Simu-CIC - release notes

Versions history

The following versions of SIMU-CIC have been issued:

Version	Date	Recommended Scilab version	Recommended CelestLab version
1.0.1	2018-11-28		
1.1.1	2019-12-20		
1.2.0	2020-09-28		
1.2.1	2021-08-02		
1.3.0	2022-10-11	6.0.2 or 6.1.0	3.4.0
1.4.0	2024-03-11	2024.0.0	3.5.0
1.4.1	2024-10-17	2024.0.0 or 2024.1.0	3.5.0
1.4.2	2024-11-06	2024.0.0 or 2024.1.0	3.5.0
1.4.3	2025-06-09	2025.0.0 or 2025.1.0	3.5.2
1.4.4	2026-03-04	2026.0.1	3.5.2

Major changes between versions 1.4.3 and 1.4.4

- Attitude:
  - New attitude law: “Nadir Trace”, satellite axis points towards the Nadir and second satellite axis points as best as possible towards the Nadir sub point velocity relative to Earth.
  - New attitude law: “ATT->Clone”, defined as a copy of another already defined attitude law.
  - New combined elementary conditions can be defined based on already defined conditions:
    - “COND->Before”: condition corresponding to time intervals placed before the start of intervals defined by the selected base condition.
    - “COND->After”: condition corresponding to time intervals placed after the end of of intervals defined by the selected base condition.
    - “COND->Offset”: condition defined from another condition by changing the beginning/end of intervals by time offsets.
  - New parameter added for “Local Orbital Frame” and “Local Orbital Frame – Offset” attitude laws: “ref_frame” that defines the reference frame relative to which the velocity vector is relative to.

Major changes between versions 1.4.2 and 1.4.3

- Correction of anomaly (due to a Scilab bug about to be fixed): reading of files containing calendar dates sometimes failed.
- Added calendar option for dates in output CIC files.

- If the orbital elements are defined using "Orbit properties" (and only in this case), the "aol" (argument of latitude) parameter is now construed as an osculating value. A value a 0 then means that the trajectory exactly starts at the equator.
- To prevent eclipse and glint computation errors when the satellite is below Earth's (or Moon's) surface, the radius of the body is replaced by the norm of the position vector (with some margin), which ensures robustness in these edge cases.
- Added a parameter for orbit numbering time tolerance: "numbering_tolerance" (in seconds). This parameter can be used to avoid having a too small number of points in orbit numbered 1.

Major changes between versions 1.4.1 and 1.4.2

- Correction of anomaly: a function to be added to CelestLab soon was missing for some plots.
- Correction of anomaly: it was not possible to import ephemeris files containing position vectors only.
- The quaternion type (“FIRST” or “LAST”) in imported quaternion files is now correctly managed for both CIC and CCSDS formats:
  - CIC format: quaternion type is optional, “FIRST” by default.
  - CCSDS format version 1.0: quaternion type is mandatory.
  - CCSDS format version 2.0: quaternion type shall not be present and is assumed to be “LAST”.

Major changes between versions 1.4.0 and 1.4.1

- GUI:
  - New attitude law: “Sun Pointing - Earth Opt”, satellite axis pointed towards the Sun and second satellite axis pointed at best towards Earth centre.
- Input ephemeris files (CIC format, OEM, AEM, condition files) can now contain dates in ISO format (aaaa-mm-ddThh:mn:ss.xxx).
- CCSDS files for position/velocity and attitude are now accepted. Warning : the AEM version should be 1.0, and should only contain quaternions.
- New example script added for constellation definition, including computation of inter-satellite visibility results. Outputs are MEM files produced for each combination of satellites pairs in the constellation, including information about:
  - Relative directions of satellites.
  - Inter-satellite distances.
  - Inter-satellites geometrical visibility indicators.

