GRANADA

Environment and Navigation

Graphical user interface and output files.
The simulator provides a user interface that allows the configuration of all system parameters, execution of the selected case and the visualisation of simulation outputs results and statistics.

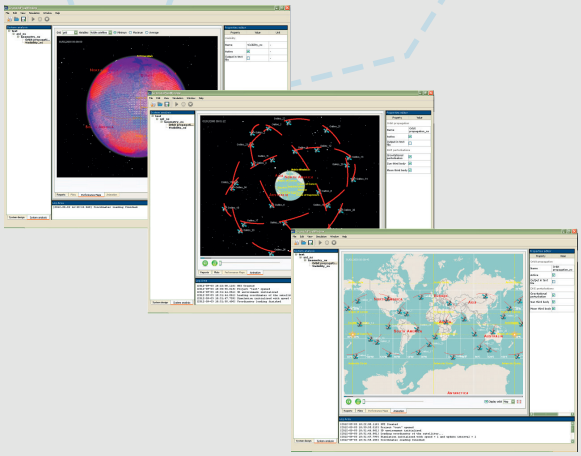
Requirements:
Single PC under windows: Pentium IV with 512 Mbytes of RAM or higher

The GRANADA Environment & Navigation simulator is a Galileo/GPS raw data generator and navigation tool. It is oriented to application developers who need external access to raw measurements or PVT solution. It includes realistic characterisation of the effect of the different error components depending on the type of terminal and GNSS receiver configuration. It is possible to configure Galileo and GPS constellations, environmental conditions, satellites and receiver parameters, and navigation algorithm.

Navigation and environment modelling tool. The GRANADA E&N tool, implemented in C/C++-code, allows the user to simulate the navigation process and analyse the performance of different types of systems and receivers. Visibility and Dilution of Precision analyses from a user segment (composed by one or more user defined grids) are calculated and the main figures of merit from the analyses are obtained. Pseudorange, carrier phase and Doppler measurements are generated considering satellites and user receiver dynamics, environmental perturbations, receiver configuration, and selected GPS/Galileo carriers and channels.

Measurement error characterisation. Configurable user equivalent range errors are introduced in the generated measurements. The range errors include satellite and receiver clock modelling, user dynamics, ionospheric and tropospheric delays, receiver tracking errors, multipath, relativistic effects, ephemeris errors and cycle slips. These errors are studied as separate analyses and accounted in the measurements calculation as defined by the user. The receiver implements configurable algorithms to correct these perturbations.

Navigation algorithms. The obtained measurements are used to estimate the receiver position, velocity and clock error. Several navigation algorithms can be selected in the user interface, including Least Squares, Recursive Least Squares, and Weighed Least Squares. A carrier-phase smoothing algorithm is also included in the simulator. Both single and dual frequency receivers can be selected to perform PVT computation. It is also possible to compute a combined Galileo-GPS navigation solution (selecting satellites from either constellation with a DOP optimisation criterion).



General characteristics

- Galileo and GPS constellation, environment and receiver simulator
- Developed in C/C++-code and Qt under Windows (no additional software is required)
- Configurable constellation
- Configurable user segment
- User-defined environment model
- Receiver error modelling and Navigation algorithms
- Graphical user interface to configure the software and visualise the results

Constellation

- Configurable Galileo and GPS constellations
- Configurable satellite clocks
- Constellation visualisation
- DKE perturbations

Errors budget

- Ionospheric and Tropospheric models
- Receiver DLL and PLL tracking errors
- Configurable C/N_0 for different elevation angles
- Multipath model
- Ephemeris errors
- Configurable user equivalent range errors (UERE)

User Segment Receivers

- Configurable grids of points over the whole Earth
- Grids visualization in 3D and flat map modes
- Configurable Galileo carriers and services
- Default Mass-market, professional, and Safety-Of-Life receiver configurations
- Single and dual-frequency receivers
- Configurable receiver position, velocity, data and time
- Configurable masking angle
- Insertion, detection and correction of cycle slips
- Configurable number of channels
- Characterisation of receiver ground clocks
- Navigation algorithms: least squares, weighted least squares, recursive least square and carrier phase smoothing

Outputs

- Graphical output results: 2D graphs, 3D visualization and animation, performance maps
- Numeric output results, including RINEX format
- Satellites propagation, Navigation results, dilution of precision, visibility, UERE budget results (clock errors, multipath errors, tracking errors, atmospheric errors)

Graphical user interface

- Developed with Qt under Windows
- Used Qwt and Marble additional packages for 2D/3D and flat maps visualization respectively
- Allows different projects creation with user configured parameters and outputs

Requirements

- Single PC under windows: Pentium IV with 512 Mbytes of RAM or higher

elecnor deimos