Main differences between V11.5 and V11.6.2

Summary

Dependencies

This version uses GENOPUS V2.3.1, GENIUS V1.11.2 and PATRIUS V4.8.

Package names

Package have been renamed to be consistent with other tools. So, they starts with **fr.cnes.dynvol.psimu** ... When using the GUI mode, no change is visible but, when using the Java interface, an update of the import will be necessary.

Events logs improvements

Logs for events are improved as all the events are taken into account and not only the ones defined in the Events panel:

- First and last point
- Start and end of a maneuver (even in case of an impulsive one to see the discontinuity)
- Start and end of each attitude change.

Orbit file as output

There is now the possibility to store the final orbit parameters in a specific file. These parameters will be cartesian ones in the inertial output frame defined in Output panel. And, of course, this file can be imported directly in the **"Initial Orbit"** panel!
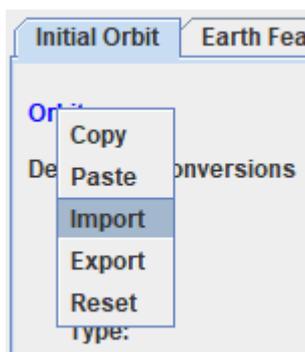
New EXM and EYM variables

Two new variables have been added corresponding to the components of the mean eccentricity vector: **EXM** and **EYM**.

Note also that now, these variables as well as **EX** and **EY** (components of the osculating eccentricity vector) corresponds exactly to:

Ex=ecos(w)
and
Ey=esin(w)

... as, previously, these variables was considered as the components for equinoctial parameters.

Complex potential for third bodies

In line with the new GPForceModels widget from GENOPUS, there is now the possibility to consider complex potential fields for third bodies.

More explicit console output

Console output is more explicit now.

Events names getter

Methods are available to get the events names (see PsimuUsingUtils class in TutorialsForV11.6)

Main differences between V11.4.1 and V11.5

This version is essentially due to an update of the lower level libraries GENIUS V1.10.1, GENOPUS V2.2 and PATRIUS V4.6, allowing to improve or correct the previous version.

Summary

- Orbit and EarthFeatures consistency
- New reset option in the Copy/Paste menu
- Adding Copy/Paste/… for Integrator panel
- By default numbering for engines and tanks
- Anomaly corrections

Orbit and EarthFeatures consistency

Now there is a consistency management between Earth features (i.e. Frames configuration) data and initial orbit data: if frames configuration changes, "**Display**" orbit data will change to be consistent with this new configuration (but "**Pivot**" reference data will not be modified).

New reset option in the Copy/Paste menu

Thanks to the new GENIUS version, there is now a new possibility in the **Copy/Paste/…** menu with the "**Reset**" option that allows to set data to their default values.

Adding Copy/Paste/… for Integrator panel

The menu **Copy/Paste/…** is now available for Integrator panel.

By default numbering for engines and tanks

The by default numbering starts now at 1 (and no more at 2).

Anomaly corrections

- There were some problems with the fact that, since V11.3, **PSIMU** is able to store in its context file, both "**Pivot**" and "**Display**" data for initial orbital conditions. Indeed:
  - if "**Pivot**" and "**Display**" frames were not the same, **PSIMU** considered orbital parameters coming from the "**Pivot**" data and frame characteristics from the "**Display**" ones which was of course totally wrong.
  - if the user modified the context file not through the **PSIMU** GUI, it had to modify both "**Pivot**" and "**Display**" data in order to keep consistency between both data.
- When modifying constants (for example μ) of initial orbital conditions (even only the units), a conversion was done which was useless.
- When reading the initial orbit, **PSIMU** had not already read Earth Features characteristics. So, in some cases, it exited in an error mode (for example when using H0-n frames) saying that no EOP were available even if we did not need them as it used the [PATRIUS] by default configuration.

- When using the Java API, due to a PATRIUS anomaly, if the user needs to define solar panels characteristics, it was mandatory to use the Vehicle constructor with all parameters and the VehiculeSurfaceModel including the panels (and not a list of Facet); also, setters methods had not to be used.

- Anomalies raised due to [GENOPUS] or [GENIUS] widgets used by **PSIMU**. In particular, due to a [GENIUS] anomaly, when using the Custom plots tab, we can normally display data together from the ephemeris table data but also from the events table. With the previous version, it was no more possible.

