoints()

```
void PointGroup::ComputeHelicalPoints (
            Integer numReqPts )  [protected]
```

Computes the number of test points specified, using a model.

Parameters

numReqPts	number of test points to compute and add

5.12.3.7 ComputeTestPoints()

```
void PointGroup::ComputeTestPoints (
            const std::string & modelName,
            Integer numGridPts )  [protected]
```

Computes the number of test points specified, for the model specified.

Parameters

modelName	model for the points
numGridPoints	number of points to compute and add

5.12.3.8 GetLatAndLon()

```
void PointGroup::GetLatAndLon (
            Integer idx,
            Real & theLat,
            Real & theLon )  [virtual]
```

Get the latitude and longitude for the given index.

Returns the latitude and longtude of the specified point.

Parameters

idx	[in] index of point whose latitude/longitude to return
theLat	[out] latitude of the specified point
theLon	[out] longitude of the specified point

5.12.3.9 GetLatLonVectors()

```
void PointGroup::GetLatLonVectors (
            RealArray & lats,
            RealArray & lons )  [virtual]
```

Get the latitude and longitude vectors.

Returns vectors of latitudes and longitudes for the points.

Parameters

lats	[out] array of latitudes for the points
lons	[out] array of longitudes for the points

5.12.3.10 GetNumPoints()

```
Integer PointGroup::GetNumPoints ( )  [virtual]
```

Get the number of points.

Returns the number of points.

Returns

the number of points

5.12.3.11 GetPointPositionVector()

```
Rvector3 * PointGroup::GetPointPositionVector (
            Integer idx )  [virtual]
```

Get point position for given index.

Returns the coordinates of the specified point.

Parameters

idx	index of point whose coordinates to return

Returns

a 3-vector representing the coordinates of the specifed point

5.12.3.12 operator=()

```
PointGroup & PointGroup::operator= (
            const PointGroup & copy )
```

operator= for the PointGroup class.

Parameters

copy	PointGroup object to copy

5.12.3.13 SetLatLonBounds()

```
void PointGroup::SetLatLonBounds (
            Real latUp,
            Real latLow,
            Real lonUp,
            Real lonLow )  [virtual]
```

Set the latitude and longitude bounds values.

Sets the latitude and longtude upper and lower bounds.

Parameters

latUp	upper bound for latitude (radians)
latLow	lower bound for latitude (radians)
lonUp	upper bound for longitude (radians)
lonLow	lower bound for longitude (radians)

5.12.4 Member Data Documentation

5.12.4.1 coords

```
std::vector<Rvector3*> PointGroup::coords  [protected]
```

5.12.4.2 lat

```
RealArray PointGroup::lat  [protected]
```

Latitude coordinates of grid points.

5.12.4.3 latLower

```
Real PointGroup::latLower  [protected]
```

Upper bound on allowable latitude -pi/2 <= latLower <= pi/2.

5.12.4.4 latUpper

```
Real PointGroup::latUpper  [protected]
```

Upper bound on allowable latitude -pi/2 <= latUpper <= pi/2.

5.12.4.5 lon

```
RealArray PointGroup::lon  [protected]
```

Longitude coordinates of grid points.

5.12.4.6 lonLower

```
Real PointGroup::lonLower  [protected]
```

Upper bound on allowable longitude.

5.12.4.7 lonUpper

```
Real PointGroup::lonUpper  [protected]
```

Upper bound on allowable longitude.

5.12.4.8 numPoints

```
Integer PointGroup::numPoints  [protected]
```

num of points

5.12.4.9 numRequestedPoints

```
Integer PointGroup::numRequestedPoints  [protected]
```

Number of points requested in the point algorithm.

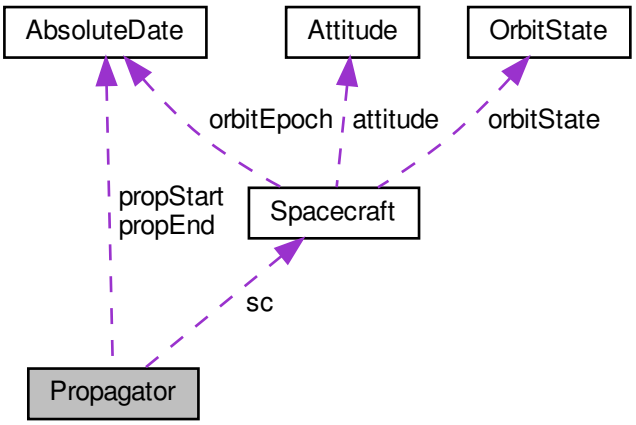
The documentation for this class was generated from the following files:

- src/PointGroup.hpp
- src/PointGroup.cpp

5.13 Propagator Class Reference

`#include <Propagator.hpp>`

Collaboration diagram for Propagator:



Public Member Functions

- Propagator (Spacecraft *sat)
  class construction/destruction
- Propagator (const Propagator &copy)
- Propagator & operator= (const Propagator &copy)
- virtual ~Propagator ()
- virtual void SetPhysicalConstants (Real bodyMu, Real bodyJ2, Real bodyRadius)
  Set the body physical constants on teh propagator.
- virtual Rvector6 Propagate (const AbsoluteDate &toDate)
  Propagate the spacecraft.
- virtual void GetPropStartEnd (AbsoluteDate &pStart, AbsoluteDate &pEnd)
  Get the propagation start and end times.
- void SetApplyDrag (bool applyDrag)
  Set the flag indicating whether or not to apply drag.
- bool GetApplyDrag ()
  Get the flag indicating whether or not to apply drag.

Protected Member Functions

- void SetOrbitState (OrbitState *orbState)
  Set the orbit state.
- Real ComputePeriapsisAltitude (Rvector6 orbElem, Real julianDate)
  Compute the periapsis altitude.

- Rvector6 PropagateOrbitalElements (Real propDuration)

  Propagate the orbital elements.
- void ComputeDragEffects (Real sma, Real ecc, Real altitude, Real &deltaSMAperRev, Real &deltaECCper↩ Rev)

  Compute the drag effects.
- Real MeanMotion ()

  Compute the orbital mean motion.
- Real SemiParameter ()

  Compute the semi parameter.
- void ComputeOrbitRates ()

  Compute the orbit rates.
- void ComputeMeanMotionRate ()

  Compute the mean motion rate.
- void ComputeArgumentOfPeriapsisRate ()

  Compute the argument of periapsis.
- void ComputeRightAscensionNodeRate ()

  Compute the right ascension of the ascending node rate.

Protected Attributes

- Spacecraft * sc

  The spacecraft to be propagated.
- ExponentialAtmosphere * densityModel

  Density model used in computing effects of atmospheric drag.
- Real J2

  J2 term for Earth.
- Real mu

  Gravitational parameter of the Earth.
- Real eqRadius

  Equatorial radius of the Earth.
- bool applyDrag

  Flag to turn on/off drag modeling.
- Real refJd

  Julian date of the reference orbital elements.
- AbsoluteDate propStart

  The epoch at which the propagation started.
- AbsoluteDate propEnd
- Real lastDragUpdateEpoch

  Epoch of last update to orbit to account for drag effects.
- Real orbitPeriod

  The orbital period.
- Real SMA

  Orbital semi-major axis.
- Real ECC

  Orbital eccentricity.
- Real INC

  Orbital inclination.
- Real RAAN

  Orbital right ascention of the ascending node.
- Real AOP

Orbital sargument of periapsis.

- Real TA

  Orbital true anomaly.
- Real MA

  Orbital true anomaly.
- Real meanMotionRate

  The drift in mean motion caused by J2.
- Real argPeriapsisRate

  The drift in argument of periapsis caused by J2.
- Real rightAscensionNodeRate

  The drift in right ascention of the ascending node caused by J2.
- Real semiLatusRectum

  The orbital semi-latus rectum.
- Real meanMotion

  The orbital mean motion.

Static Protected Attributes

- static const Real MU_FOR_EARTH = 398600.4415

  <static const>=""> Mu for the Earth

5.13.1 Detailed Description

Definition of the the propagator class.

5.13.2 Constructor & Destructor Documentation

5.13.2.1 Propagator() [1/2]

```
Propagator::Propagator (
            Spacecraft * sat )
```

class construction/destruction

Default constructor for Propagator.

Parameters

sat	The spacecraft object

5.13.2.2 Propagator() [2/2]

```
Propagator::Propagator (
```

```
            const Propagator & copy )
```

Copy constructor for Propagator.

Parameters

copy	The propagator to copy

5.13.2.3 ~Propagator()

```
Propagator::~Propagator ( )  [virtual]
```

destructor for Propagator.

5.13.3 Member Function Documentation

5.13.3.1 ComputeArgumentOfPeriapsisRate()

```
void Propagator::ComputeArgumentOfPeriapsisRate ( )  [protected]
```

Compute the argument of periapsis.

Computes the argument of periapsis rate.

5.13.3.2 ComputeDragEffects()

```
void Propagator::ComputeDragEffects (
            Real sma,
            Real ecc,
            Real altitude,
            Real & deltaSMAPerRev,
            Real & deltaECCperRev )  [protected]
```

Compute the drag effects.

Computes the drag effects

Parameters

sma	[in] semimajor axis
ecc	[in] eccentricity
altitude	[in] altitude
deltaSMAPerRev	[out] the delta SMA
deltaECCperRev	[out[the delta ECC

5.13.3.3 ComputeMeanMotionRate()

```
void Propagator::ComputeMeanMotionRate ( )  [protected]
```

Compute the mean motion rate.

Computes the mean motion rate.

5.13.3.4 ComputeOrbitRates()

```
void Propagator::ComputeOrbitRates ( )  [protected]
```

Compute the orbit rates.

Computes the orbit rates.

5.13.3.5 ComputePeriapsisAltitude()

```
Real Propagator::ComputePeriapsisAltitude (
            Rvector6 orbElem,
            Real julianDate )  [protected]
```

Compute the periapsis altitude.

Computes the periapsis altitude

Parameters

orbElem	input orbital elements
julianDate	the date at which to compute the periapsis altitude

Returns

the periapsis altitude

5.13.3.6 ComputeRightAscensionNodeRate()

```
void Propagator::ComputeRightAscensionNodeRate ( )  [protected]
```

Compute the right ascension of the ascending node rate.

Computes the right ascension node rate.

5.13.3.7 GetApplyDrag()

```
bool Propagator::GetApplyDrag ( )
```

Get the flag indicating whether or not to apply drag.

Returns the flag indicating whether or not to apply drag

Returns

apply drag flag

5.13.3.8 GetPropStartEnd()

```
void Propagator::GetPropStartEnd (
            AbsoluteDate & pStart,
            AbsoluteDate & pEnd )  [virtual]
```

Get the propagation start and end times.

Returns the propagator start and end times

Parameters

pStart	[out] start time
pEnd	[out] end time

5.13.3.9 MeanMotion()

```
Real Propagator::MeanMotion ( )  [protected]
```

Compute the orbital mean motion.

Computes the mean motion.

Returns

Mean Motion

5.13.3.10 operator=()

```
Propagator & Propagator::operator= (
            const Propagator & copy )
```

operator= for Propagator.

Parameters

copy	The propagator to copy

5.13.3.11 Propagate()

```
Rvector6 Propagator::Propagate (
            const AbsoluteDate & toDate )  [virtual]
```

Propagate the spacecraft.

Propagates to the input time.

Parameters

toDate	date to which to propagate

5.13.3.12 PropagateOrbitalElements()

```
Rvector6 Propagator::PropagateOrbitalElements (
            Real propDuration )  [protected]
```

Propagate the orbital elements.

Propagates the orbital elements for the specificed duration.

Parameters

propDuration	duration over which to propagate

Returns

the propagated orbital elements

5.13.3.13 SemiParameter()

```
Real Propagator::SemiParameter ( )  [protected]
```

Compute the semi parameter.

Computes the semi parameter.

Returns

SemiParameter

5.13.3.14 SetApplyDrag()

```
void Propagator::SetApplyDrag (
            bool flag )
```

Set the flag indicating whether or not to apply drag.

Sets the flag indicating whether or not to apply drag

Parameters

flag	apply drag flag

5.13.3.15 SetOrbitState()

```
void Propagator::SetOrbitState (
            OrbitState * orbState )  [protected]
```

Set the orbit state.

Sets the orbit state on the Propagator.

Parameters

orbState	orbit state

5.13.3.16 SetPhysicalConstants()

```
void Propagator::SetPhysicalConstants (
            Real bodyMu,
            Real bodyJ2,
            Real bodyRadius )  [virtual]
```

Set the body physical constants on teh propagator.

Sets physical constant values for the Propagator.

Parameters

bodyMu	gravitational parameter to use
bodyJ2	J2 term to use
bodyRadius	radius of the body

5.13.4 Member Data Documentation

5.13.4.1 AOP

```
Real Propagator::AOP  [protected]
```

Orbital sargument of periapsis.

5.13.4.2 applyDrag

```
bool Propagator::applyDrag  [protected]
```

Flag to turn on/off drag modeling.

5.13.4.3 argPeriapsisRate

```
Real Propagator::argPeriapsisRate  [protected]
```

The drift in argument of periapsis caused by J2.

