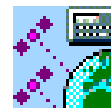


AVIGA®

*Professional
Version 2.7*

Main Features

September 26, 2008
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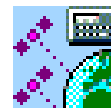


The AVIGA Professional Version 2.7.18.0 (hereinafter AVIGA) provides for solution of the following tasks:

- Prediction of GPS, GLONASS (or Galileo), user-defined satellites' positions/velocities in ECEF frame.
- Analysis of satellite Visibility & DOP characteristics:
 - at a given space-time point for mask skyline angles specified by the user;
 - at regular space-time points within a definable geographic area.
- Analysis of degraded Visibility & DOP characteristics.
- Analysis of maximum, minimum, average Visibility & DOP characteristics.
- View satellite positions on the azimuth/elevation sky plot.
- Analysis of position accuracy based on position error covariance matrix.
- Analysis of Integrity/Continuity characteristics.
- Analysis of XPL/XNSE characteristics.
- Analysis of Availability characteristics.
- Analysis of Galileo XPL characteristics including SISMA and Integrity Risk.
- Analysis of Galileo Integrity and Service Availability.

AVIGA provides the following features:

- Automated downloading of the latest GPS almanacs from FTP servers
- In Visibility and Geometry tasks the user can simulate up to three satellite constellations amounting to a total of 180 satellites. Two of three are predefined constellations – GPS and GLONASS (or Galileo) satellites, the third is a user-defined constellation. Additionally, the user can simulate pseudolites and geostationary satellites as fixed WGS-84 points.
- The weighted observational matrix is used accounting for altitude aiding.
- The simplified position accuracy analysis at 67%, 95%, and 99.7% probability levels using DOP calculation results.
- To account for probable satellite failures, the user can apply the operational probability model for each constellation based either on Durand-Caseau approach, or directly, specifying failure probability coefficients for each constellation.
- Analysis of Integrity/Continuity characteristics based on the Protection Levels for:
 - RAIM: The basic input parameters for RAIM FD/FDE snapshot algorithms are false alarm and missed detection probabilities.
 - SBAS: The protection level XPLsbas is computed in accordance with RTCA / DO-229B.
- Analysis of Galileo Integrity characteristics based on XPL, SISMA, Integrity Risk.
- Service Availability Module: for service-volume simulations in accordance with the Galileo Common Integrity Algorithm Assumptions for Service Volume Simulations.
- The critical satellites concept is included in the XPL availability computation.
- Stanford plot can be applied for analysis of Integrity/Continuity characteristics.



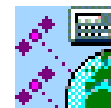
- Computation of XDOP/XNSE 67th, 95th, and 99.7th percentiles directly from the simulated distributions.
- UERE can be presented in tabulated elevation dependent form.
- Analysis of GBAS/ Galileo Local Element (LE) characteristics
- GBAS and Galileo LE modules: GAD, AAD and AMD parameters can be set separately for GPS, Galileo and SBAS. Probability coefficients in the integrity computation can be changed by the user
- AVIGA output results are OLE documents, which can be embedded into other Windows applications, for example, MS WinWord. The documents allow different graphic representations: 2D plots, 2D static/animated area graphs, and 3D static/animated area graphs. The document images can be saved to either one of BMP, JPG, PNG and AVI formats. Besides, there is an option to save numerical results to ASCII files compatible with MS Excel.

AVIGA uses standard almanacs: ICD-200, ICD GLONASS, YUMA GPS / GLONASS, RINEX2 GPS / GLONASS, TLE files. For the future Galileo constellation and other user-defined constellations, Keplerian almanacs are used.

AVIGA is running under WIN98/NT/2000/XP and requires approximately about 30 MB of disk space.

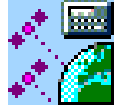
AVIGA Pro Ver.2.7.18.0 has the following new features:

- Improved download of almanac, RINEX, and SP3 files from ftp sites: scanning over a number of almanac links; automated selecting and unpacking of RINEX, SP3 files in a given time span.
- Improved handling of template, scenario files: preview, roll back, saving parameters from any Calculation Wizard tab.
- Scenario files can be exported to HTML format.
- AVIGA Scheduler 1.0 automates calculation of several AVIGA tasks. The scheduler is used for generating the GalTeC daily Simulation and Prediction products.



Abbreviations

AVIGA	Analysis of Visibility, Integrity, Geometry and Availability of Global Navigation Satellite Systems
EGNOS	European Geostationary Overlay System
FD/FDE	Fault Detection/Fault Detection and Exclusion
GNSS	Global Navigation Satellite System
GSS	Galileo Sensor Station
PA	Precision Approach phase of flight
PVT	Position, Velocity and Time navigation solution
RAIM	Receiver Autonomous Integrity Monitoring, a technique whereby a civil GNSS receiver/processor determines the integrity of the GNSS navigation signals without reference to sensors or non-DoD integrity systems other than the receiver itself. This determination is achieved by a consistency check among redundant pseudorange measurements
RNP	Required Navigation Performance
SBAS	Satellite Based Augmentation System (SBAS) – International name used in the Global Navigation System Panel and Recommendation Practices (SARPs) for a set of programs that use satellites to transmit GPS and GLONASS integrity and correction data. The U.S. program is the WAAS, which is planned to provide integrity and corrections to GPS and SBAS satellites only.
SISA	Signal-in-Space Accuracy is a prediction of the minimum standard deviation (1-sigma) of the unbiased Gaussian distribution, which over-bounds the SISE predictable distribution for all possible user locations
SISE	Signal-in-Space Error is the range error, which is a function of time and location within the satellite coverage area due to its navigation message, clock and ephemeris errors
SISMA	Signal- In- Space Monitored Accuracy is a prediction of the minimum standard deviation (1-sigma) of the unbiased Gaussian distribution, which over-bounds the SISE estimation error as determined by the integrity monitoring system.
UERE	User Equivalent Range Error
UDRE	User Differential Range Error. It corresponds to the estimation of the error at user level caused by the Signal in Space error components after differential corrections. Used for EGNOS.
WAAS	Wide Area Augmentation System
XAL	X = H or V, Horizontal or Vertical Alert Limit
XDOP	X =E(asterisk), N(orth),V(ertical), H(orizontal),T(emporal), P(osition), G(eometrical)
XNSE	X = H or V, Horizontal or Vertical Navigation System Error
XPL	X = H or V, Horizontal or Vertical Protection Level



XPLrain RAIM XPL
XPLsbas SBAS XPL