Main differences between V11.4 and V11.4.1

This version is almost the same as the V11.4 one. It corrects these two anomalies:

- It is now possible again to have a maneuver (impulsive or continuous one) at the initial date (or near of it).
- The comment included in the header of ephemeris/events files for the **DATE** parameter is correctly updated, taking into account the right time scale.

Main differences between V11.3 and V11.4

Summary

- Compatibility with PATRIUS
- Recurrent date events
- New maneuvers trigerring criteriae
- Impulsive maneuvers with orbital parameters criteriae
- Recurrent date events
- New data for Dormand Price 853 integrator
- Additional validity criteria on PRS coefficients
- Altitudes on stop criteria
- Best management of consistency between force model and vehicle panels
- By default attitude law
- Ergonomics change for output variables selection
- New possibilities for plotting
- New output variables
- Possibility to customize its own output variables
- New output modes
- Some new util methods
- Anomaly corrections

Compatibility with PATRIUS

This version is compatible with the version 4.4 of the PATRIUS library.

Recurrent date events

Thanks to the V2.1.1 version of GENOPUS, it is now possible to define date (relative or absolute ones) events with a recurrence (for example each day).

New maneuvers trigerring criteriae

Thanks to the V2.1.1 version of GENOPUS, new criteriae on nodes and apsides (as well as recurreent dates) have been added to the previous ones (relative or absolute dates and AOL)

Impulsive maneuvers with orbital parameters criteriae

Thanks to the V2.1.1 version of GENOPUS, it is now possible to define an impulsive maneuver giving orbital parameters increments:

- on semi-major axis
- on eccentricity (and semi-major axis eventually)
- on inclination (and semi-major axis eventually)

New data for Dormand Price 853 integrator

Thanks to the V4.4 version of PATRIUS and the V2.1.1 version of GENOPUS with its new specific widget, it is now possible to by-pass the Dormand Price 853 error mode on the minimum step. When this solution is chosen, the propagation will go on even if the conditions on precision will not be temporary fulfilled.

Moreover, a user help is available to initialize tolerances values for different kind of trajectories:
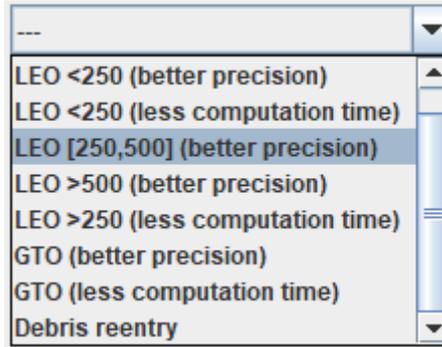
Additional validity criteria on PRS coefficients

Thanks to the V2.1.1 version of GENOPUS, besides validity interval of [0,1] for each coefficient, there is an additional test on the sum of the three coefficients (absorption, specular and diffuse) that must be equal to 1.

Altitudes on stop criteria

It is now possible to choose if the stop criteria will be a geocentric or geodetic altitude.

## Best management of consistency between force model and vehicle panels

In the previous versions, if we decided to select an atmospheric model without entering data on mass and aerodynamic coefficients, the error was only detected when launching the propagation. Now it is detected sooner and the vehicle tab becomes red as it shifts in error mode.

By default attitude law

Now an attitude law is defined by default (TNW) to avoid to select if it is not critical.

Ergonomics change for output variables selection

Thanks to the V2.1.1 version of GENOPUS, we use a GListSelect widget rather than the previous list.
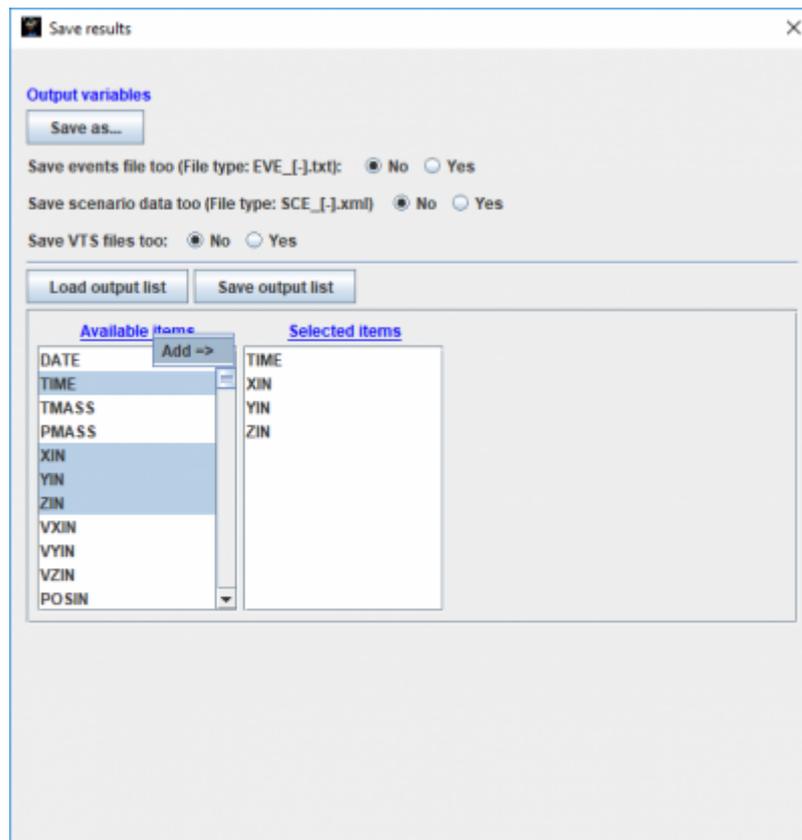
Using it, it is easier to add / move / remove the variables we want to store in the MADONA columns format file

