*F*ast
*G*eophysical
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SeisPos

SeisPos is a Windows NT/95/98/2000/XP program to perform processing of raw navigation data for streamer surveys from UKOOA P2 raw data format to UKOOA P1/90 final data format.

The software has been developed in the office and in the field over the past five years, benefiting from the availability of an abundance of datasets recorded by many different contractors under widely varying configurations and conditions. This has been a significant factor in the development of a system which is flexible, robust and user friendly and yet able to provide a rigorous solution to the most demanding of problems in seismic streamer survey positioning.

From conception SeisPos, in common with all FGPS software, was developed primarily with quality appraisal in mind, and rapidly evolved into a fully featured processing system whilst maintaining its high level of quality control functionality. The software is written in C++, resulting in a fast and compact executable which can be readily modified and augmented to support clients' requirements and the fast pace of development characterised by the industry.

The software is modular with each of the main processing steps functioning separately. User interaction is strongly featured throughout to enable full control of the processing and a comprehensive level of data analysis and quality control. Non-interactive P2 to P1 processing is also supported, requiring only initial operator input. Processor intensive operations are run as background processes, taking advantage of the multi-tasking environment, yet maintain full user interaction.

To provide our clients with complete assurance, FGPS provides an unparalleled level of technical support, with a short response time, covering not only software related issues, but advice and assistance on all aspects of positioning in relation to seismic surveys. This service is available 365 days per year by e-mail and telephone.

Main Modules

SeisPos comprises a number of discrete modules which, executed in turn, form a logical processing flow.


SeisPos
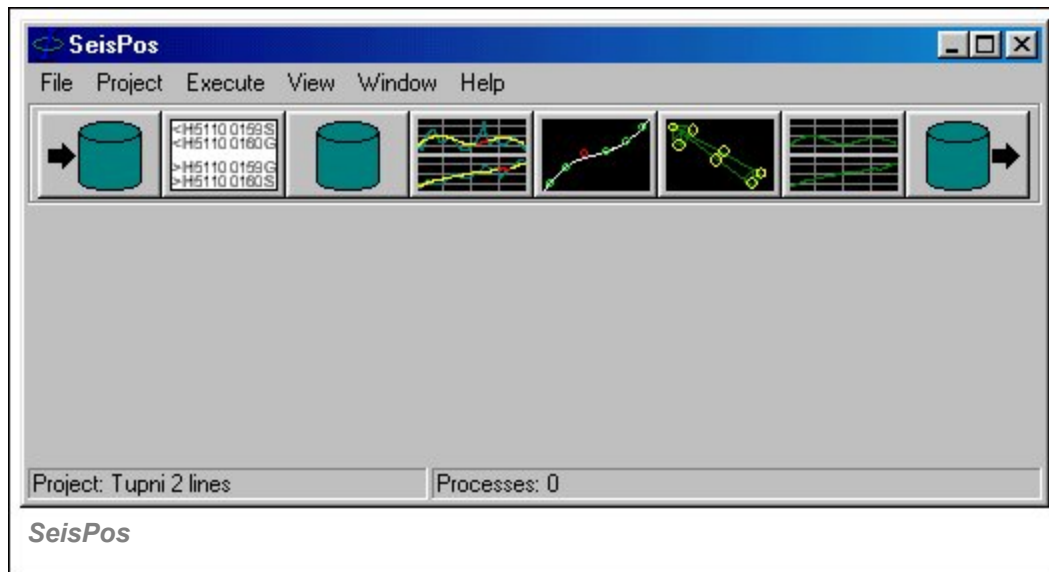
Input

- Builds a proprietary database of network and observation data from raw data files recorded in UKOOA P2/91 and P2/94 formats.