5.13.4.4 densityModel

```
ExponentialAtmosphere* Propagator::densityModel  [protected]
```

Density model used in computing effects of atmospheric drag.

5.13.4.5 ECC

```
Real Propagator::ECC  [protected]
```

Orbital eccentricity.

5.13.4.6 eqRadius

```
Real Propagator::eqRadius  [protected]
```

Equatorial radius of the Earth.

5.13.4.7 INC

```
Real Propagator::INC  [protected]
```

Orbital inclination.

5.13.4.8 J2

```
Real Propagator::J2  [protected]
```

J2 term for Earth.

5.13.4.9 lastDragUpdateEpoch

```
Real Propagator::lastDragUpdateEpoch  [protected]
```

Epoch of last update to orbit to account for drag effects.

5.13.4.10 MA

```
Real Propagator::MA  [protected]
```

Orbital true anomaly.

5.13.4.11 meanMotion

```
Real Propagator::meanMotion  [protected]
```

The orbital mean motion.

5.13.4.12 meanMotionRate

```
Real Propagator::meanMotionRate  [protected]
```

The drift in mean motion caused by J2.

5.13.4.13 mu

```
Real Propagator::mu  [protected]
```

Gravitational parameter of the Earth.

5.13.4.14 MU_FOR_EARTH

```
const Real Propagator::MU_FOR_EARTH = 398600.4415  [static], [protected]
```

<static const>=""> Mu for the Earth

Implementation of the propagator class

5.13.4.15 orbitPeriod

```
Real Propagator::orbitPeriod  [protected]
```

The orbital period.

5.13.4.16 propEnd

```
AbsoluteDate Propagator::propEnd  [protected]
```

The epoch at which the propagation ended (so far, i.e. the last propagation time)

5.13.4.17 propStart

```
AbsoluteDate Propagator::propStart  [protected]
```

The epoch at which the propagation started.

5.13.4.18 RAAN

```
Real Propagator::RAAN  [protected]
```

Orbital right ascention of the ascending node.

5.13.4.19 refJd

```
Real Propagator::refJd  [protected]
```

Julian date of the reference orbital elements.

5.13.4.20 rightAscensionNodeRate

```
Real Propagator::rightAscensionNodeRate  [protected]
```

The drift in right ascention of the ascending node caused by J2.

5.13.4.21 sc

```
Spacecraft* Propagator::sc  [protected]
```

The spacecraft to be propagated.

Todo should this be an array of sc?

5.13.4.22 semiLatusRectum

```
Real Propagator::semiLatusRectum  [protected]
```

The orbital semi-latus rectum.

5.13.4.23 SMA

```
Real Propagator::SMA  [protected]
```

Orbital semi-major axis.

5.13.4.24 TA

```
Real Propagator::TA  [protected]
```

Orbital true anomaly.

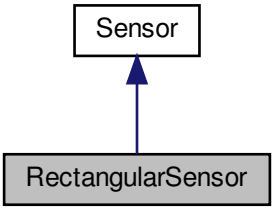
The documentation for this class was generated from the following files:

- src/Propagator.hpp
- src/Propagator.cpp

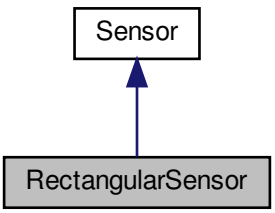
5.14 RectangularSensor Class Reference

```
#include <RectangularSensor.hpp>
```

Inheritance diagram for RectangularSensor:



Collaboration diagram for RectangularSensor:



Public Member Functions

- RectangularSensor (Real angleWidthIn, Real angleHeightIn)

  class construction/destruction
- RectangularSensor (const RectangularSensor &copy)
- RectangularSensor & operator= (const RectangularSensor &copy)
- virtual ~RectangularSensor ()
- virtual bool CheckTargetVisibility (Real viewConeAngle, Real viewClockAngle)
- virtual void SetAngleWidth (Real angleWidthIn)

  Set/Get angle width.
- virtual Real GetAngleWidth ()
- virtual void SetAngleHeight (Real angleHeightIn)

  Set/Get angle height.
- virtual Real GetAngleHeight ()

Protected Attributes

- Real angleWidth = 0.0

  Angle width.
- Real angleHeight = 0.0

  Angle height.

Additional Inherited Members

5.14.1 Detailed Description

Definition of the Conical Sensor class. This class models a conical sensor.

5.14.2 Constructor & Destructor Documentation

5.14.2.1 RectangularSensor() [1/2]

```
RectangularSensor::RectangularSensor (
            Real angleWidthIn,
            Real angleHeightIn )
```

class construction/destruction

Constructor

Parameters

angleWidthIn	angle width
angle↩ HeightIn	angle height

5.14.2.2 RectangularSensor() [2/2]

```
RectangularSensor::RectangularSensor (
            const RectangularSensor & copy )
```

Copy constructor

Parameters

copy	object to copy

5.14.2.3 ~RectangularSensor()

```
RectangularSensor::~RectangularSensor ( )  [virtual]
```

Destructor

5.14.3 Member Function Documentation

5.14.3.1 CheckTargetVisibility()

```
bool RectangularSensor::CheckTargetVisibility (
            Real viewConeAngle,
            Real viewClockAngle )  [virtual]
```

Check the target visibility given the input cone and clock angles: determines whether or not the point is in the sensor FOV.

Determines whether or not the point is in the sensor FOV

Parameters

viewConeAngle	the view cone angle
viewClockAngle	the view clock angle <unused for="" this="" class>="">

Returns

true if the point is in the sensor FOV; false otherwise

Implements Sensor.

5.14.3.2 GetAngleHeight()

```
Real RectangularSensor::GetAngleHeight ( )  [virtual]
```

Returns the angle height for the RectangularSensor

Returns

the angle height

5.14.3.3 GetAngleWidth()

```
Real RectangularSensor::GetAngleWidth ( )  [virtual]
```

Returns the angle width for the RectangularSensor

Returns

the angle width

5.14.3.4 operator=()

```
RectangularSensor & RectangularSensor::operator= (
            const RectangularSensor & copy )
```

The operator= for the RectangularSensor

Parameters

copy	object to copy

5.14.3.5 SetAngleHeight()

```
void RectangularSensor::SetAngleHeight (
            Real angleHeightIn )  [virtual]
```

Set/Get angle height.

Sets the angle height for the RectangularSensor

Parameters

angle↩ HeightIn	angle height

5.14.3.6 SetAngleWidth()

```
void RectangularSensor::SetAngleWidth (
            Real angleWidthIn )  [virtual]
```

Set/Get angle width.

Sets the angle width for the RectangularSensor

Parameters

angle↩ WidthIn	angle width

5.14.4 Member Data Documentation

5.14.4.1 angleHeight

```
Real RectangularSensor::angleHeight = 0.0  [protected]
```

Angle height.

5.14.4.2 angleWidth

```
Real RectangularSensor::angleWidth = 0.0  [protected]
```

Angle width.

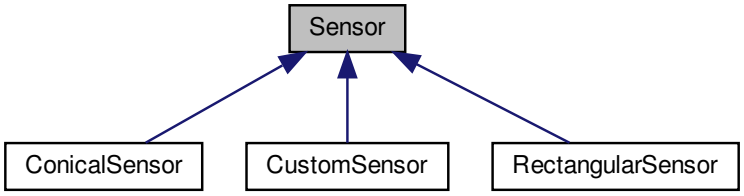
The documentation for this class was generated from the following files:

- src/RectangularSensor.hpp
- src/RectangularSensor.cpp

5.15 Sensor Class Reference

`#include <Sensor.hpp>`

Inheritance diagram for Sensor:



Public Member Functions

- Sensor (Real angle1=0.0, Real angle2=0.0, Real angle3=0.0, Integer seq1=1, Integer seq2=2, Integer seq3=3)

  class construction/destruction
- Sensor (const Sensor &copy)
- Sensor & operator= (const Sensor &copy)
- virtual ~Sensor ()
- virtual void SetSensorBodyOffsetAngles (Real angle1=0.0, Real angle2=0.0, Real angle3=0.0, Integer seq1=1, Integer seq2=2, Integer seq3=3)

  Set the sensor-to-body offset angles.
- virtual Rmatrix33 GetBodyToSensorMatrix (Real forTime)

  Get the body-to-sensor matrix.
- virtual bool CheckTargetVisibility (Real viewConeAngle, Real viewClockAngle=0.0)=0

Protected Member Functions

- virtual bool CheckTargetMaxExcursionAngle (Real viewConeAngle)

  Check the target maximum excursion angle.
- virtual void ComputeBodyToSensorMatrix ()

  Compute the body-to-sensor matrix.
- void ConeClocktoRADEC (Real coneAngle, Real clockAngle, Real &RA, Real &dec)

  Coordinate conversion utilities.
- Rvector3 RADECtoUnitVec (Real RA, Real dec)
- void UnitVecToStereographic (const Rvector3 &u, Real &xCoord, Real &yCoord)
- void ConeClockToStereographic (Real coneAngle, Real clockAngle, Real &xCoord, Real &yCoord)
- void ConeClockArraysToStereographic (const Rvector &coneAngleVec, const Rvector &clockAngleVec, Rvector &xArray, Rvector &yArray)

Protected Attributes

- Real maxExcursionAngle

  The maximum excursion angle.
- Real offsetAngle1

  Offset angles.
- Real offsetAngle2
- Real offsetAngle3
- Integer eulerSeq1

  Euler sequence.
- Integer eulerSeq2
- Integer eulerSeq3
- Rmatrix33 R_SB

  The rotation matrix from the body frame to the sensor frame.

5.15.1 Detailed Description

Definition of the base Sensor class. This class models a sensor.

5.15.2 Constructor & Destructor Documentation

5.15.2.1 Sensor() [1/2]

```
Sensor::Sensor (
            Real angle1 = 0.0,
            Real angle2 = 0.0,
            Real angle3 = 0.0,
            Integer seq1 = 1,
            Integer seq2 = 2,
            Integer seq3 = 3 )
```

class construction/destruction

Implementation of the Sensor class Constructor

Parameters

angle1	The euler angle 1 (degrees)
angle2	The euler angle 2 (degrees)
angle3	The euler angle 3 (degrees)
seq1	Euler sequence 1
seq2	Euler sequence 2
seq3	Euler sequence 3

5.15.2.2 Sensor() [2/2]

```
Sensor::Sensor (
            const Sensor & copy )
```

Copy constructor

Parameters

copy	object to copy

5.15.2.3 ~Sensor()

```
Sensor::~Sensor ( )  [virtual]
```

Destructor

5.15.3 Member Function Documentation

5.15.3.1 CheckTargetMaxExcursionAngle()

```
bool Sensor::CheckTargetMaxExcursionAngle (
            Real viewConeAngle )  [protected], [virtual]
```

Check the target maximum excursion angle.

Checks if the target lies inside the max excursion angle

Parameters

viewConeAngle	the view cone angle

Returns

true if the point lies inside the max excursion angle; false otherwise

5.15.3.2 CheckTargetVisibility()

```
virtual bool Sensor::CheckTargetVisibility (
            Real viewConeAngle,
            Real viewClockAngle = 0.0 )  [pure virtual]
```

Check the target visibility given the input cone and clock angles: determines whether or not the point is in the sensor FOV.

Parameters

viewConeAngle	cone angle
viewClockAngle	clock angle

Returns

true if point is in the sensor FOV; false otherwise

Note

This method is pure virtual and MUST be implemented in child classes

Implemented in ConicalSensor, CustomSensor, and RectangularSensor.

5.15.3.3 ComputeBodyToSensorMatrix()

```
void Sensor::ComputeBodyToSensorMatrix ( )  [protected], [virtual]
```

Compute the body-to-sensor matrix.

Computes the rotation matrix from the body frame to the sensor frame.

5.15.3.4 ConeClockArraysToStereographic()

```
void Sensor::ConeClockArraysToStereographic (
             const Rvector & coneAngleVec,
             const Rvector & clockAngleVec,
             Rvector & xArray,
             Rvector & yArray )  [protected]
```

5.15.3.5 ConeClocktoRADEC()

```
void Sensor::ConeClocktoRADEC (
             Real coneAngle,
             Real clockAngle,
             Real & RA,
             Real & dec )  [protected]
```

Coordinate conversion utilities.

5.15.3.6 ConeClockToStereographic()

```
void Sensor::ConeClockToStereographic (
            Real coneAngle,
            Real clockAngle,
            Real & xCoord,
            Real & yCoord )  [protected]
```

5.15.3.7 GetBodyToSensorMatrix()

```
Rmatrix33 Sensor::GetBodyToSensorMatrix (
            Real forTime )  [virtual]
```

Get the body-to-sensor matrix.

Returns the rotation matrix from the body frame to the sensor frame.

Parameters

forTime	time at which to get the body-to-sensor matrix <unused>

5.15.3.8 operator=()

```
Sensor & Sensor::operator= (
            const Sensor & copy )
```

The operator= for the Sensor

Parameters

copy	object to copy

5.15.3.9 RADECtoUnitVec()

```
Rvector3 Sensor::RADECtoUnitVec (
            Real RA,
            Real dec )  [protected]
```

5.15.3.10 SetSensorBodyOffsetAngles()

```
void Sensor::SetSensorBodyOffsetAngles (
            Real angle1 = 0.0,
            Real angle2 = 0.0,
            Real angle3 = 0.0,
            Integer seq1 = 1,
            Integer seq2 = 2,
            Integer seq3 = 3 )  [virtual]
```

Set the sensor-to-body offset angles.

