Residual Plotting and Ambiguity Resolution (REPA)

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Abstract

Some elements of the Calc/Solve software have been identified which badly needed re-programming for migration of the package to LINUX operating system. One of these elements is the interactive graphics tool CNPLT. The program REPA is an interactive graphics tool which replaces CNPLT and can be used for visualization of observations and residuals, manual ambiguity resolution, and other interactions for a given VLBI experiment. As of now program versions on the basis of FORTRAN77 and FORTRAN90 are running on HP workstations.

1. General Idea

REPA is based on the open PGPLOT software and on the DiaGI/MultiDiaGI layer which is a comprehensive set of graphic tools based on PGPLOT (Petrov, L. (2003)). REPA is a module of the Calc/Solve analysis software package and can be used either in standalone mode or it can be started from interactive Solve. The main idea is a three level structure as shown in figure 1.
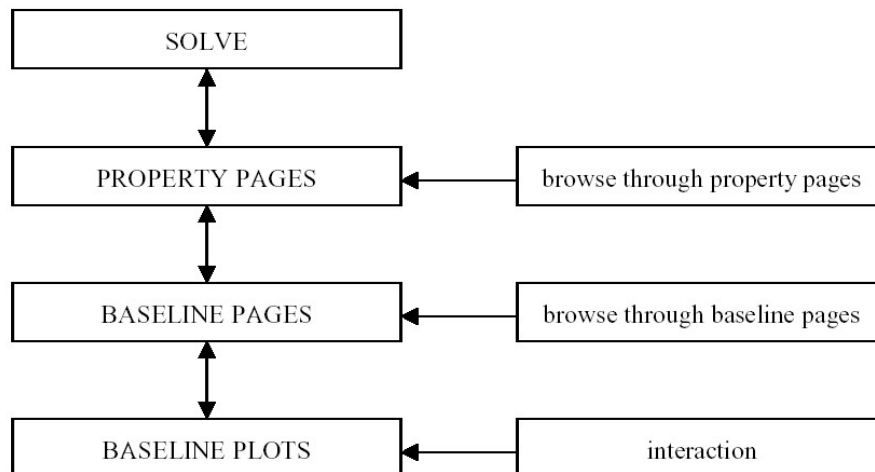

Figure 1. Three Level Structure.

The main features of the program are:

- **suppress/recover observations**
  single observations, groups of observations in a single baseline

- **resolve/reset ambiguities**
  single observations, groups of observations in a single baseline, all ambiguities of a database in one step

- **plotting of different database characteristics**
  group delays vs. time, elevation and azimuth; rates vs. time; SNR vs. elevation; phase delays vs. time; cable calibrations vs. time; ionospheric corrections vs. time; meteorological data (temperature, pressure, humidity) vs. time

2.   First Level - Property Pages

Here the analyst can choose one of the available so-called Properties. Properties are different kinds of observations and residuals which can be displayed and changed interactively, depending on the kind of data. In the current version of REPA three Property Pages are included. First Property Page is shown in figure 2.
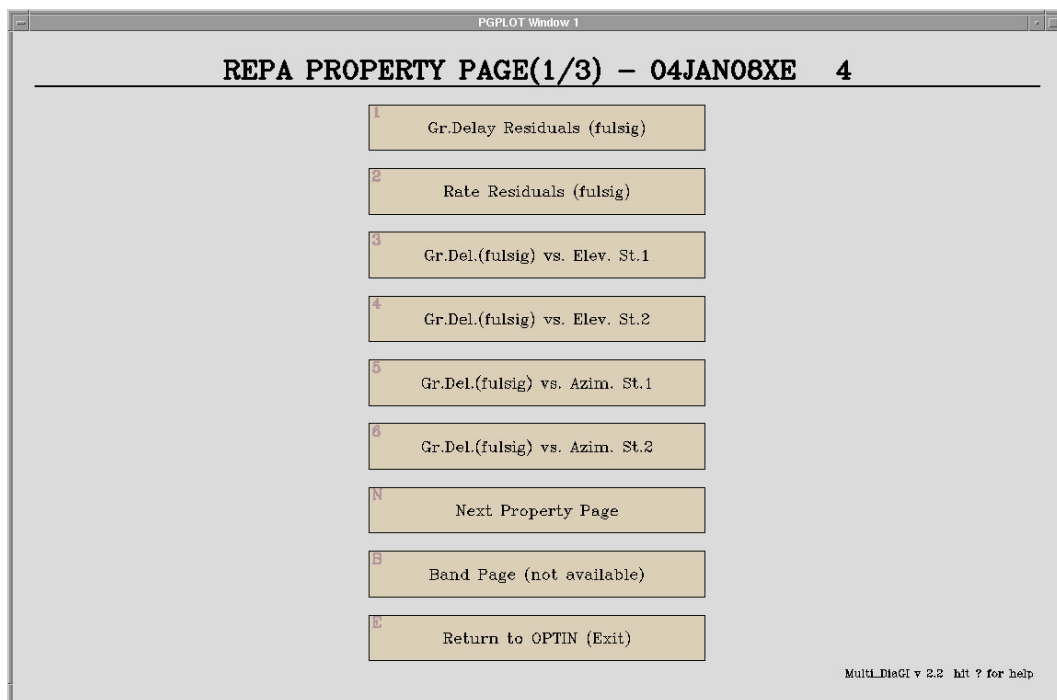

Figure 2. First Level - Property Pages.