- Performs automated format compliance checking and data integrity checks, taking advantage of redundant information.
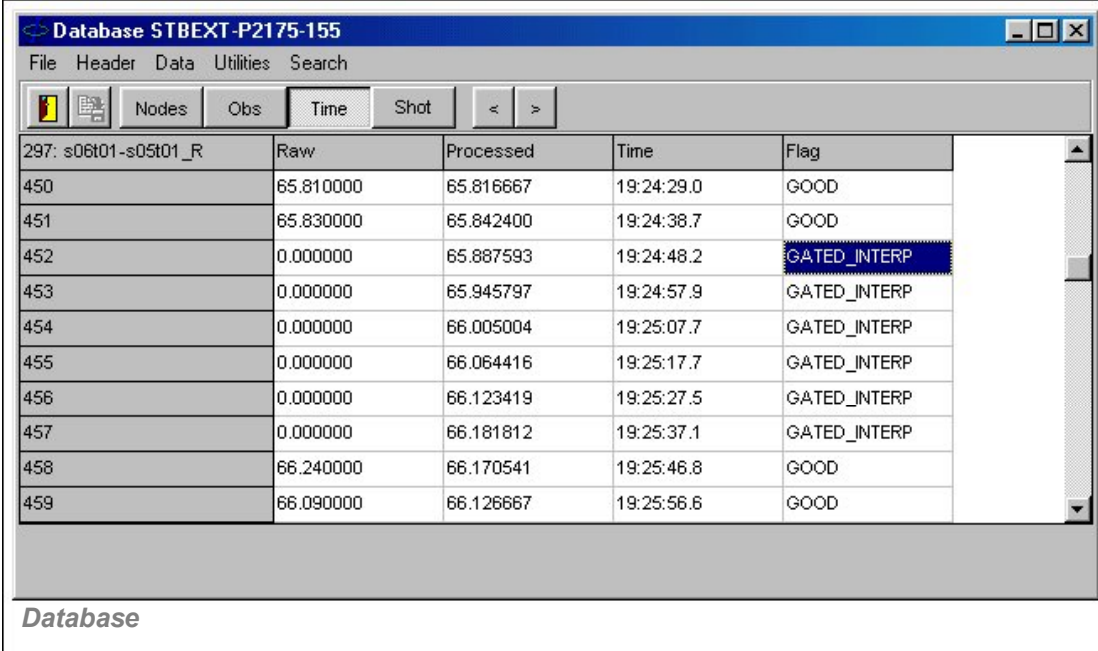

Input Log
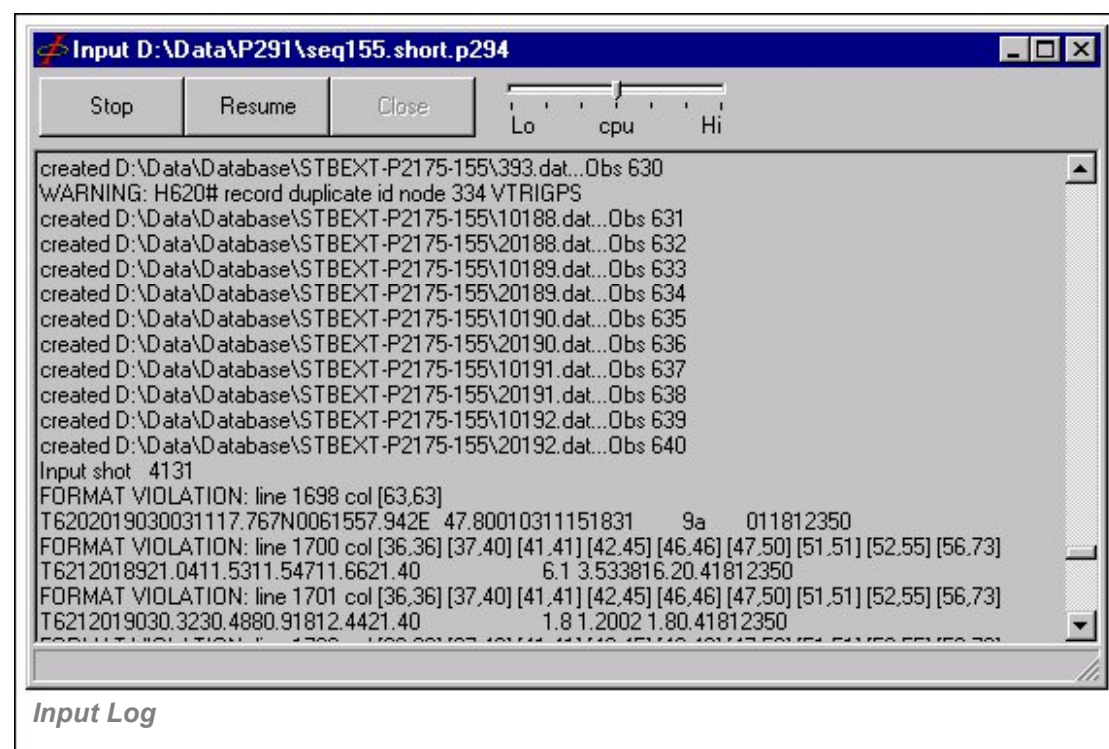
Precondition

- Pre-conditions raw data to eliminate outliers and reduce noise.