Sets the euler angles and sequence for the sensor

Parameters

angle1	The euler angle 1 (degrees)
angle2	The euler angle 2 (degrees)
angle3	The euler angle 3 (degrees)
seq1	Euler sequence 1
seq2	Euler sequence 2
seq3	Euler sequence 3

5.15.3.11 UnitVecToStereographic()

```
void Sensor::UnitVecToStereographic (
            const Rvector3 & u,
            Real & xCoord,
            Real & yCoord )  [protected]
```

5.15.4 Member Data Documentation

5.15.4.1 eulerSeq1

```
Integer Sensor::eulerSeq1  [protected]
```

Euler sequence.

5.15.4.2 eulerSeq2

```
Integer Sensor::eulerSeq2  [protected]
```

5.15.4.3 eulerSeq3

```
Integer Sensor::eulerSeq3  [protected]
```

5.15.4.4 maxExcursionAngle

```
Real Sensor::maxExcursionAngle  [protected]
```

The maximum excursion angle.

5.15.4.5 offsetAngle1

```
Real Sensor::offsetAngle1  [protected]
```

Offset angles.

5.15.4.6 offsetAngle2

```
Real Sensor::offsetAngle2  [protected]
```

5.15.4.7 offsetAngle3

```
Real Sensor::offsetAngle3  [protected]
```

5.15.4.8 R_SB

```
Rmatrix33 Sensor::R_SB  [protected]
```

The rotation matrix from the body frame to the sensor frame.

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

- src/Sensor.hpp
- src/Sensor.cpp

5.16 SensorElement Struct Reference

`#include <CustomSensor.hpp>`

Public Attributes

- Real value
- Integer index

5.16.1 Detailed Description

data type and comparison method used in Sort(Rvector,IntegerArray,bool) to mimic Matlab sort of both values and indices of original array

5.16.2 Member Data Documentation

5.16.2.1 index

`Integer SensorElement::index`

5.16.2.2 value

`Real SensorElement::value`

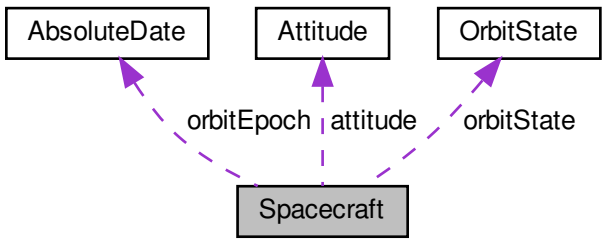
The documentation for this struct was generated from the following file:

- src/CustomSensor.hpp

5.17 Spacecraft Class Reference

`#include <Spacecraft.hpp>`

Collaboration diagram for Spacecraft:



Public Member Functions

- Spacecraft (AbsoluteDate *epoch, OrbitState *state, Attitude *att, LagrangeInterpolator *interp, Real angle1=0.0, Real angle2=0.0, Real angle3=0.0, Integer seq1=1, Integer seq2=2, Integer seq3=3)

  class construction/destruction
- Spacecraft (const Spacecraft &copy)
- Spacecraft & operator= (const Spacecraft &copy)
- virtual ~Spacecraft ()
- virtual OrbitState * GetOrbitState ()

  Get the orbit state.
- virtual AbsoluteDate * GetOrbitEpoch ()

  Get the orbit epoch.
- virtual Real GetJulianDate ()

  Get the Julian date.
- virtual Rvector6 GetCartesianState ()

  Get the current cartesian state.
- virtual void AddSensor (Sensor *sensor)

  Add a sensor to the spacecraft.
- virtual bool HasSensors ()

  Does this spacecraft have sensors?
- virtual void SetDragArea (Real area)

  Set the drag area.
- virtual void SetDragCoefficient (Real Cd)

  Set the drag coefficient.
- virtual void SetTotalMass (Real mass)

  Set the total mass.
- virtual void SetAttitude (Attitude *att)

  Set the attitude for the spacecraft.
- virtual Real GetDragArea ()

  Get the drag area.
- virtual Real GetDragCoefficient ()
- virtual Real GetTotalMass ()

  Get the toal mass.
- virtual Rvector6 GetCartesianStateAtEpoch (const AbsoluteDate &atDate)

  This method returns the interpolated MJ2000 Cartesian state.
- virtual bool CheckTargetVisibility (Real targetConeAngle, Real targetClockAngle, Integer sensorNumber)
- virtual bool CheckTargetVisibility (const Rvector6 &bodyFixedState, const Rvector3 &satToTargetVec, Real atTime, Integer sensorNumber)
- virtual Rmatrix33 GetBodyFixedToInertial (const Rvector6 &bfState)

  Get the body-fixed-to-inertial rotation matrix.
- virtual bool SetOrbitState (const AbsoluteDate &t, const Rvector6 &kepl)
- virtual void SetBodyNadirOffsetAngles (Real angle1=0.0, Real angle2=0.0, Real angle3=0.0, Integer seq1=1, Integer seq2=2, Integer seq3=3)

  Set the body nadir offset angles for the spacecraft.
- virtual bool CanInterpolate (Real atTime)

  Can the orbit be interpolated - i.e. are there enough points, etc.?
- virtual bool TimeToInterpolate (Real atTime, Real &midRange)
- virtual Rvector6 Interpolate (Real toTime)

  Interpolate the data to the input toTime.

Protected Member Functions

- virtual void InertialToConeClock (const Rvector3 &viewVec, Real &cone, Real &clock)

  Convert inertial view vector to cone and clock angles.
- virtual void ComputeNadirToBodyMatrix ()

  Compute the nadir-to-body-matrix.

Protected Attributes

- Real dragCoefficient

  Drag coefficient.
- Real dragArea

  Drag area in m^2.
- Real totalMass

  Total Mass in kg.
- OrbitState * orbitState

  Orbit State.
- AbsoluteDate * orbitEpoch

  Orbit Epoch.
- Integer numSensors

  Number of attached sensors.
- std::vector< Sensor * > sensorList

  Vector of attached sensor objects.
- Attitude * attitude

  Pointer to the Attitude object.
- LagrangeInterpolator * interpolator

  The interpolator to use (for Hermite only, currently)
- Real offsetAngle1

  Offset angles.
- Real offsetAngle2
- Real offsetAngle3
- Integer eulerSeq1

  Euler sequence.
- Integer eulerSeq2
- Integer eulerSeq3
- Rmatrix33 R_BN

  The rotation matrix from the nadir frame to the body frame.

5.17.1 Detailed Description

Definition of the Spacecraft class. This class contains data and methods for a simple Spacecraft.

5.17.2 Constructor & Destructor Documentation

5.17.2.1 Spacecraft() [1/2]

```
Spacecraft::Spacecraft (
            AbsoluteDate * epoch,
            OrbitState * state,
            Attitude * att,
            LagrangeInterpolator * interp,
            Real angle1 = 0.0,
            Real angle2 = 0.0,
            Integer seq1 = 1,
            Integer seq2 = 2,
            Integer seq3 = 3 )
```

class construction/destruction

Implementation of the Spacecraft class. Default constructor for Spacecraft.

Parameters

epoch	The orbit epoch object
state	The orbit state object
att	The attitude object
interp	The LagrangeInterpolator
angle1	The euler angle 1 (degrees)
angle2	The euler angle 2 (degrees)
angle3	The euler angle 3 (degrees)
seq1	Euler sequence 1
seq2	Euler sequence 2
seq3	Euler sequence 3

5.17.2.2 Spacecraft() [2/2]

```
Spacecraft::Spacecraft (
            const Spacecraft & copy )
```

Copy constructor for Spacecraft.

Parameters

copy	The spacecraft of which to create a copy

5.17.2.3 ~Spacecraft()

```
Spacecraft::~Spacecraft ( )  [virtual]
```

destructor for Spacecraft.

5.17.3 Member Function Documentation

5.17.3.1 AddSensor()

```
void Spacecraft::AddSensor (
            Sensor * sensor )  [virtual]
```

Add a sensor to the spacecraft.

Adds the input sensor to the Spacecraft's sensor list.

Parameters

sensor	Sensor to add to the list

Todo • check for sensor already on list!!

5.17.3.2 CanInterpolate()

```
bool Spacecraft::CanInterpolate (
            Real atTime )  [virtual]
```

Can the orbit be interpolated - i.e. are there enough points, etc.?

Can the orbit be interpolated (is it feasible given the number of points, etc.?)

Parameters

atTime	input time
checkRange	check the range to see if we need to interpolate

Returns

true if interpolation is feasible; false otherwise

5.17.3.3 CheckTargetVisibility() [1/2]

```
bool Spacecraft::CheckTargetVisibility (
            Real targetConeAngle,
            Real targetClockAngle,
            Integer sensorNumber )  [virtual]
```

Check the target visibility given the input cone and clock angles for the input sensor number

Returns a flag indicating whether or not the point is within the

Parameters

targetConeAngle	the cone angle
targetClockAngle	the clock angle
sensorNumber	sensor for which to check target visibility

Returns

true if point is visible, false otherwise

5.17.3.4 CheckTargetVisibility() [2/2]

```
bool Spacecraft::CheckTargetVisibility (
            const Rvector6 & bodyFixedState,
            const Rvector3 & satToTargetVec,
            Real atTime,
            Integer sensorNumber )  [virtual]
```

Check the target visibility given the input body fixed state and spacecraft-to-target vector, at the input time, for the input sensor number

Returns a flag indicating whether or not the point is within the visible to the sensor at the given time, given the satToTargetVec.

Parameters

bodyFixedState	input body fixed state
satToTargetVec	spacecraft-to-target vector
atTime	time for which to check the target visibility
sensorNumber	sensor for which to check target visibility

Returns

true if point is visible, false otherwise

5.17.3.5 ComputeNadirToBodyMatrix()

```
void Spacecraft::ComputeNadirToBodyMatrix ( )  [protected], [virtual]
```

Compute the nadir-to-body-matrix.

Computes the rotation matrix from the body frame to the sensor frame.

5.17.3.6 GetBodyFixedToInertial()

```
Rmatrix33 Spacecraft::GetBodyFixedToInertial (
            const Rvector6 & bfState )  [virtual]
```

Get the body-fixed-to-inertial rotation matrix.

Returns the bodyfixed-to-inertial matrix, given the input state

Parameters

bfState	body-fixed state

Returns

bodyfixed-to-inertial matrix

5.17.3.7 GetCartesianState()

```
Rvector6 Spacecraft::GetCartesianState ( )  [virtual]
```

Get the current cartesian state.

Returns the Spacecraft's cartesian state.

Returns

Spacecraft's cartesian state

5.17.3.8 GetCartesianStateAtEpoch()

```
Rvector6 Spacecraft::GetCartesianStateAtEpoch (
            const AbsoluteDate & atDate )  [virtual]
```

This method returns the interpolated MJ2000 Cartesian state.

Gets the Spacecraft's cartesian state (Earth MJ2000Eq) at the input time

Parameters

atDate	the date for which to get the cartesian state

Returns

state

5.17.3.9 GetDragArea()

```
Real Spacecraft::GetDragArea ( )  [virtual]
```

Get the drag area.

Gets the Spacecraft's drag area.

Returns

the drag area in m^2

5.17.3.10 GetDragCoefficient()

```
Real Spacecraft::GetDragCoefficient ( )  [virtual]
```

Gets the Spacecraft's drag coefficient.

Returns

the drag coefficient

5.17.3.11 GetJulianDate()

```
Real Spacecraft::GetJulianDate ( )  [virtual]
```

Get the Julian date.

Returns the Spacecraft's Julian Date.

Returns

Spacecraft's JulianDate

5.17.3.12 GetOrbitEpoch()

```
AbsoluteDate * Spacecraft::GetOrbitEpoch ( )  [virtual]
```

Get the orbit epoch.

Returns a pointer to the Spacecraft's AbsoluteDate object.

Returns

pointer to the spacecraft's AbsoluteDate

5.17.3.13 GetOrbitState()

```
OrbitState * Spacecraft::GetOrbitState ( )  [virtual]
```

Get the orbit state.

Returns a pointer to the Spacecraft's OrbitState object.

Returns

pointer to the spacecraft's OrbitState

5.17.3.14 GetTotalMass()

```
Real Spacecraft::GetTotalMass ( )  [virtual]
```

Get the toal mass.

Gets the Spacecraft's total mass.

Returns

the total mass

5.17.3.15 HasSensors()

```
bool Spacecraft::HasSensors ( )  [virtual]
```

Does this spacecraft have sensors?

Returns a flag indicating whether or not the spacecraft has sensors.

Returns

flag indicating whether or not the spacecraft has sensors.

5.17.3.16 InertialToConeClock()

```
void Spacecraft::InertialToConeClock (
            const Rvector3 & viewVec,
            Real & cone,
            Real & clock )  [protected], [virtual]
```

Convert inertial view vector to cone and clock angles.

