

Solar System

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Explore

This section is to document an initial list all known issues with this feature. Put findings here during feature exploration. This is a temporary holding place, and all of these items **MUST** be moved to JIRA early in the feature finalization or they will not be tracked or scheduled to be fixed!

Known Bugs

Known bugs [committed in JIRA](#) against this feature.

P1 R2013a

Bug GMT-3135

User-provided SPK kernel is not validated or used

Bug GMT-1304

Setting SPK kernel name in GUI overwrites DE file name

Bug GMT-3134

DEFileName field contains stale data after invalid file is rejected.

Bug GMT-3131

Invalide warning thrown when loading SPK kernel for most built-in bodies

P2 R2103a

Bug GMT-3132

Crash when invalid DE file is specified

Bug GMT-2725

User cannot clone, rename or delete User-defined bodies (ie. a new moon or comet)

Wendy Shoan R2013a P2 Open Open Unresolved

Actions

Bug GMT-3103

Double error window for Solar System objects when entering invalid value in panel

Steven Hughes Someday P3 Open Open Unresolved

Actions

P3 Someday/Enhancement

Bug GMT-2336

Error Propagating Earth Using Two Body Model

Wendy Shoan Someday P3 Open Open Unresolved

Actions

Bug GMT-2323

Errors in TwoBody Computations for User-Defined Bodies

Wendy Shoan Someday P3 Open Open Unresolved

Actions

Bug GMT-348

Need .jpg files for Comet and Asteroid

Linda Jun Someday P3 Open Open Unresolved

Actions

Bug GMT-2178

Solar System: extra blank line was added to default planet's scripts

Wendy Shoan Someday P3 Open Open Unresolved
Actions

Bug GMT-2216

LSK file text ctrl remains visible when source set to DE405 or 2Body

Wendy Shoan Someday P3 Open Open Unresolved
Actions

Failing Tests

Other Findings/To Do

- Remove old warning message for outer planets when using SPK for Ephem Source.
- Remove old SPK file from data files

If you provide a non-existent file in the GUI, you get a string of error messages like this. This error message is old dating back to when EphemerisSource was a list. We should fix the message. In addition, the mission runs but I have no idea what ephemeris is used.

Error opening DE file:../data/planetary_ephem/de/leDE1900.405.
Please check file path. The next filetype in the list will be used.

CCB Updated xls file on 20 Nov 2013

ID	Requirements
FRR-xyz	The requirement.
FRR-xyz.	The requirement

Interface/Functional Spec

Overview

High level solar system configuration options.

Description

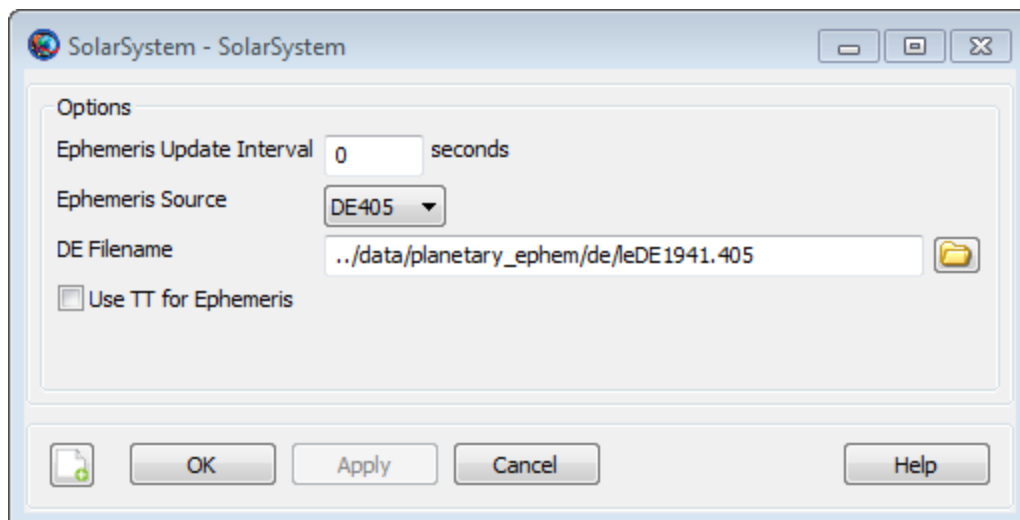
The SolarSystem resource allows you to define global properties for the model of the solar system including the ephemeris source for built-in celestial bodies and selected settings to improve performance when medium fidelity modelling is acceptable for your application.