- Supports both automatic processing and interactive processing using time series plots.

- Multi-layered de-spiking using median and rate of change.

- Multi-layered filtering using averaging, polynomial and rate of change.

- Multi-layered interpolation and extrapolation.

- Parameter application to data groups.

- Manual editing, correcting and creating data.

- Interpolate data to shot event time.

- Dynamically displays detailed statistical data for each observation.

- Combines with network display to show effect on network of rejected/missing data.

- Display rate of change, delta, polynomial delta, comparison, raw minus processed plots.

- Comprehensive zooming functions and display options.

- Generates summary report.

Interactive Precondition
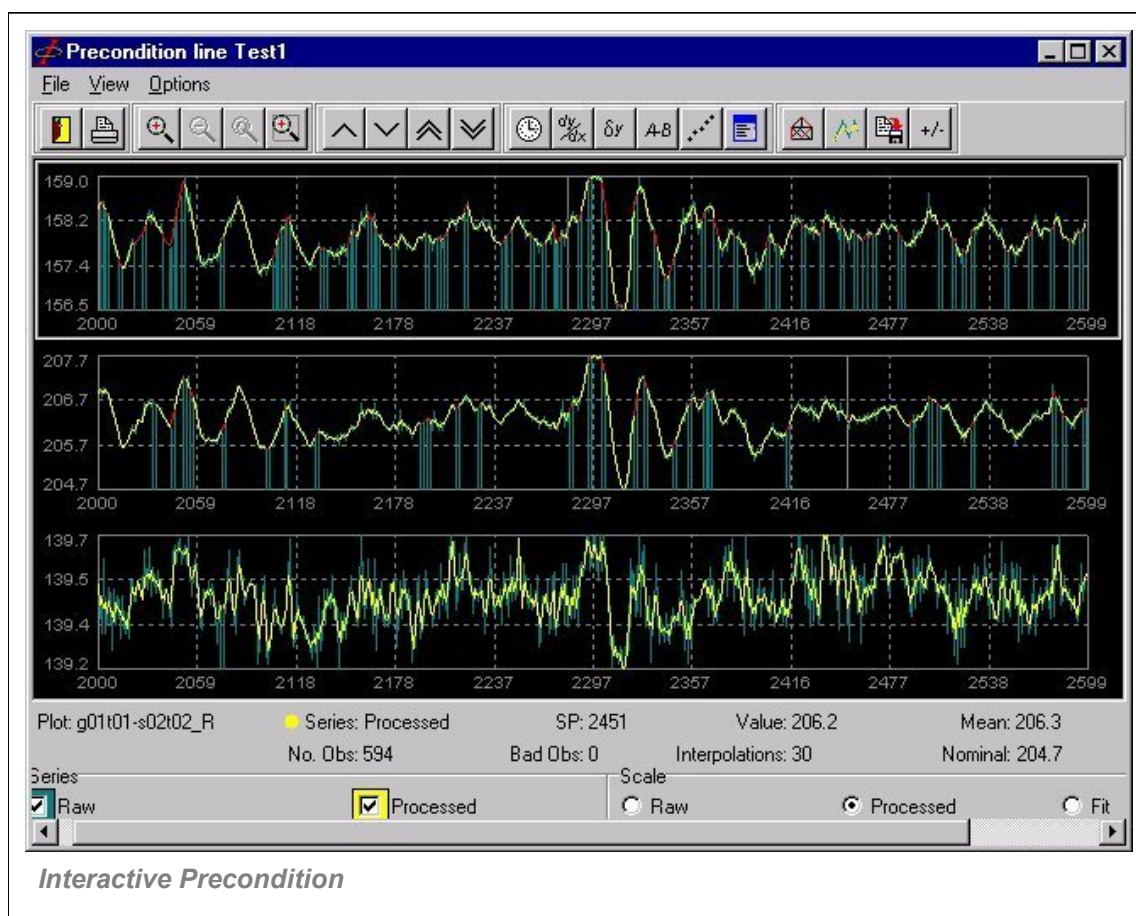
Database

- Relational binary database of header information, raw and processed data.

- Manual creation and deletion of header information where relevant.

- Data editing.

- Coordinate transformations: grid $\leftrightarrow$ geographical.

- Creation of manual nodes – essential for 2D surveys.

- Creation of observations. Data can be modelled from nominal value, course made good or any existing recorded data – essential for 2D surveys

- Creation of network of magnetic variation points – essential for 2D surveys without active tailbuoys.