Todo • do we need to buffer states here as well??

Computes the rotation matrix from the body frame to the sensor frame.

Parameters

viewVec	[in] input view vector
cone	[out] cone angle
clock	[out] clock angle

5.17.3.17 Interpolate()

```
Rvector6 Spacecraft::Interpolate (
            Real toTime )  [virtual]
```

Interpolate the data to the input toTime.

Interpolate the orbit data at the input time

Parameters

atTime	input time

Returns

interpolated state data

5.17.3.18 operator=()

```
Spacecraft & Spacecraft::operator= (
            const Spacecraft & copy )
```

operator= for Spacecraft.

Parameters

copy	The spacecraft whose values to copy

5.17.3.19 SetAttitude()

```
void Spacecraft::SetAttitude (
            Attitude * att )  [virtual]
```

Set the attitude for the spacecraft.

Sets the Spacecraft's attitude object

Parameters

att	the attitude object

5.17.3.20 SetBodyNadirOffsetAngles()

```
void Spacecraft::SetBodyNadirOffsetAngles (
             Real angle1 = 0.0,
             Real angle2 = 0.0,
             Real angle3 = 0.0,
             Integer seq1 = 1,
             Integer seq2 = 2,
             Integer seq3 = 3 )  [virtual]
```

Set the body nadir offset angles for the spacecraft.

Sets the body nadir offset angles

Parameters

angle1	euler angle 1 (degrees)
angle2	euler angle 2 (degrees)
angle3	euler angle 3 (degrees)
seq1	euler msequence 1
seq2	euler msequence 2
seq3	euler msequence 3

5.17.3.21 SetDragArea()

```
void Spacecraft::SetDragArea (
             Real area )  [virtual]
```

Set the drag area.

Sets the Spacecraft's drag area.

Parameters

the	drag area in m^2

5.17.3.22 SetDragCoefficient()

```
void Spacecraft::SetDragCoefficient (
```

```
            Real Cd )  [virtual]
```

Set the drag coefficient.

Sets the Spacecraft's drag coefficient.

Parameters

the	drag coefficient

5.17.3.23 SetOrbitState()

```
bool Spacecraft::SetOrbitState (
            const AbsoluteDate & t,
            const Rvector6 & kepl )  [virtual]
```

Add an orbit state (Keplerian elements) for the spacecraft at the input time t

Sets the orbit state on the Spacecraft

Parameters

t	input time
kepl	input keplerian elements

Returns

true if set; false otherwise

5.17.3.24 SetTotalMass()

```
void Spacecraft::SetTotalMass (
            Real mass )  [virtual]
```

Set the total mass.

Sets the Spacecraft's total mass.

Parameters

the	total mass

5.17.3.25 TimeToInterpolate()

```
bool Spacecraft::TimeToInterpolate (
            Real atTime,
            Real & midRange ) [virtual]
```

Is it time to interpolate? i.e. are there enough points? if so, what is the midpoint of the independent variable lower/upper range

Get the midpoint time to interpolate to, if

Parameters

atTime	[in] input time
midRange	[out] middle of the interpolation range size

Returns

true if interpolation should be performed at the input time; false otherwise

5.17.4 Member Data Documentation

5.17.4.1 attitude

```
Attitude* Spacecraft::attitude [protected]
```

Pointer to the Attitude object.

5.17.4.2 dragArea

```
Real Spacecraft::dragArea [protected]
```

Drag area in m^2.

5.17.4.3 dragCoefficient

```
Real Spacecraft::dragCoefficient [protected]
```

Drag coefficient.

5.17.4.4 eulerSeq1

```
Integer Spacecraft::eulerSeq1  [protected]
```

Euler sequence.

5.17.4.5 eulerSeq2

```
Integer Spacecraft::eulerSeq2  [protected]
```

5.17.4.6 eulerSeq3

```
Integer Spacecraft::eulerSeq3  [protected]
```

5.17.4.7 interpolator

```
LagrangeInterpolator* Spacecraft::interpolator  [protected]
```

The interpolator to use (for Hermite only, currently)

5.17.4.8 numSensors

```
Integer Spacecraft::numSensors  [protected]
```

Number of attached sensors.

5.17.4.9 offsetAngle1

```
Real Spacecraft::offsetAngle1  [protected]
```

Offset angles.

5.17.4.10 offsetAngle2

```
Real Spacecraft::offsetAngle2  [protected]
```

5.17.4.11 offsetAngle3

```
Real Spacecraft::offsetAngle3  [protected]
```

5.17.4.12 orbitEpoch

```
AbsoluteDate* Spacecraft::orbitEpoch  [protected]
```

Orbit Epoch.

5.17.4.13 orbitState

```
OrbitState* Spacecraft::orbitState  [protected]
```

Orbit State.

5.17.4.14 R_BN

```
Rmatrix33 Spacecraft::R_BN  [protected]
```

The rotation matrix from the nadir frame to the body frame.

5.17.4.15 sensorList

```
std::vector<Sensor*> Spacecraft::sensorList  [protected]
```

Vector of attached sensor objects.

5.17.4.16 totalMass

```
Real Spacecraft::totalMass  [protected]
```

Total Mass in kg.

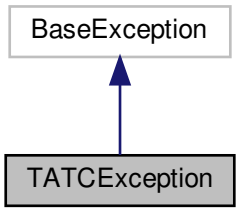
The documentation for this class was generated from the following files:

- src/Spacecraft.hpp
- src/Spacecraft.cpp

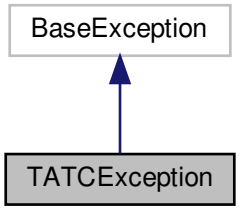
5.18 TATCException Class Reference

`#include <TATCException.hpp>`

Inheritance diagram for TATCException:



Collaboration diagram for TATCException:



Public Member Functions

- TATCException (const std::string &details="")
  class construction/destruction
- TATCException (const TATCException &be)

5.18.1 Detailed Description

Exception class used by the TAT-C code to generate visibilty reports. Exception class used to report issues with event location.

5.18.2 Constructor & Destructor Documentation

5.18.2.1 TATCException() [1/2]

```
TATCException::TATCException (
            const std::string & details = "" )
```

class construction/destruction

Exception class used by the TAT-C code to generate visibilty reports. Constructs TATCException instance (default constructor).

Parameters

details	A message providing the details of the exception.

5.18.2.2 TATCException() [2/2]

```
TATCException::TATCException (
            const TATCException & be )
```

Constructs TATCException instance (copy constructor).

Parameters

be	The instance that is copied.

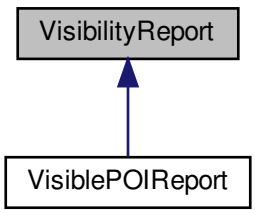
The documentation for this class was generated from the following files:

- src/TATCException.hpp
- src/TATCException.cpp

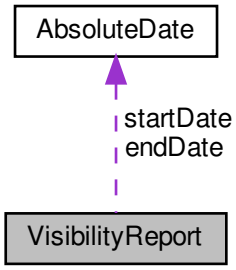
5.19 VisibilityReport Class Reference

`#include <VisibilityReport.hpp>`

Inheritance diagram for VisibilityReport:



Collaboration diagram for VisibilityReport:



Public Member Functions

- VisibilityReport ()

  class construction/destruction
- VisibilityReport (const VisibilityReport &copy)
- VisibilityReport & operator= (const VisibilityReport &copy)
- virtual ~VisibilityReport ()
- virtual void SetStartDate (const AbsoluteDate &toDate)

  Set the start date.
- virtual void SetEndDate (const AbsoluteDate &toDate)

  Set the end date.
- virtual const AbsoluteDate & GetStartDate ()

  Get the start date.
- virtual const AbsoluteDate & GetEndDate ()

  Get the end date.

Protected Attributes

- AbsoluteDate startDate

  Start date of the interval event.
- AbsoluteDate endDate

  End date of the interval event.

5.19.1 Detailed Description

Definition of the visibility report base class. This class reports and stores visibilty data.

5.19.2 Constructor & Destructor Documentation

5.19.2.1 VisibilityReport() [1/2]

```
VisibilityReport::VisibilityReport ( )
```

class construction/destruction

Implementation of the visibility report base class. Constructs VisibilityReport instance (default constructor).

5.19.2.2 VisibilityReport() [2/2]

```
VisibilityReport::VisibilityReport (
            const VisibilityReport & copy )
```

Constructs VisibilityReport instance (copy constructor).

Parameters

be	The instance that is copied.

5.19.2.3 ~VisibilityReport()

```
VisibilityReport::~VisibilityReport ( )  [virtual]
```

Destructs VisibilityReport instance

5.19.3 Member Function Documentation

5.19.3.1 GetEndDate()

```
const AbsoluteDate & VisibilityReport::GetEndDate ( )  [virtual]
```

Get the end date.

Returns the end date for the report.

Returns

The end time for the report.

5.19.3.2 GetStartDate()

```
const AbsoluteDate & VisibilityReport::GetStartDate ( )  [virtual]
```

Get the start date.

Returns the start date for the report.

Returns

The start time for the report.

5.19.3.3 operator=()

```
VisibilityReport & VisibilityReport::operator= (
            const VisibilityReport & copy )
```

VisibilityReport operator=.

Parameters

be	The instance that is copied.

5.19.3.4 SetEndDate()

```
void VisibilityReport::SetEndDate (
            const AbsoluteDate & toDate )  [virtual]
```

Set the end date.

Sets the end date for the report.

Parameters

toDate	The end time for the report.

5.19.3.5 SetStartDate()

```
void VisibilityReport::SetStartDate (
            const AbsoluteDate & toDate )  [virtual]
```

Set the start date.

Sets the start date for the report.

Parameters

toDate	The start time for the report.

5.19.4 Member Data Documentation

5.19.4.1 endDate

```
AbsoluteDate VisibilityReport::endDate  [protected]
```

End date of the interval event.

5.19.4.2 startDate

```
AbsoluteDate VisibilityReport::startDate  [protected]
```

Start date of the interval event.

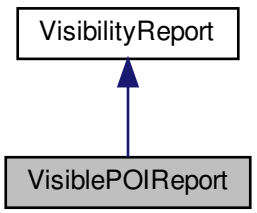
The documentation for this class was generated from the following files:

- src/VisibilityReport.hpp
- src/VisibilityReport.cpp

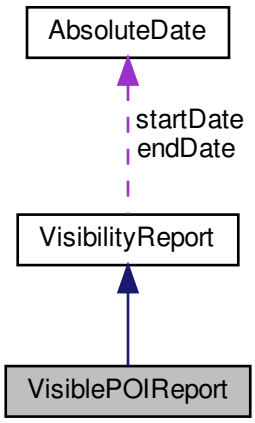
5.20 VisiblePOIReport Class Reference

```
#include <VisiblePOIReport.hpp>
```

Inheritance diagram for VisiblePOIReport:



Collaboration diagram for VisiblePOIReport:



Public Member Functions

- VisiblePOIReport ()

  class construction/destruction
- VisiblePOIReport (const VisiblePOIReport &copy)
- VisiblePOIReport & operator= (const VisiblePOIReport &copy)
- virtual ~VisiblePOIReport ()
- virtual void SetPOIIndex (Integer toIdx)

  Set/Get the POI index.
- virtual Integer GetPOIIndex ()
- virtual void SetObsZenith (Real obsZenithIn)

  Set/Get the observation zenith angle.
- virtual Real GetObsZenith ()
- virtual void SetObsAzimuth (Real obsZenithIn)

  Set/Get the observation azimuth.
- virtual Real GetObsAzimuth ()
- virtual void SetObsRange (Real obsRangeIn)

  Set/Get the observation range.
- virtual Real GetObsRange ()
- virtual void SetSunZenith (Real sunZenithIn)

  Set/Get the Sun zenith angle.
- virtual Real GetSunZenith ()
- virtual void SetSunAzimuth (Real obsZenithIn)

  Set/Get the Sun azimuth.
- virtual Real GetSunAzimuth ()

Protected Attributes

- Integer poiIndex

  Index of point of interest.
- Real obsZenith

  The observation zenith angle.
- Real obsAzimuth

  The observation azimuth angle.
- Real obsRange

  The observation range angle.
- Real sunZenith

  The Sun zenith angle.
- Real sunAzimuth

  The Sun azimuth angle.

5.20.1 Detailed Description

Definition of the visibility POI report class. This class is the container for data on POI interval events.

5.20.2 Constructor & Destructor Documentation

5.20.2.1 VisiblePOIReport() [1/2]

```
VisiblePOIReport::VisiblePOIReport ( )
```

class construction/destruction

Implementation of the visibility POI report class. Default constructor for VisiblePOIReport.

5.20.2.2 VisiblePOIReport() [2/2]

```
VisiblePOIReport::VisiblePOIReport (
            const VisiblePOIReport & copy )
```

Copy constructor for VisiblePOIReport.

5.20.2.3 ~VisiblePOIReport()

```
VisiblePOIReport::~VisiblePOIReport ( )  [virtual]
```

Destructor for VisiblePOIReport.