See Also: Celestial Body, Libration Point, Barycenter, CoordinateSystem.

Fields

See the [User Interface Spec](#) spreadsheet for reference information for fields.

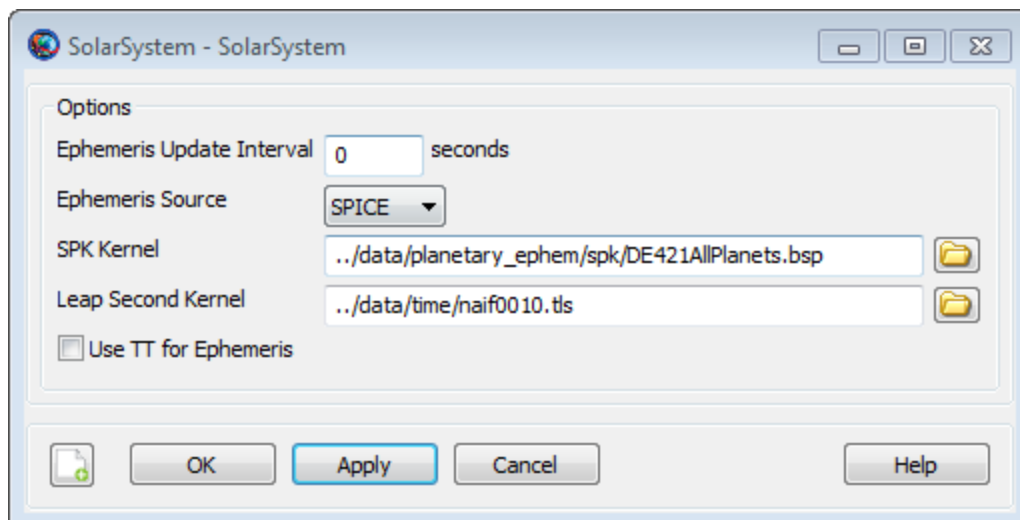
GUI



The SolarSystem dialog box allows you to configure global properties for solar system modelling and the default configuration is illustrated above. Use EphemerisSource to choose the ephemeris model for built-in celestial bodies. If you select either DE405, DE421, or DE424 the dialog box above illustrates available options.

Caution: GMAT allows you to provide user-created DE or SPK kernel files but we recommend using the files distributed with GMAT. The files provided with GMAT have been extensively tested for consistency and accuracy with the original data provided by JPL and other models in GMAT. Using inconsistent ephemeris files or user-generated files can result in instability or numerical issues if the files are not generated correctly.

Changing the ephemeris source for an application is equivalent to making a fundamental change to the model of the solar system. We recommend selecting the EphemerisSource early in the design process and using that model consistently. In the event that an ephemeris model change is necessary, we recommend that you change the model in the script file and not via the GUI. We allow you to change EphemerisSource via the GUI for convenience in early design phases when rigorous consistency in modelling is less important.



If you select SPICE for EphemerisSource, the SolarSystem dialog box reconfigures to allow you to define the SPK Kernel and the leap second kernel.

For Developer/GUI Tester: The SolarSystem dialog box configuration is different depending upon the selection of EphemerisSource. If EphemerisSource is SPICE the GUI label should read "SPK Kernel" and the Leap Second Kernel field and browser button should be displayed. If Ephemeris Source is DE405, DE421, or DE424, then the GUI label for the file

field should read “DE Filename” and the Leap Second Kernel fields should NOT be displayed.

Remarks

GMAT uses the ephemeris file selected in the EphemerisSource field for all built-in celestial bodies. For user-defined bodies, the ephemeris model is specified on the CelestialBody object.

- For more information on the DE files provide by JPL see the readme file here(<http://iau-comm4.jpl.nasa.gov/README>).
- For general information on SPICE ephemeris files see <http://naif.jpl.nasa.gov/naif/toolkit.html>
- For information on the SPK kernel named DE421AllPlanets.bsp distributed with GMAT see the SPK.Readme located in data\planetary_ephem\spk in the GMAT distribution.

