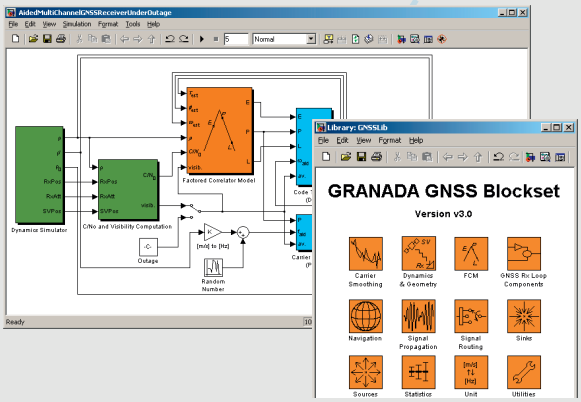
GRANADA

GNSS Blockset



Graphical user interface

The Simulink graphical user interface allows an intuitive and functional organisation of the different components, easy access to internal signals, and their visualisation.

Requirements:

Single PC under Windows: Pentium IV with 512 Mbytes of RAM or higher.

MATLAB/Simulink release 2009b or higher.

The GRANADA GNSS Blockset (formerly known as GRANADA Factored Correlator Model) is a Simulink library that provides a swift, flexible, and realistic way of simulating different signal processing architectures, either of standalone GNSS receivers or multi-system solutions. It is directed to a wide variety of users - from industry to research - who require simulation speed as well as to access and control internal receiver signals and model system interactions.

Based on an analytical model of a GNSS receiver's correlator outputs (the Factored Correlator Model, FCM), it precludes the need for the simulation of low-level signal processing stages, therefore allowing a great increase in simulation speed while still accounting for correlation losses due to different effects.

The GRANADA GNSS Blockset includes a dynamics simulator, propagation channel model, numerous GNSS receiver components, and other utilities to be used with the correlator outputs model, allowing a fast and easy setup of a GNSS receiver's tracking loops.

The new 3.0 release builds upon release 2.0 of the GRANADA FCM Blockset, adding functionality, speed, and ease of use.

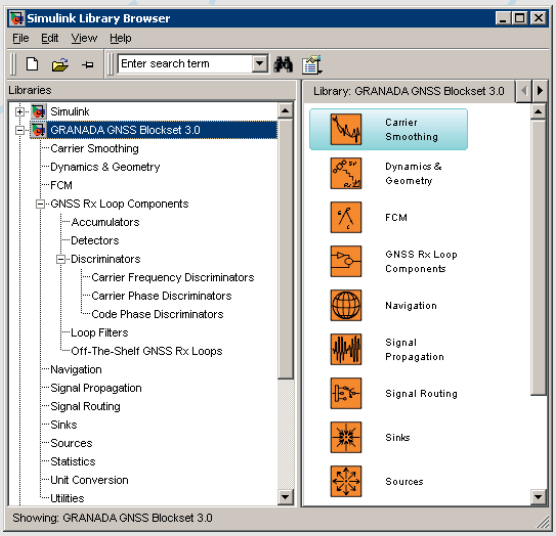
Fast GNSS receiver simulation. Allowing near real-time simulation of correlator outputs, the FCM is the smart choice for the early stages of receiver architecture design and test and for the fast simulation of standalone or hybrid systems where inter-system coupling must be considered.

Realistic modelling. The FCM accounts for correlation losses due to carrier phase and frequency errors, code phase error, code Doppler, and multipath. The model was validated using theoretical and GRANADA Bit-True as well as results obtained with an actual hardware receiver, highlighting its reliability and accuracy.

Flexibility. Access to deep receiver signals (I and Q measurements) provides the necessary freedom to design novel algorithms for signal tracking, lock detection, noise level estimation, multipath mitigation, etc., as well as to develop new receiver architectures for single or multi-system devices. Each effect may be included or not, varying the model's accuracy and allowing the analysis of particular parts of the receiver architecture independently.

Multi-channel. The GRANADA GNSS Blockset allows the simultaneous simulation of multiple receiver channels under representative conditions (in terms of dynamics, satellite visibility, signal power, and multipath) for different GNSS bands, including GPS L1/L2/L5 and Galileo E1/E6/E5a/E5b/E5 signals.

DATA SHEET



Requirements

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- MATLAB/Simulink release 2009b or higher.

General characteristics

- Simulink Blockset for GNSS receiver simulation
- Fast, realistic, and flexible modelling of GNSS receiver correlator
- Wide variety of GNSS related blocks allowing complete end-to-end GNSS simulations
- Multi-channel support
- Quick and easy GNSS receiver setup even for inexperienced users

Factored Correlator Model (FCM)

- Near real-time simulation of multiple channels
- User definable parameters:
  - RF carrier frequency
  - Modulation (supports multiple modulations, including BPSK, BOC, MBOC, CBOC, TMBOC, and AltBOC)
  - Spreading code period
  - Integration period
  - Number of correlators and correlator spacing
  - Multipath characteristics
- Accounts for correlation losses due to several effects (which may be turned on/off independently) including:
  - Carrier phase and frequency errors
  - Code delay error
  - Code Doppler influence
  - Noise
  - Multipath

Dynamics & Geometry and Propagation Channel

- Reference pseudoranges, pseudorange rates and attitude based on satellite ephemeris (multiple file formats supported) and user-defined trajectory file
- C/N_0 based on satellite elevation and user-defined look-up table or antenna radiation patterns
- Satellite azimuth, elevation and visibility and satellite-receiver relative orientation outputs

GNSS Receiver Tracking Loop Components

- Coherent and non-coherent carrier and code loop discriminators
- Loop filters with user-definable loop equivalent noise bandwidth
- Off-the-shelf aided and unaided code and carrier tracking loops
- Code and carrier lock detectors

Output Examples

- Reference ranges and range rates
- Attitude
- Visibility
- Satellite azimuth and elevation
- Correlator Outputs (I and Q measurements)
- Internal tracking loop signals (as discriminator and filter outputs and aiding signal integration results)
- Code and carrier phase and frequency estimates
- Pseudorange and pseudorange rate estimates (based on tracking loop outputs)
- Position and velocity estimates
- Measurement errors and estimated position and velocity errors

Other Features

- Measurement Generation
- Carrier smoothing
- Navigation filter
- Power estimation
- Correlator outputs normalization
- Sliding statistics
- Unit conversion
- And many other useful blocks

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