5.20.3 Member Function Documentation

5.20.3.1 GetObsAzimuth()

```
Real VisiblePOIReport::GetObsAzimuth ( )  [virtual]
```

Returns the Azimuth angle of observation w/r/t target

Returns

Azimuth angle of observation w/r/t target

5.20.3.2 GetObsRange()

```
Real VisiblePOIReport::GetObsRange ( )  [virtual]
```

Returns the Range angle of observation w/r/t target

Returns

Range angle of observation w/r/t target

5.20.3.3 GetObsZenith()

```
Real VisiblePOIReport::GetObsZenith ( )  [virtual]
```

Returns the zenith angle of observation w/r/t target

Returns

zenith angle of observation w/r/t target

5.20.3.4 GetPOIIndex()

```
Integer VisiblePOIReport::GetPOIIndex ( )  [virtual]
```

Returns the POI Index for the report.

Returns

<toIdx> Index for the report

5.20.3.5 GetSunAzimuth()

```
Real VisiblePOIReport::GetSunAzimuth ( )  [virtual]
```

Returns the zenith angle of sun w/r/t target

Returns

zenith angle of sun w/r/t target

5.20.3.6 GetSunZenith()

```
Real VisiblePOIReport::GetSunZenith ( )  [virtual]
```

Returns the zenith angle of sun w/r/t target

Returns

zenith angle of sun w/r/t target

5.20.3.7 operator=()

```
VisiblePOIReport & VisiblePOIReport::operator= (
            const VisiblePOIReport & copy )
```

operator= for VisiblePOIReport.

5.20.3.8 SetObsAzimuth()

```
void VisiblePOIReport::SetObsAzimuth (
            Real obsAzimuthIn )  [virtual]
```

Set/Get the observation azimuth.

Sets the Azimuth angle of observation w/r/t target

Parameters

obs↩ AzimuthIn	The observation Azimuth angle

5.20.3.9 SetObsRange()

```
void VisiblePOIReport::SetObsRange (
            Real obsRangeIn ) [virtual]
```

Set/Get the observation range.

Sets the Range angle of observation w/r/t target

Parameters

obsRangeIn	The observation Range angle

5.20.3.10 SetObsZenith()

```
void VisiblePOIReport::SetObsZenith (
            Real obsZenithIn ) [virtual]
```

Set/Get the observation zenith angle.

Sets the zenith angle of observation w/r/t target

Parameters

obsZenithIn	The observation zenith angle

5.20.3.11 SetPOIIndex()

```
void VisiblePOIReport::SetPOIIndex (
            Integer toIdx ) [virtual]
```

Set/Get the POI index.

Sets the POI Index for the report.

Parameters

<toIdx>	Index for the report

5.20.3.12 SetSunAzimuth()

```
void VisiblePOIReport::SetSunAzimuth (
            Real sunAzimuthIn )  [virtual]
```

Set/Get the Sun azimuth.

Sets the zenith angle of sun w/r/t target

Parameters

sun↩ AzimuthIn	The sun zenith angle

5.20.3.13 SetSunZenith()

```
void VisiblePOIReport::SetSunZenith (
            Real sunZenithIn )  [virtual]
```

Set/Get the Sun zenith angle.

Sets the zenith angle of sun w/r/t target

Parameters

sun↩ ZenithIn	The sun zenith angle

5.20.4 Member Data Documentation

5.20.4.1 obsAzimuth

```
Real VisiblePOIReport::obsAzimuth  [protected]
```

The observation azimuth angle.

5.20.4.2 obsRange

```
Real VisiblePOIReport::obsRange  [protected]
```

The observation range angle.

5.20.4.3 obsZenith

```
Real VisiblePOIReport::obsZenith  [protected]
```

The observation zenith angle.

5.20.4.4 poiIndex

```
Integer VisiblePOIReport::poiIndex  [protected]
```

Index of point of interest.

5.20.4.5 sunAzimuth

```
Real VisiblePOIReport::sunAzimuth  [protected]
```

The Sun azimuth angle.

5.20.4.6 sunZenith

```
Real VisiblePOIReport::sunZenith  [protected]
```

The Sun zenith angle.

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

- src/VisiblePOIReport.hpp
- src/VisiblePOIReport.cpp

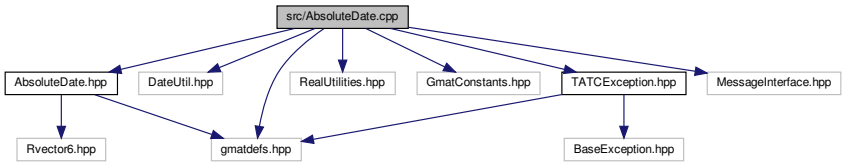
Chapter 6

File Documentation

6.1 src/AbsoluteDate.cpp File Reference

```
#include "gmatdefs.hpp"
#include "DateUtil.hpp"
#include "AbsoluteDate.hpp"
#include "RealUtilities.hpp"
#include "GmatConstants.hpp"
#include "TATCException.hpp"
#include "MessageInterface.hpp"
```

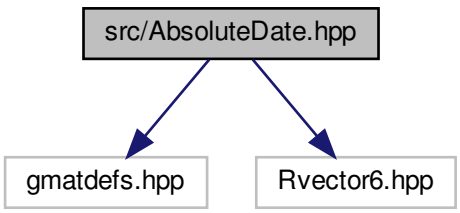
Include dependency graph for AbsoluteDate.cpp:



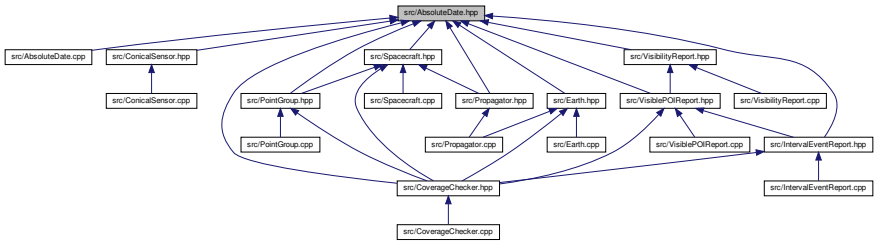
6.2 src/AbsoluteDate.hpp File Reference

```
#include "gmatdefs.hpp"
#include "Rvector6.hpp"
```

Include dependency graph for AbsoluteDate.hpp:



This graph shows which files directly or indirectly include this file:



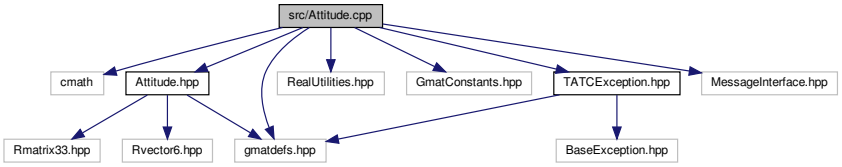
Classes

- class AbsoluteDate

6.3 src/Attitude.cpp File Reference

```
#include <cmath>
#include "gmatdefs.hpp"
#include "Attitude.hpp"
#include "RealUtilities.hpp"
#include "GmatConstants.hpp"
#include "TATCException.hpp"
#include "MessageInterface.hpp"
```

Include dependency graph for Attitude.cpp:

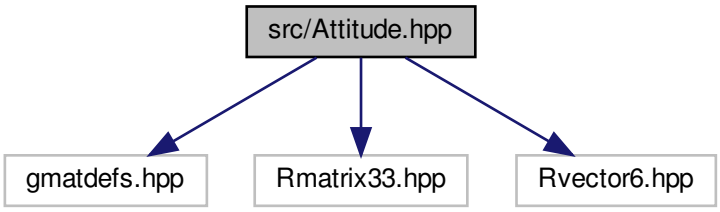


6.4 src/Attitude.hpp File Reference

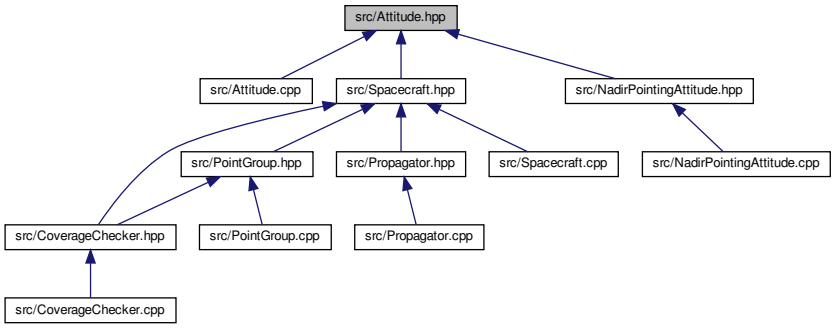
```
#include "gmatdefs.hpp"
#include "Rmatrix33.hpp"
```

```
#include "Rvector6.hpp"
```

Include dependency graph for Attitude.hpp:



This graph shows which files directly or indirectly include this file:



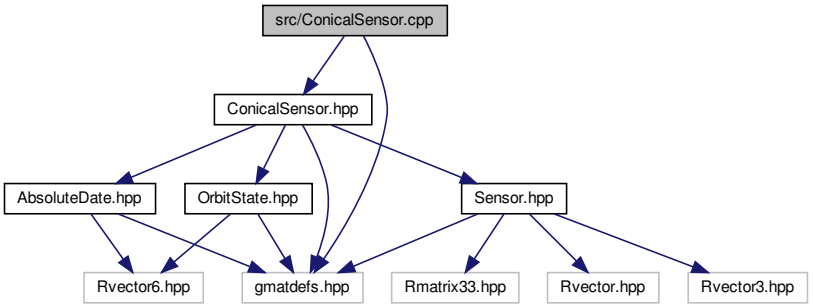
Classes

- class Attitude

6.5 src/ConicalSensor.cpp File Reference

```
#include "gmatdefs.hpp"
#include "ConicalSensor.hpp"
```

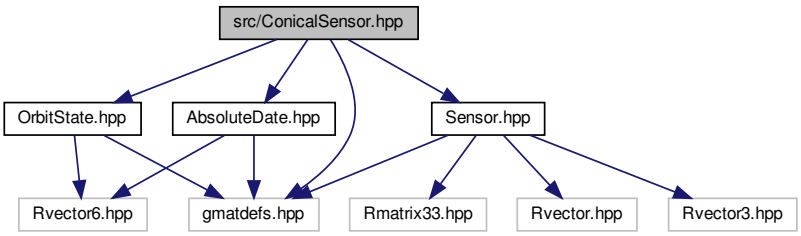
Include dependency graph for ConicalSensor.cpp:



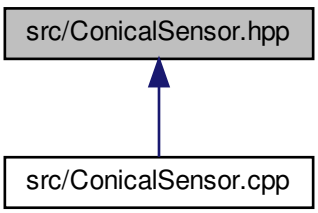
6.6 src/ConicalSensor.hpp File Reference

```
#include "gmatdefs.hpp"
#include "OrbitState.hpp"
#include "AbsoluteDate.hpp"
#include "Sensor.hpp"
```

Include dependency graph for ConicalSensor.hpp:



This graph shows which files directly or indirectly include this file:



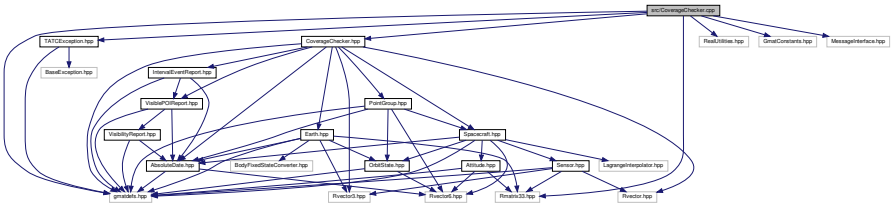
Classes

- class ConicalSensor

6.7 src/CoverageChecker.cpp File Reference

```
#include "gmatdefs.hpp"
#include "CoverageChecker.hpp"
#include "RealUtilities.hpp"
#include "GmatConstants.hpp"
#include "Rmatrix33.hpp"
#include "TATCException.hpp"
#include "MessageInterface.hpp"
```

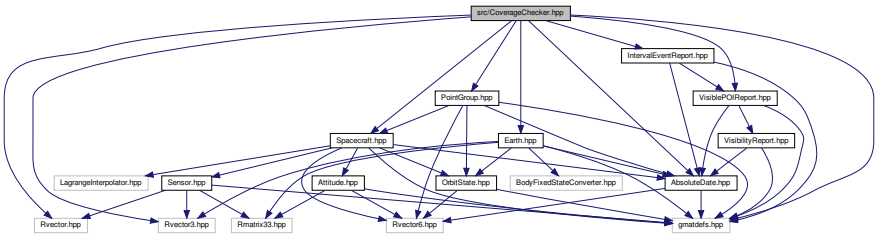
Include dependency graph for CoverageChecker.cpp:



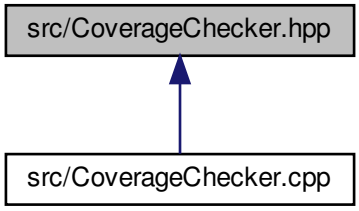
6.8 src/CoverageChecker.hpp File Reference

```
#include "gmatdefs.hpp"
#include "AbsoluteDate.hpp"
#include "Spacecraft.hpp"
#include "PointGroup.hpp"
#include "Earth.hpp"
#include "Rvector.hpp"
#include "Rvector3.hpp"
#include "VisiblePOIReport.hpp"
#include "IntervalEventReport.hpp"
```