Note: The SolarSystem and built-in CelestialBody resources require several hundred fields for full configuration. GMAT only saves non-default values for SolarSystem and CelestialBody to the script so that scripts are not populated with hundreds of default settings.

Examples

Use DE421 for Ephemeris.

```
GMAT SolarSystem.EphemerisSource = 'DE421';

Create Spacecraft aSpacecraft;
Create Propagator aPropagator;
aPropagator.FM = aForceModel;
Create ForceModel aForceModel
aForceModel.PointMasses = {Luna, Sun};

BeginMissionSequence;

Propagate aPropagator(aSpacecraft) {aSpacecraft.ElapsedSecs = 12000.0};
```

Use SPICE for Ephemeris.

```
GMAT SolarSystem.EphemerisSource = 'SPICE';
```

```

Create Spacecraft aSpacecraft;
Create Propagator aPropagator;
aPropagator.FM = aForceModel;
Create ForceModel aForceModel
aForceModel.PointMasses = {Luna, Sun};

BeginMissionSequence;

Propagate aPropagator(aSpacecraft) {aSpacecraft.ElapsedSecs = 12000.0};

```

Test Procedures

Assumptions

If you are making assumptions about how tests will be performed or that other test areas will cover some of this functionality describe that here.

SolarSystem EphemerisUpdateInterval
SolarSystem UseTTForEphemeris

SolarSystem EphemerisSource
SolarSystem DEFilename
SolarSystem LSKFilename
SolarSystem SPKFilename

Existing Tests

Describe existing test types using a row for each class of test.

Priority	Status	Summary
P1	Done:SPH	Test using SPK, DE421, DE405, and DE424 in coordinate system translations See files named

		EphemTest_SPK_* EphemTest_DE405_* EphemTest_DE421_* EphemTest_DE424_*
P1	Done:SPH	Test using SPK, DE421, DE405, and DE424 in propagation: See files named: GMAT_LunarTransfer_AllPlanets_DE405 GMAT_LunarTransfer_AllPlanets_DE421 GMAT_LunarTransfer_AllPlanets_DE424 GMAT_LunarTransfer_AllPlanets_SPK
P1	Done: SPH	Test using TT in ephemeris by setting UseTTforEphemers to true: See file named below located in Dynamics Model test folder GMAT_LunarTransfer_UseTTForEphemIsTrue
P1	Done: SPH	Test Ephem sources in barycenter and libration point: See files named like below located in Barycenter and Libration test folders: Barycenter_*_PlutoOrbit LibPoint_Earth_Luna_EarthOrbit_L2_*
P1	Done: SPH	Test ephemeris update interval at zero and non zero values. See files named: SolarSystem_EphemUpdateInterval_*
P1	Done:SPH	Test providing user defined SPK kernel for main solar system ephemeris

Recommended Additional Tests

Nominal Tests

Priority	Status	Summary
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P2	Deferred	Test spk leap second kernel calculation by computing ephemeris before and after addition of leap second with truth data. Numerous indirect numerical tests verify this works and there is currently no direct way to test. If the file was not loading, SPK ephem source could not work. -SPH

Edge/Corner/Stress

Priority	Status	Summary
P1	Done: SPH	Test that errors are thrown when propagating off DE405, DE421, DE405 and SPK files. See files named: PropOffEphem_Backward_DE405 PropOffEphem_Backward_DE421 PropOffEphem_Backward_DE424 PropOffEphem_Backward_SPK PropOffEphem_Forward_DE405 PropOffEphem_Forward_DE421 PropOffEphem_Forward_DE424 PropOffEphem_Forward_SPK

Unique Validation

Priority	Status	Summary
P1	Done:SPH	Test error thrown for non-existent SPK kernel
P1	Done:SPH	Test error thrown for non-existent DE file

P1	Done:SPH	Test error thrown for non-existent SPK leap second kernel
P1	Done: JJKP	PCKFilename

Unique Mode Tests

None: Changes to solar system are not allowed in Command mode. -SPH

Priority	Status	Summary

Unique GUI Tests

These are tests that are unique to the GUI interface for this feature that are not covered by the standard GUI test template and procedures.

Priority	Status	Summary
P1	By Inspection: SPH	Test that change in ephemeris source is reflected in numeric results.
P1	By Inspection: SPH	Test error is thrown when setting DE421 as source but DE424 as file.