New possibilities for plotting

Thanks to the V1.9.1 version of GENIUS, it is possible to plot dashed curves. Moreover a new utility tool is available outside **PSIMU** allowing to plot curves from different files (with possibility of relative information): see here or getting it with the full GENIUS package.

New output variables

New variables are now available:

- **F107** (solar Flux / 0 if the atmospheric model does not use it)
- **AP** (geomagnetic index / 0 if the atmospheric model does not use it)
- **DV** (cumulated velocity increment in m/s / 0 if no maneuvers)

Moreover, the time scale used for dates may be selected in the Output panel (UTC by default)

Possibility to customize its own output variables

PSIMU allows to get hundreds of output variables but, for some users, this output list may be incomplete and they will have to wait for a new version to get them. Indeed, these variables could be so particular that there will be no interest to integrate them in a standard **PSIMU** version! A specific mechanism (see here) is now proposed using the Java interface (so, not available with the GUI mode) to add as many variables as wished. Of course, these variables will be found in the same list as the initial basic variables.

New output modes

Previously, using Java interface, only three output modes were available:

- StorageType.**MEMORY** ⇒ spacecraft states memory stored
- StorageType.**FILE_SC_BINARY** ⇒ spacecraft states directly stored in a SQLite format file
- StorageType.**FILE_COLUMNS** ⇒ output variables stored in a SQLite format file

Now, it is possible to combine any kind of output modes as explained here.

Some new util methods

New methods have been declared as "public" to read data from files (see here).

Anomaly corrections

- Corrections due to GENOPUS anomalies
  - Impossibility to initialize an orbit using a H0-n frame.
  - Calling GPVisibilityFromStationDetector or GPAttitudeSequence widgets make the tool incompatible with a headless mode (no display).
- **PSIMU** is now able to propagate a trajectory using initial orbital parameters correspond to an hyperbolic trajectory.
- when propagation duration is exactly equals to zero, **PSIMU** will no more exit in error.
- use of mean zonal terms was previously wrong in case of *Droziner* or *Cunningham* equations (not available in GUI mode); it is now corrected.
- In Java mode, using **FILE_SC_BINARY** output option, calling getSpacecraftStateList() or getSpacecraftState(i) methods now gives the same kind of results (sort problem corrected).
- geocentric altitude and latitude (so in ITRF frame) are now correctly computed.

Main differences between V11.2 and V11.3

Summary

- Upgrade of PATRIUS, GENIUS and GENOPUS versions
- Warning messages when saving result files
- New output variables
- New Ground station management
- Ground track plot
- Anomaly corrections

Upgrade of PATRIUS, GENIUS and GENOPUS version

This **PSIMU** version is now linked with PATRIUS V4.1.1, GENIUS V1.8 and GENOPUS V2.0.1

Warning messages when saving result files

When using Save Results possibility, if files already exist, a pop up window appears with a warning message asking for overwriting them or not.

New output variables

This version owns new output variables with:

- solar radiation pressure acceleration (components and norm);
- thrust acceleration (components and norm);
- thrust value;
- mean Lyddane orbital elements
- percentage of the satellite and solar panels illuminated surface.

New Ground station management

Thanks to the new specific GENOPUS widget, it is easier to deal with ground stations list.

Ground track plot

In addition to the plots already available, a specific panel allows to plot directly the ground track with computed orbital events.