- Dump database tables to file in comma separated value format, suitable for most spreadsheets.

| 297: s06t01-s05t01_R	Raw	Processed	Time	Flag
450	65.810000	65.816667	19:24:29.0	GOOD
451	65.830000	65.842400	19:24:38.7	GOOD
452	0.000000	65.887593	19:24:48.2	GATED_INTERP
453	0.000000	65.945797	19:24:57.9	GATED_INTERP
454	0.000000	66.005004	19:25:07.7	GATED_INTERP
455	0.000000	66.064416	19:25:17.7	GATED_INTERP
456	0.000000	66.123419	19:25:27.5	GATED_INTERP
457	0.000000	66.181812	19:25:37.1	GATED_INTERP
458	66.240000	66.170541	19:25:46.8	GOOD
459	66.090000	66.126667	19:25:56.6	GOOD

Database

Network Adjustment

- Multi-vessel, multi-streamer.

- Fully integrated weighted least squares solution.

- User configurable Delft method statistical testing incorporating automatic rejection or weighting of observations.

Network Adjustment Control
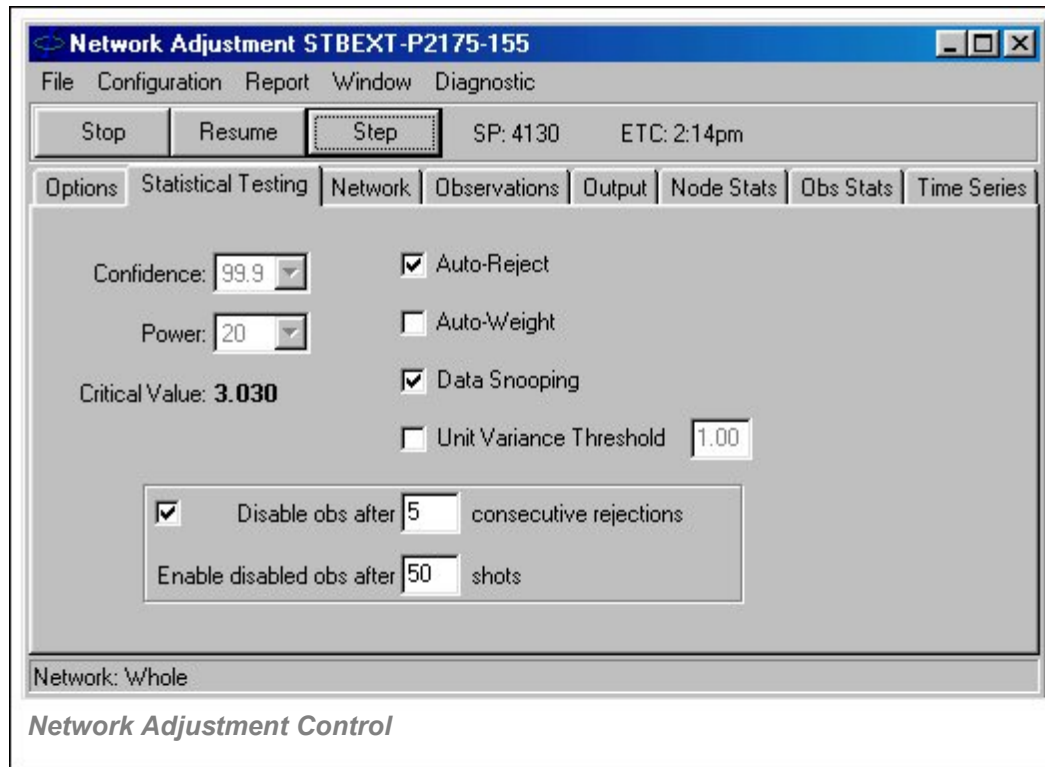
- Least squares solution for rotation and stretch for each streamer (if at least one active tailbuoy is present).

- Streamer shaping by circular arc method.

- Magnetic variation from multiple points by inverse square method.

- Options for source array orientation – course made good, gyrocompass, streamer compasses.

- Supports dynamic speed of sound for acoustic ranges.

- Staged configurable output of all positioning and QC data:
  - Any shot range can be computed without the need to re-adjust the whole survey line.
  - Sub-networks may be defined and adjusted for diagnostic purposes.

- Dynamic interactive graphics.

- Dynamically provides numeric data and time series plots of node and observation data, coordinates and QC statistics.