Major changes between versions 1.3.0 and 1.4.0

- GUI:
  - Updated labels in the “Attitude” tab:
    - “Attitude laws” is now called “Satellite modes”.
    - “Attitude sequence” is now called “Mode sequence”
  - A new document containing spacecraft models can be displayed (see help menu and spacecraft tab)
  - The simulation duration can now be set in days or seconds.
- New CIC files:
  - *Sat_SATELLITE_ANGULAR_VELOCITY*.TXT
    -> Angular velocity vector of the spacecraft relative to the ICRF reference frame (coordinates in same frame).
  - Sat_SATELLITE_ANGULAR_ACCELERATION.TXT

-> Angular acceleration vector of the spacecraft relative to the ICRF reference frame (coordinates in same frame).
    - Sat_QUATERNION_EARTH_ROTATION.TXT
      -> Quaternion describing the transformation from ICRF to ECEF (Earth Centered Earth Fixed) reference frames.
    - Sat_INITIAL_ORBIT_PARAMETERS.TXT
      -> Initial osculating orbital elements in ICRF reference frame.
- Output file “simu_cic_info.txt” contains additional information:
    - Initial osculating orbital elements.
    - Ground stations geographical coordinates and minimal elevation angles.
    - Ground stations visibility durations.
    - Satellite modes and corresponding fraction of simulation time.
    - Sun visibility and corresponding fraction of simulation time.
- Input orbit ephemeris files can now contain position vectors only (velocity vectors are then obtained by interpolation).
- A new plot has been added: angular velocity vector coordinates.
- Computation of attitude transitions:
    - Slight improvement of the algorithm (better detection of non-convergence situations)
    - Additional messages and warnings are displayed in the Scilab console.

Major changes between versions 1.2.1 and 1.3.0

- CIC outputs:
    - New CIC file generated: *Sat*_RELATIVE_VELOCITY-SATELLITE_FRAME.TXT
      It gives the coordinates of the velocity vector relative to Earth (hence “relative”) in the spacecraft frame.
    - Changes in *Sat*_SATELLITE_MODES.TXT and *Sat*_SATELLITE_ATTITUDE_MODE.TXT:
      Depending on the values of the maximum angular velocity and angular acceleration (see Specacraft -> Platform tab), intermediate attitudes may be generated. These are denoted by :
      - the name **[SLEW]** in *Sat*_SATELLITE_MODES.TXT
      - the code (or mode) **-99** in *Sat*_SATELLITE_ATTITUDE_MODE.TXT

Major changes between versions 1.1.1 and 1.2.1

- Interfaces/GUI:
    - Command-line interfaces added to control the GUI via scripts.
    - Test procedure updated thanks to the scripting interface.
    - Scripting examples added.
    - Updated console menu.
    - Updated labels and messages.
    - Updated examples.
- Orbit properties:
    - Updated definition of orbit number, now based on true argument of latitude.
- Attitude:
    - Elementary condition on longitude added.

    - Elementary condition on orbit number added (configurable reference argument of latitude).
    - Custom elementary condition and attitude law added (definition via files).
    - Attitude sequence constraints added (to avoid quaternion discontinuities).
    - Some attitude laws renamed to make them more concise.
- CIC outputs:
    - "DISTANCE_SAT_GROUND_STATION" replaced by "DISTANCE_GROUND_STATION" in accordance with the CIC protocol.
    - "SATELLITE_ECLIPSE_MOON" and "QUATERNION_SA_*" are now compliant with the CIC protocol.
    - Version of CIC files is now 2.0.
    - "POS_GROUND_STATION_*_IN_ANTENNA_*" replaced by "GROUND_STATION_*_DIRECTION-SATELLITE_FRAME". Bug fixed causing comments to not always correspond to the correct ground station.
    - "POS_SAT_IN_GROUND_STATION_*" replaced by " SATELLITE_DIRECTION-GROUND_STATION_*_FRAME" (to be compatible with next CIC protocol update). Comments now clearly indicate the clockwise azimuth convention in station frame.
- Graphs:
    - Updated graphs: ground stations visibility
    - Trajectory relative to ECI/ECF added.
- Miscellaneous
    - Various general improvements.
    - Slight changes of the examples.
    - New script examples.