Anomaly corrections

- Reset of secondary plots: after propagating a new trajectory, all Output plots plots are reset, even secondary windows if they exist ("+" button on the right side of the panel).

- SQLite file closing: correction of the previous anomaly as the SQLite file was not correctly closed.

- SQLite bug with LINUX: previously, with some LINUX configuration (mainly when you have no full rights on /tmp directory), there was a problem when writing SQLite file. It is now fully corrected.

- Bad line for output files: the ASCII output files (ephemeris and/or event files) had a specific line that made these files uncompatible with the GENIUS GPlotpanel widget. This line does not exist anymore.

- Bug correction for AOL events in retropolation: thanks to the new GENOPUS version (V2.0.1), this bug is now corrected.

Main differences between V11.1 and V11.2

This version corrects few minor anomalies and is now linked with PatriusDataset 1.0.3.

PatriusDataset V1.0.3

This new data set includes:

- new UTC/TAI table
- new JPL DE406 ephemeris (by default !)
- new EOP data

Anomaly corrections

- Possibility again to build VTS files with the Java interface (disappeared in V11.1)
- Unit menu for duration of the propagation had disappeared in V11.

Main differences between V11.0 and V11.1

This version includes essentially ergonomic improvement of the tool. Nevertheless, some new functionalities as SQLite output files have a real interest.

Summary

- Compatibility with PATRIUS V3.3
- GUI improvements
- Cartesian coordinates in the Console output
- By default configuration frame
- Null dry mass
- Attitude management
- Improvement of graphical displays
- Variable names
- Output methods
- Events in SpacecraftState list
- Output storage
- Anomaly corrections

Compatibility with PATRIUS V3.3

This **PSIMU** version is compatible with PATRIUS V3.3, especially with its new management of exceptions due to divisions by zero as well as corrections when taking into account surface force models in conjunction with continuous thrust (numerical aspects).

GUI improvements

- Some **Copy&Paste** (and **Import/Export**) functionalities have been added to some widgets as for the orbital initial conditions or the maneuvers.
- For events which manage multiple occurrences, changes occurred to be more obvious for the user with now three entries:
    - From nth occurrence
    - Every n occurrence
    - Until nth occurrence
- Force models:
    - Choice of the "attraction models" (i.e. Balmino, Cunnigham, ...) has been hided with Balmino choice by default.
    - By default values are proposed for SRP.
- Maneuvers:
    - If engines and/or tanks needed to define a maneuver is set to **NONE**, the maneuver (and the sequence) raised an error.
    - by default, maneuvers components are set to "**Angular**" as event is a "**Relative date**".
    - For the sequence of maneuver, the delays between maneuvers are now hided.

Cartesian coordinates in the Console output

Now, this output is only displayed in "Debug mode" (Options menu).

By default configuration frame

The by default configuration frame has been changed considering only precession-nutation.

Null dry mass

Now a dry mass set to zero is only raising a warning and no more an error. Moreover, it is possible to extrapolate with such a null value, of course with the condition not to consider force models needing a positive one (as drag or SRP forces).

Attitude management

It is now possible to define an attitude sequence more simply that using switches, using a single attitude law.

Improvement of graphical displays

Now, it is not necessary to load the current result file. Moreover some improvement has been implemented as a better up to date of the title or the management of discontinuities (for example when plotting latitudes or longitudes).

Variable names

Some names changed in the XML files in order to be more consistent (for example, capitals vs lowercas letters

Output methods

- In « master mode», the printFiles() method allows to create same kind of files as in GUI mode.
- The getSV() method allows to recover output variables.

Events in SpacecraftState list

Orbital events are now stored inside the SpacecraftState list computed in master mode.

Output storage

Rather than to use a binary file as in the previous version, the output of the computation including all computed intermediate parameters (with the output step as defined by the user as well as orbital events) are stored in a SQLite formatted file which can be read directly by PSIMU plots but also by many other tools (some are free) compatible with this format.

Moreover, when using the master mode, an additional parameter is used to define how output data are stored.

=> incompatibility in the code due to an additional argument in the propagateInMasterMode() method. Method getListOfSpacecraftStates() is also renamed as getSpacecraftStateList().

Anomaly corrections

- In the previous version, sometimes the JVM continued to run after exiting the GUI application
- After reading a scenario file, if an error (exception) is raised as the absolute path of the file contains some blank characters, nothing previously occured (i.e. no messages appeared while data do not have been loaded) => now corrected in V11.1
- bug when displaying perigee altitude.
- bad update of the units for date offsets.