Include dependency graph for CoverageChecker.hpp:



This graph shows which files directly or indirectly include this file:



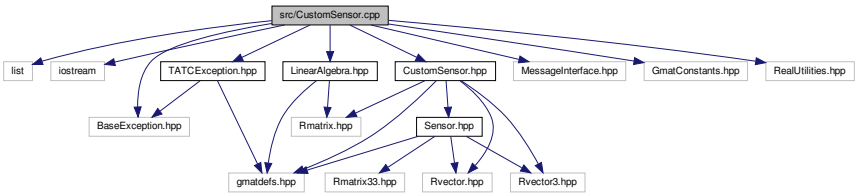
Classes

- class CoverageChecker

6.9 src/CustomSensor.cpp File Reference

```
#include <list>
#include <iostream>
#include "CustomSensor.hpp"
#include "MessageInterface.hpp"
#include "BaseException.hpp"
#include "TATCException.hpp"
#include "GmatConstants.hpp"
#include "RealUtilities.hpp"
#include "LinearAlgebra.hpp"
```

Include dependency graph for CustomSensor.cpp:



Functions

- bool CompareSensorElements (const SensorElement &e1, const SensorElement &e2)

6.9.1 Function Documentation

6.9.1.1 CompareSensorElements()

```
bool CompareSensorElements (
            const SensorElement & e1,
            const SensorElement & e2 )
```

compares 2 elements using ordering of values

Parameters

e1	first element in comparison
e2	second element in comparison

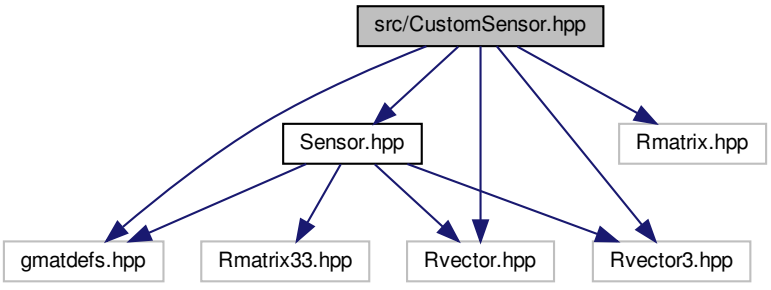
Returns

true if value of e1 is less than value of e2, false otherwise

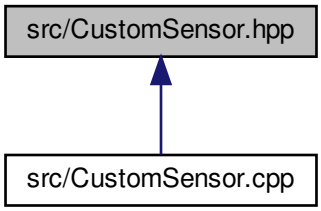
6.10 src/CustomSensor.hpp File Reference

```
#include "Sensor.hpp"
#include "gmatdefs.hpp"
#include "Rvector.hpp"
#include "Rvector3.hpp"
#include "Rmatrix.hpp"
```

Include dependency graph for CustomSensor.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class CustomSensor
- struct SensorElement

Functions

- bool CompareSensorElements (const SensorElement &e1, const SensorElement &e2)

6.10.1 Function Documentation

6.10.1.1 CompareSensorElements()

```
bool CompareSensorElements (
            const SensorElement & e1,
            const SensorElement & e2 )
```

compares 2 elements using ordering of values

Parameters

e1	first element in comparison
e2	second element in comparison

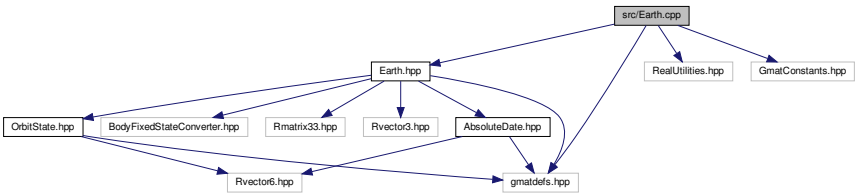
Returns

true if value of e1 is less than value of e2, false otherwise

6.11 src/Earth.cpp File Reference

```
#include "gmatdefs.hpp"
#include "Earth.hpp"
#include "RealUtilities.hpp"
#include "GmatConstants.hpp"
```

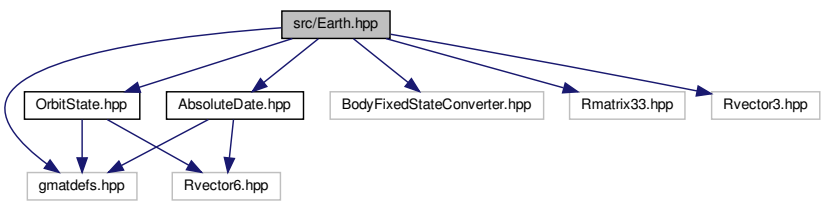
Include dependency graph for Earth.cpp:



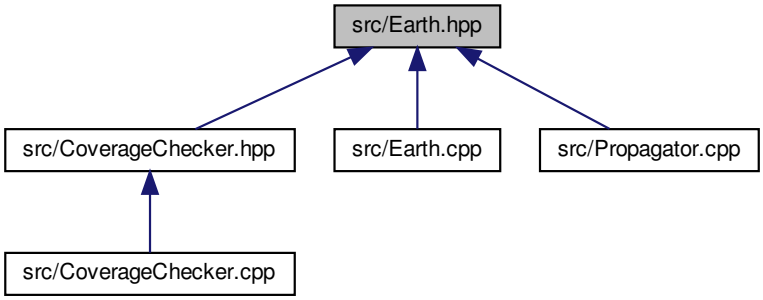
6.12 src/Earth.hpp File Reference

```
#include "gmatdefs.hpp"
#include "OrbitState.hpp"
#include "AbsoluteDate.hpp"
#include "BodyFixedStateConverter.hpp"
#include "Rmatrix33.hpp"
#include "Rvector3.hpp"
```

Include dependency graph for Earth.hpp:



This graph shows which files directly or indirectly include this file:



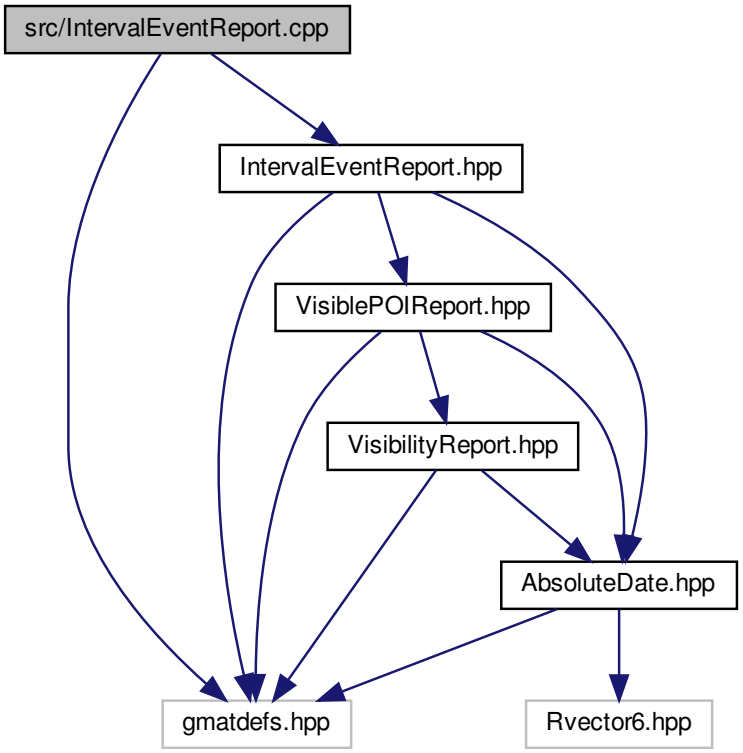
Classes

- class Earth

6.13 src/IntervalEventReport.cpp File Reference

```
#include "gmatdefs.hpp"
#include "IntervalEventReport.hpp"
```

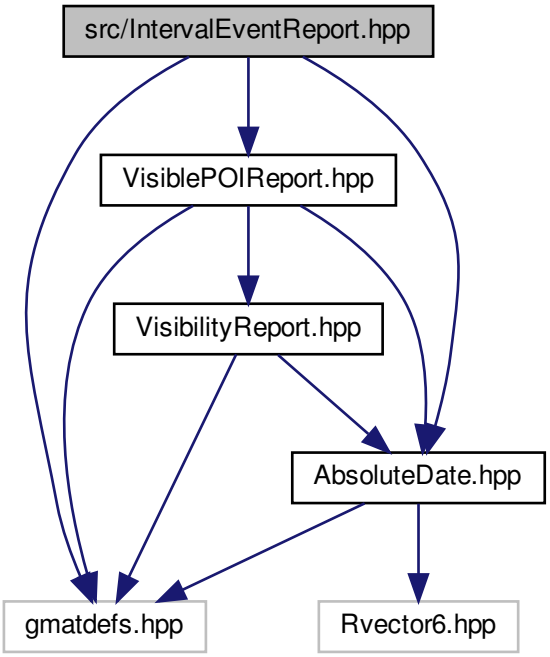
Include dependency graph for IntervalEventReport.cpp:



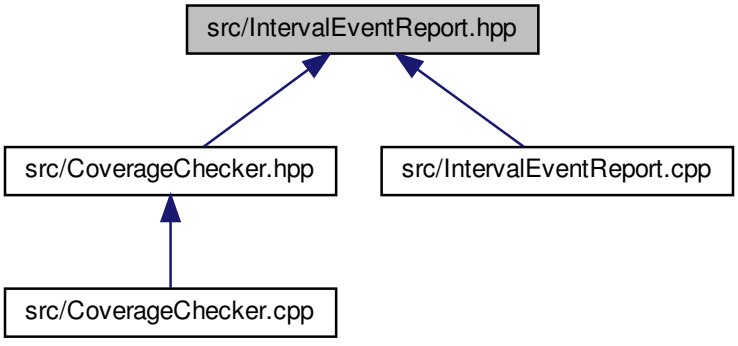
6.14 src/IntervalEventReport.hpp File Reference

```
#include "gmatdefs.hpp"
#include "AbsoluteDate.hpp"
#include "VisiblePOIReport.hpp"
```

Include dependency graph for IntervalEventReport.hpp:



This graph shows which files directly or indirectly include this file:



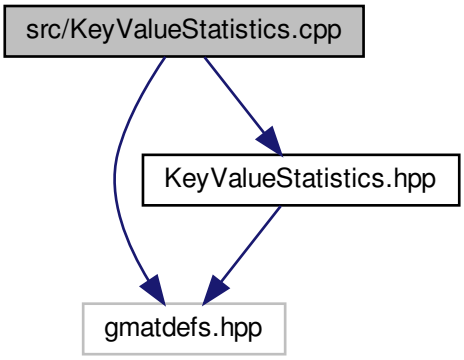
Classes

- class IntervalEventReport

6.15 src/KeyValueStatistics.cpp File Reference

```
#include "gmatdefs.hpp"
#include "KeyValueStatistics.hpp"
```

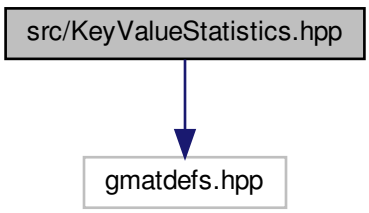
Include dependency graph for KeyValueStatistics.cpp:



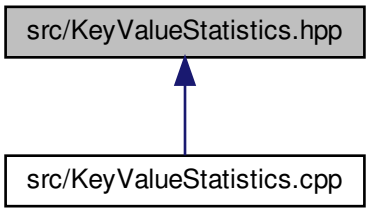
6.16 src/KeyValueStatistics.hpp File Reference

```
#include "gmatdefs.hpp"
```

Include dependency graph for KeyValueStatistics.hpp:



This graph shows which files directly or indirectly include this file:



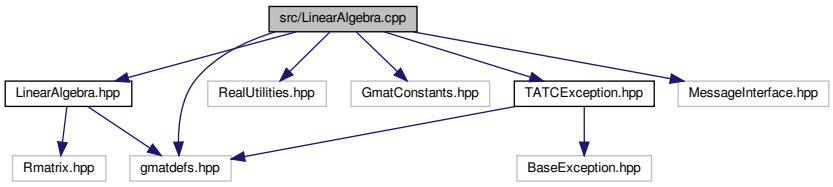
Classes

- class KeyValueStatistics

6.17 src/LinearAlgebra.cpp File Reference

```
#include "gmatdefs.hpp"
#include "LinearAlgebra.hpp"
#include "RealUtilities.hpp"
#include "GmatConstants.hpp"
#include "TATCException.hpp"
#include "MessageInterface.hpp"
```

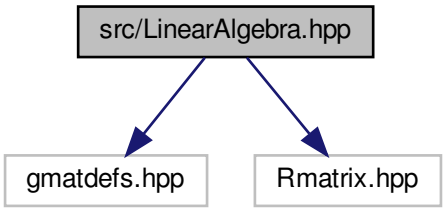
Include dependency graph for LinearAlgebra.cpp:



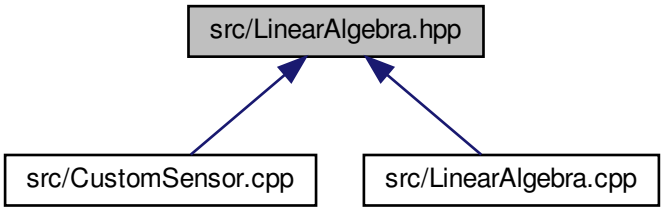
6.18 src/LinearAlgebra.hpp File Reference

```
#include "gmatdefs.hpp"
#include "Rmatrix.hpp"
```

Include dependency graph for LinearAlgebra.hpp:



This graph shows which files directly or indirectly include this file:



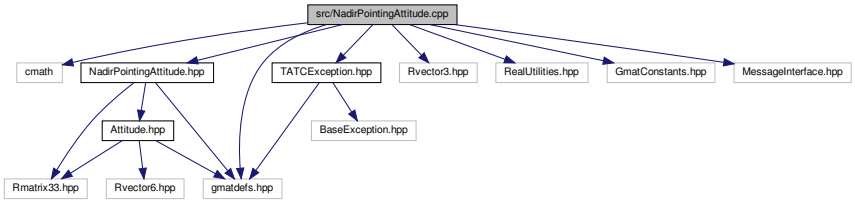
Classes

- class LinearAlgebra

6.19 src/NadirPointingAttitude.cpp File Reference

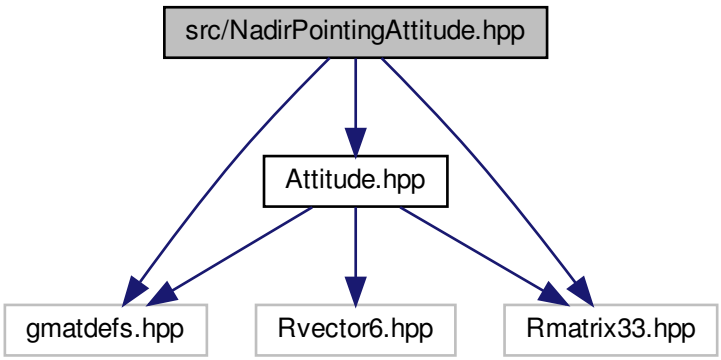
```
#include <cmath>
#include "gmatdefs.hpp"
#include "Rvector3.hpp"
#include "NadirPointingAttitude.hpp"
#include "RealUtilities.hpp"
#include "GmatConstants.hpp"
#include "TATCException.hpp"
```

```
#include "MessageInterface.hpp"
```
Include dependency graph for NadirPointingAttitude.cpp:

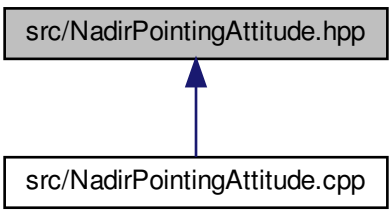


6.20 src/NadirPointingAttitude.hpp File Reference

```
#include "gmatdefs.hpp"
#include "Attitude.hpp"
#include "Rmatrix33.hpp"
```
Include dependency graph for NadirPointingAttitude.hpp:



This graph shows which files directly or indirectly include this file:



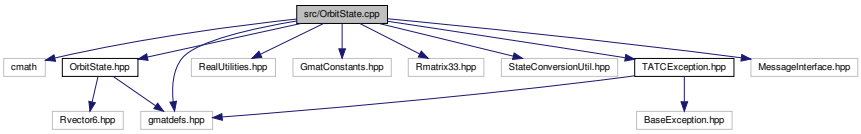
Classes

- class NadirPointingAttitude

6.21 src/OrbitState.cpp File Reference

```
#include <cmath>
#include "gmatdefs.hpp"
#include "OrbitState.hpp"
#include "RealUtilities.hpp"
#include "GmatConstants.hpp"
#include "Rmatrix33.hpp"
#include "StateConversionUtil.hpp"
#include "TATCException.hpp"
#include "MessageInterface.hpp"
```

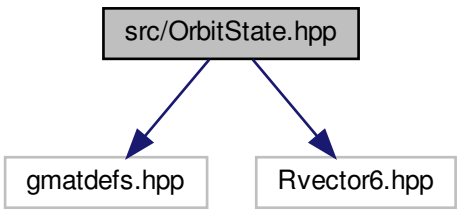
Include dependency graph for OrbitState.cpp:



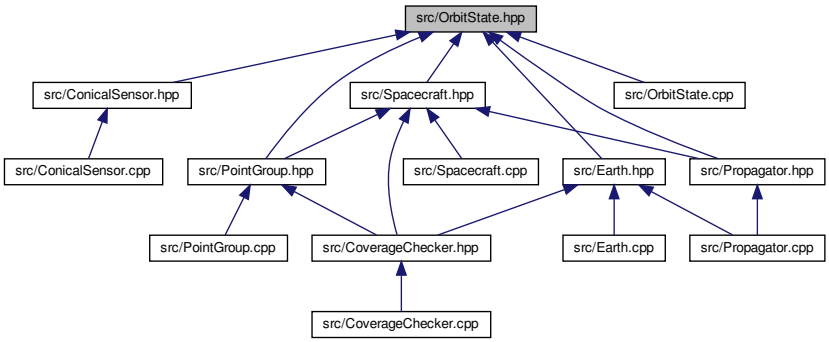
6.22 src/OrbitState.hpp File Reference

```
#include "gmatdefs.hpp"
#include "Rvector6.hpp"
```

Include dependency graph for OrbitState.hpp:



This graph shows which files directly or indirectly include this file:



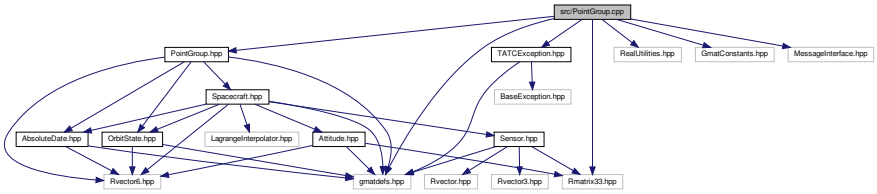
Classes

- class OrbitState

6.23 src/PointGroup.cpp File Reference

```
#include "gmatdefs.hpp"
#include "PointGroup.hpp"
#include "RealUtilities.hpp"
#include "GmatConstants.hpp"
#include "Rmatrix33.hpp"
#include "TATCException.hpp"
#include "MessageInterface.hpp"
```

Include dependency graph for PointGroup.cpp:

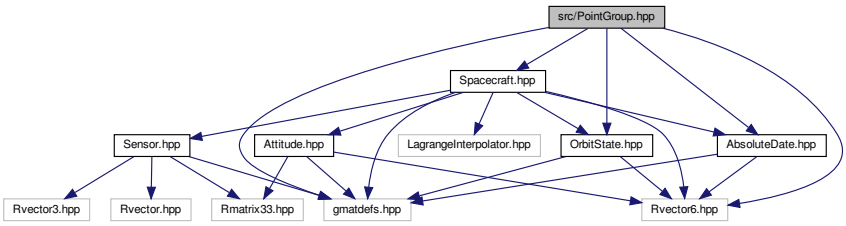


6.24 src/PointGroup.hpp File Reference

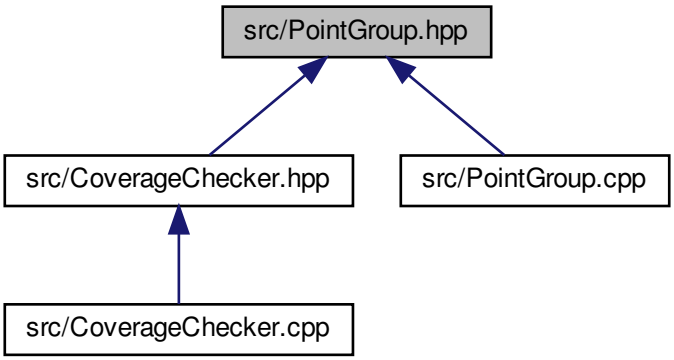
```
#include "gmatdefs.hpp"
#include "AbsoluteDate.hpp"
#include "Spacecraft.hpp"
#include "OrbitState.hpp"
```

```
#include "Rvector6.hpp"
```

Include dependency graph for PointGroup.hpp:



This graph shows which files directly or indirectly include this file:



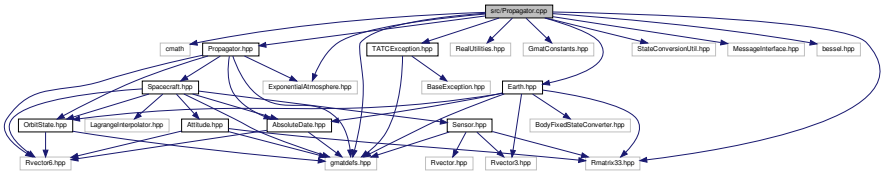
Classes

- class PointGroup

6.25 src/Propagator.cpp File Reference

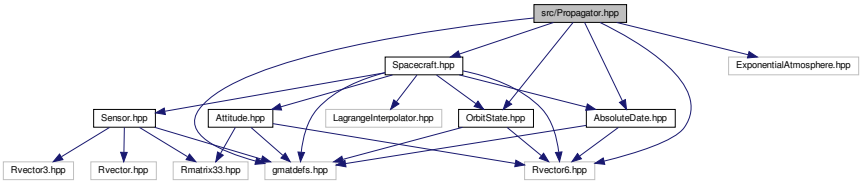
```
#include <cmath>
#include "gmatdefs.hpp"
#include "Propagator.hpp"
#include "RealUtilities.hpp"
#include "GmatConstants.hpp"
#include "Rmatrix33.hpp"
#include "TATCException.hpp"
#include "StateConversionUtil.hpp"
#include "MessageInterface.hpp"
#include "bessel.hpp"
#include "ExponentialAtmosphere.hpp"
```

```
#include "Earth.hpp"
```
Include dependency graph for Propagator.cpp:

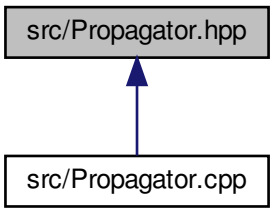


6.26 src/Propagator.hpp File Reference

```
#include "gmatdefs.hpp"
#include "AbsoluteDate.hpp"
#include "Spacecraft.hpp"
#include "OrbitState.hpp"
#include "Rvector6.hpp"
#include "ExponentialAtmosphere.hpp"
```
Include dependency graph for Propagator.hpp:



This graph shows which files directly or indirectly include this file:



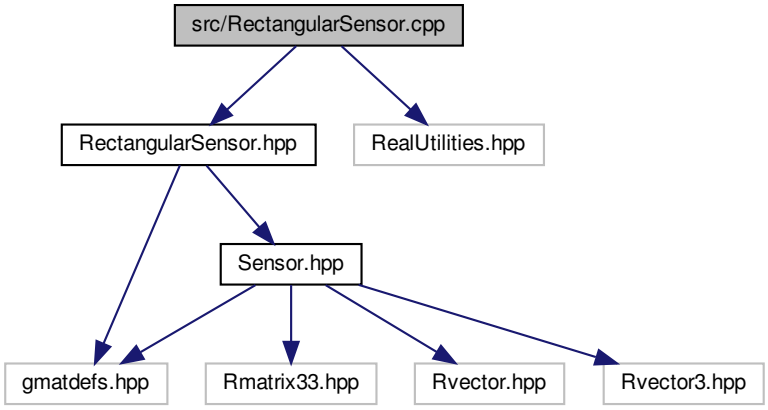
Classes

- class Propagator

6.27 src/RectangularSensor.cpp File Reference

```
#include "RectangularSensor.hpp"
#include "RealUtilities.hpp"
```

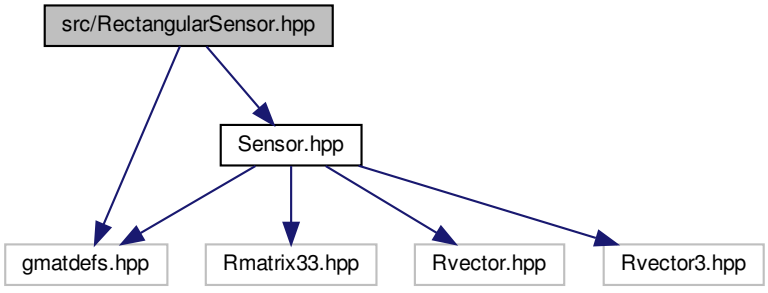
Include dependency graph for RectangularSensor.cpp:



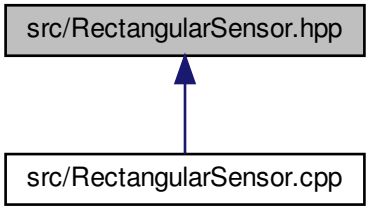
6.28 src/RectangularSensor.hpp File Reference

```
#include "gmatdefs.hpp"
#include "Sensor.hpp"
```

Include dependency graph for RectangularSensor.hpp:



This graph shows which files directly or indirectly include this file:



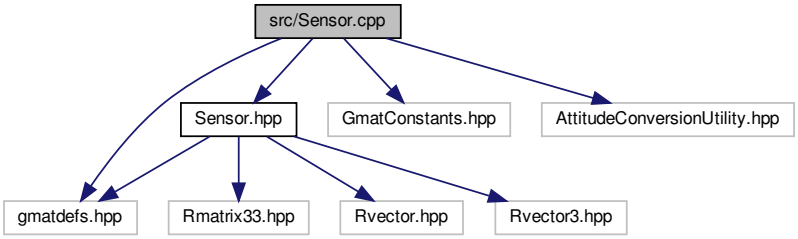
Classes

- class RectangularSensor

6.29 src/Sensor.cpp File Reference

```
#include "gmatdefs.hpp"
#include "Sensor.hpp"
#include "GmatConstants.hpp"
#include "AttitudeConversionUtility.hpp"
```

Include dependency graph for Sensor.cpp:

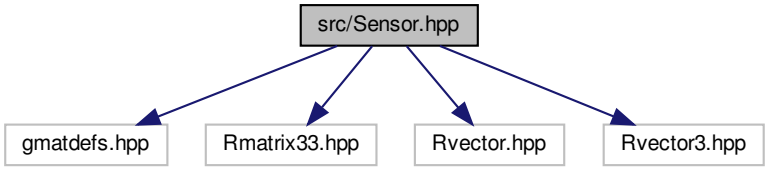


6.30 src/Sensor.hpp File Reference

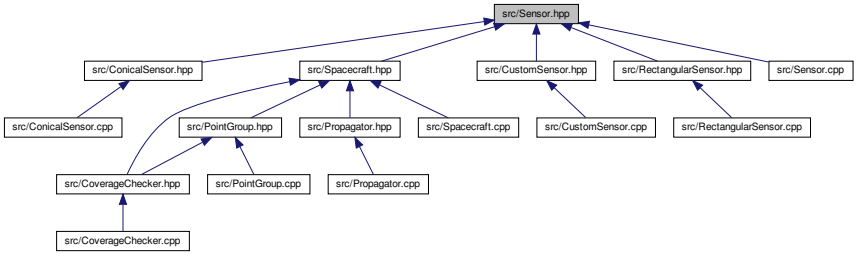
```
#include "gmatdefs.hpp"
#include "Rmatrix33.hpp"
#include "Rvector.hpp"
```

```
#include "Rvector3.hpp"
```

Include dependency graph for Sensor.hpp:



This graph shows which files directly or indirectly include this file:



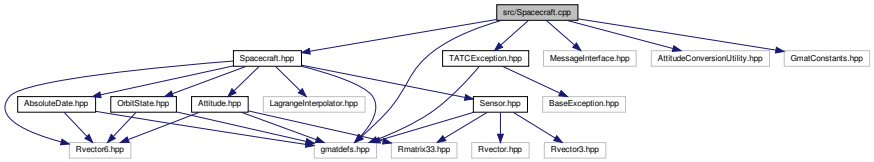
Classes

- class Sensor

6.31 src/Spacecraft.cpp File Reference

```
#include "gmatdefs.hpp"
#include "Spacecraft.hpp"
#include "TATCException.hpp"
#include "MessageInterface.hpp"
#include "AttitudeConversionUtility.hpp"
#include "GmatConstants.hpp"
```

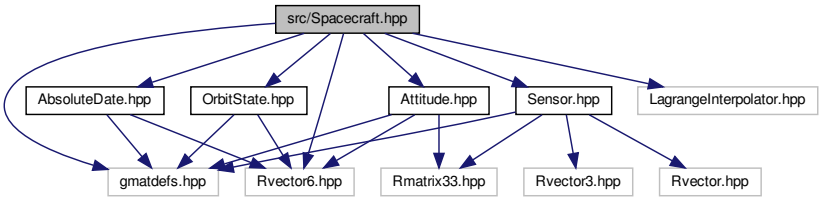
Include dependency graph for Spacecraft.cpp:



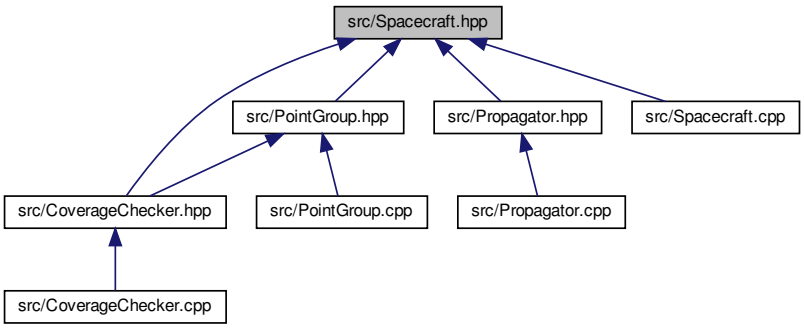
6.32 src/Spacecraft.hpp File Reference

```
#include "gmatdefs.hpp"
#include "OrbitState.hpp"
#include "AbsoluteDate.hpp"
#include "Sensor.hpp"
#include "Attitude.hpp"
#include "LagrangeInterpolator.hpp"
#include "Rvector6.hpp"
```

Include dependency graph for Spacecraft.hpp:



This graph shows which files directly or indirectly include this file:



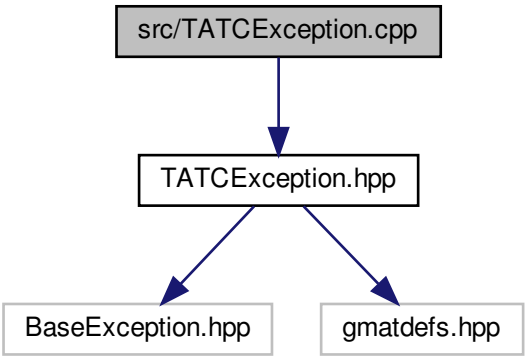
Classes

- class Spacecraft

6.33 src/TATCException.cpp File Reference

```
#include "TATCException.hpp"
```

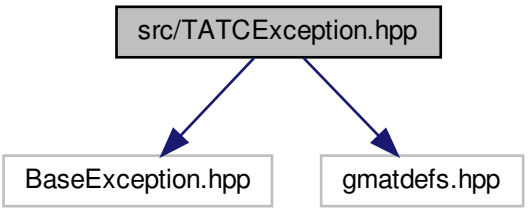
Include dependency graph for TATCException.cpp:



6.34 src/TATCException.hpp File Reference

```
#include "BaseException.hpp"
#include "gmatdefs.hpp"
```

Include dependency graph for TATCException.hpp:



This graph shows which files directly or indirectly include this file:

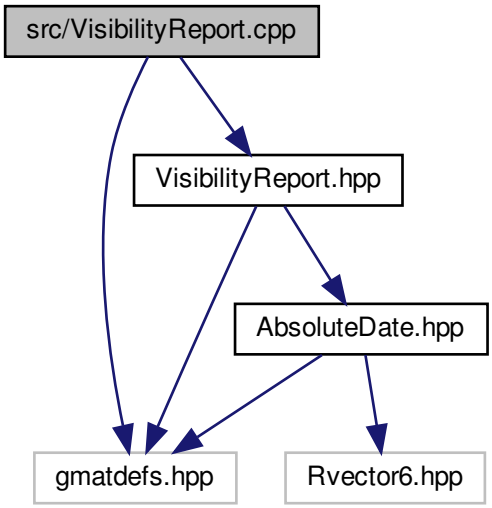
Classes

- class TATCException

6.35 src/VisibilityReport.cpp File Reference

```
#include "gmatdefs.hpp"
#include "VisibilityReport.hpp"
```

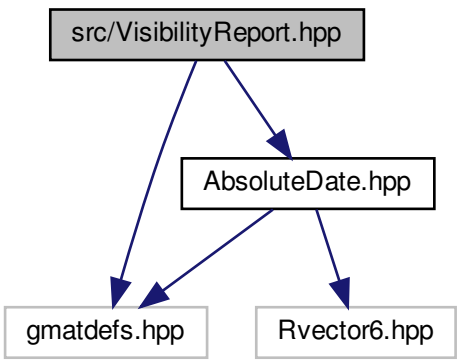
Include dependency graph for VisibilityReport.cpp:



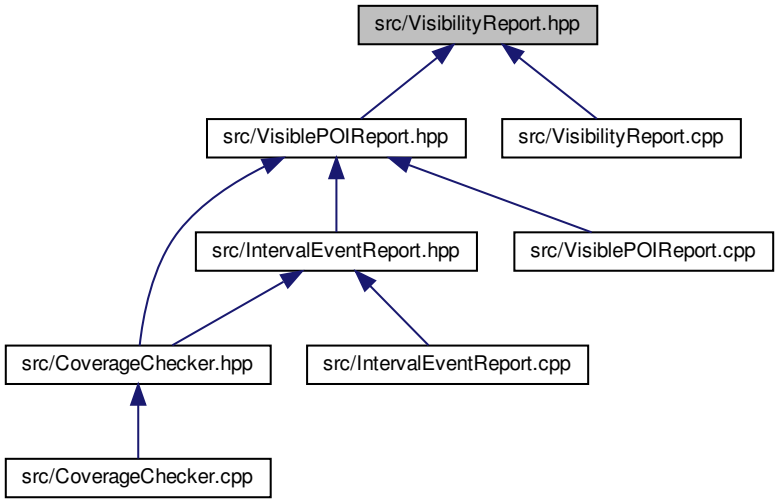
6.36 src/VisibilityReport.hpp File Reference

```
#include "gmatdefs.hpp"
#include "AbsoluteDate.hpp"
```

Include dependency graph for VisibilityReport.hpp:



This graph shows which files directly or indirectly include this file:



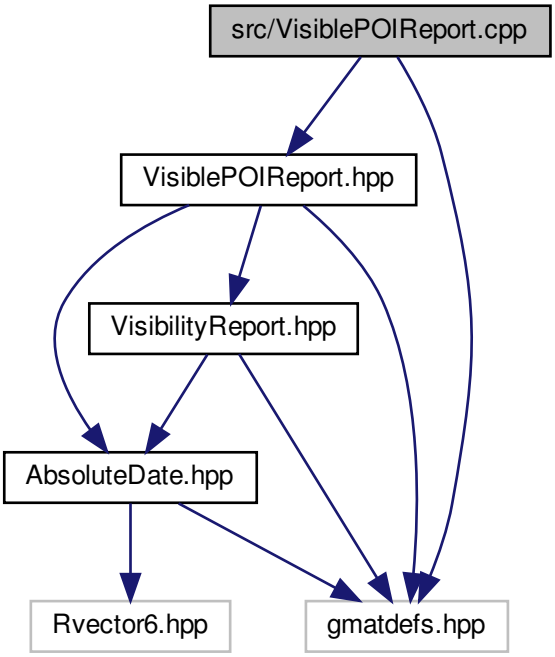
Classes

- class VisibilityReport

6.37 src/VisiblePOIReport.cpp File Reference

```
#include "gmatdefs.hpp"
#include "VisiblePOIReport.hpp"
```

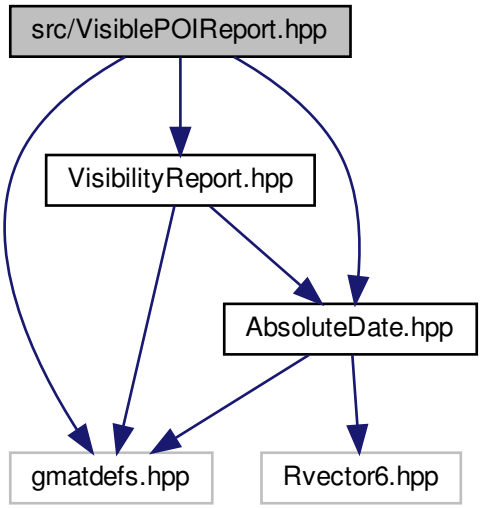
Include dependency graph for VisiblePOIReport.cpp:



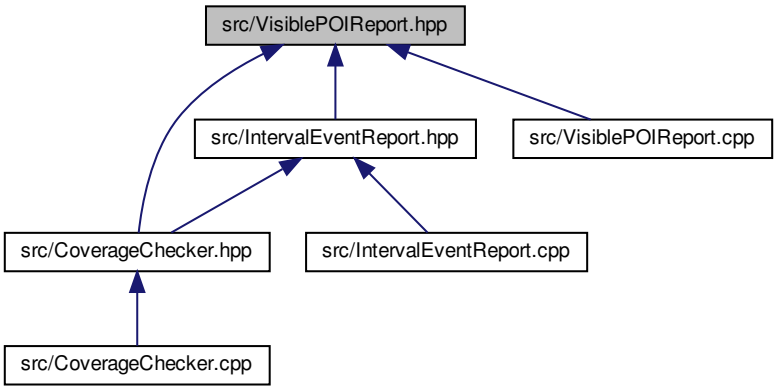
6.38 src/VisiblePOIReport.hpp File Reference

```
#include "gmatdefs.hpp"
#include "AbsoluteDate.hpp"
#include "VisibilityReport.hpp"
```

Include dependency graph for VisiblePOIReport.hpp:



This graph shows which files directly or indirectly include this file:



Classes

- class VisiblePOIReport

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