- Outputs all statistics for use in the QC module.
- Produces numeric summary files of all statistics.

Network Adjustment
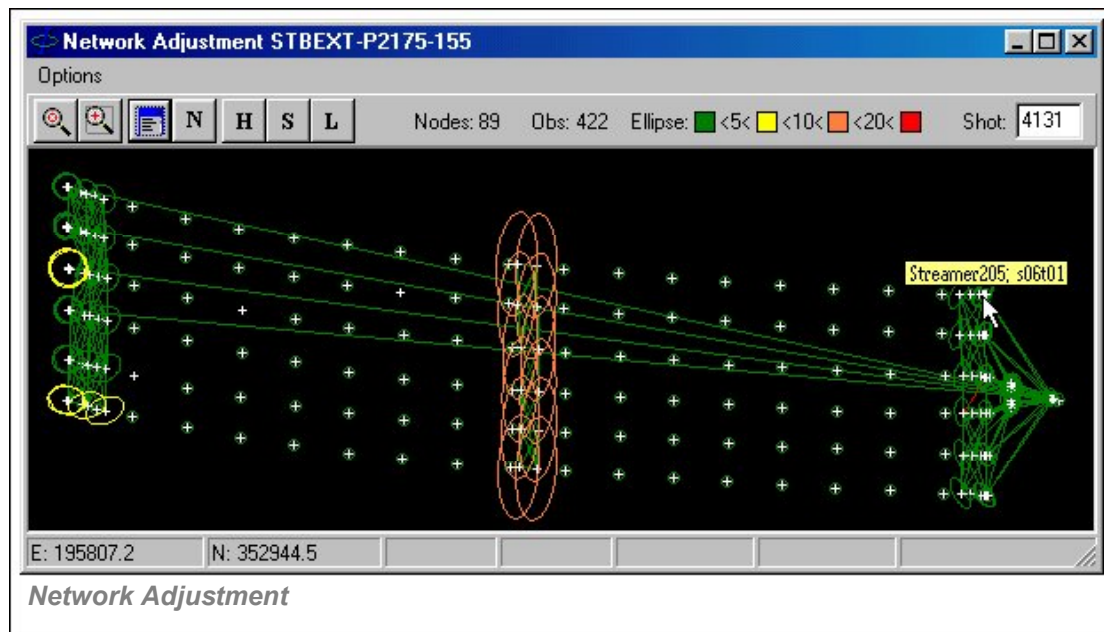
- Statistics produced are:
    - Unit variance
    - Degrees of freedom
    - Number of iterations
    - Streamer rotation
    - Streamer stretch
    - Semi-major axes (95%)
    - External reliability
    - Number of observations to a node
    - Residuals
    - Normalised residuals
    - Marginally detectable errors
    - A priori SD (used if varied by auto-weighting)

Output

- Outputs user configurable positioning data in the industry standard UKOOA P1/90 format or Shell Processing Support (SPS) format.

- P1/90 decimation by shot and receiver group.

- Header from pre-compiled file, or internally generated.

- Optional interpolation of missing shotpoints.

- Application of tidal reductions

- Correction to bathymetry for vessel draught and speed of sound

P1/90 Output

Quality Control

- Interactive time series plots of all adjustment QC data:
    - Unit variance
    - Degrees of freedom
    - Number of iterations
    - Streamer rotation
    - Streamer stretch
    - Semi-major axis (95%)
    - External reliability
    - Number of observations to a node
    - Residuals
    - Normalised residuals
    - Marginally detectable errors
    - A priori SD (used if varied by auto-weighting)
- Shot distance, time interval, vessel speed and course made good.
- Observation data
- Node coordinates:
    - Easting, northing
    - Along line and across line distance
- Plot functions:
    - Comparisons
    - Rate of change
    - Delta
    - Data table
    - Shot domain and time domain

Additional Features

- Scaled network diagram from header information supporting:
  - Horizontal and vertical plans
  - Interactive node information
  - Interactive measurements
  - Zooming
  - Printing
  - Saving to bitmap file
- P2 header difference report.
- Shot report.
- Streamer compass bias estimate computations by spatial method and least squares polynomial fit.
- Plot configuration and printing module for automated printing of user configurable data.
- Full history of saved numeric summaries on all processes.
- Comprehensive log file of all operations and processes.
- Warning and format violation log.
- Simultaneous multi-line processing.
- Simultaneous multi-project processing.
- Automatic, non-interactive processing – "fast-track" P2 to P1/90.
- Multi-tasking environment.

Warning Log