3.   Second Level - Baseline Pages

Small plots of all baselines are displayed in MultiDiaGI plots (figure 3). The user can browse through all Baseline Pages to find the baseline which has to be treated. A set of different buttons is located on the right hand side of the Baseline Pages. Here it is possible to browse through the Baseline Pages (if there are more than one), to change or to reload experiment bands, and to work on the ambiguities. By pressing the reset ambiguities button all ambiguities can be set back to the original state. The solve ambiguities button causes the ambiguity resolution for all baselines of the loaded experiment in one step. To make it easier to evaluate the result of this action the program writes some information about it to the terminal similar to the example in the table below:

Table 1. Screen output for ambiguity resolution.

Baseline	CALCULATED	THEORETICALLY
GILCREEK HARTRAO	37	46 IDP
GILCREEK MATERA	-15	-19 IDP
GILCREEK TIGOCONC	-61	-61 IDP
GILCREEK WESTFORD	-52	-46 IDP
GILCREEK WETTZELL	63	56 IDP
HARTRAO MATERA	-45	-65
HARTRAO TIGOCONC	-109	-107
HARTRAO WESTFORD	-86	-93
HARTRAO WETTZELL	33	10
MATERA TIGOCONC	-48	-42
MATERA WESTFORD	-37	-28
MATERA WETTZELL	77	74
TIGOCONC WESTFORD	22	15
TIGOCONC WETTZELL	137	117
WESTFORD WETTZELL	115	102

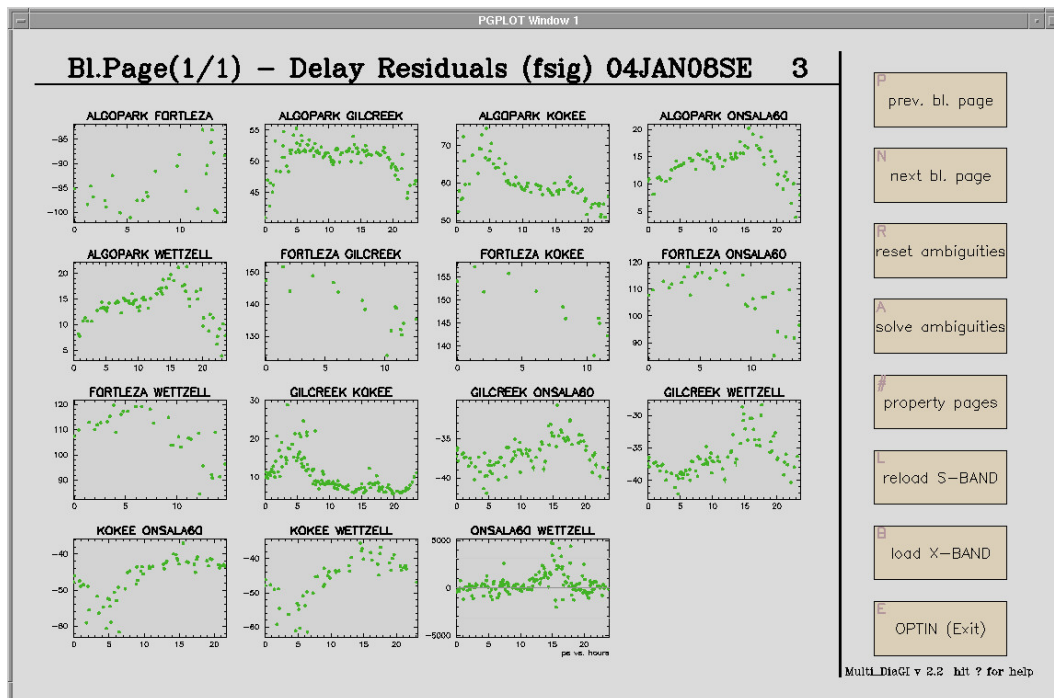Weighted Mean Residuals (WM) in nanoseconds, IDP: independent baselines

Figure 3. Second Level - Baseline Pages.

4.   Third Level - Baseline Plots

All observations of the chosen baseline are displayed in the Baseline Plot as shown in figure 4. The plot consists of the observation plot area with axes and inscriptions, the user function line,

the headline, the bottom line(s), one or two (for more than 50 sources) source name columns, and status labels.

Depending on the chosen property there are different sets of user functions available which are displayed in the user function line and can be chosen by left mouse clicks on the buttons. This action causes the binding of the chosen user function(s) to the mouse button(s). The analyst has the following user functions at his disposal:

- **get information on observations**
- **suppress/recover single observation**
- **suppress/recover observation groups**
- **ambiguity shift for single observations**
- **ambiguity resolution of observation groups**
- **reset ambiguities to original status**
- **connect observations with the same source**
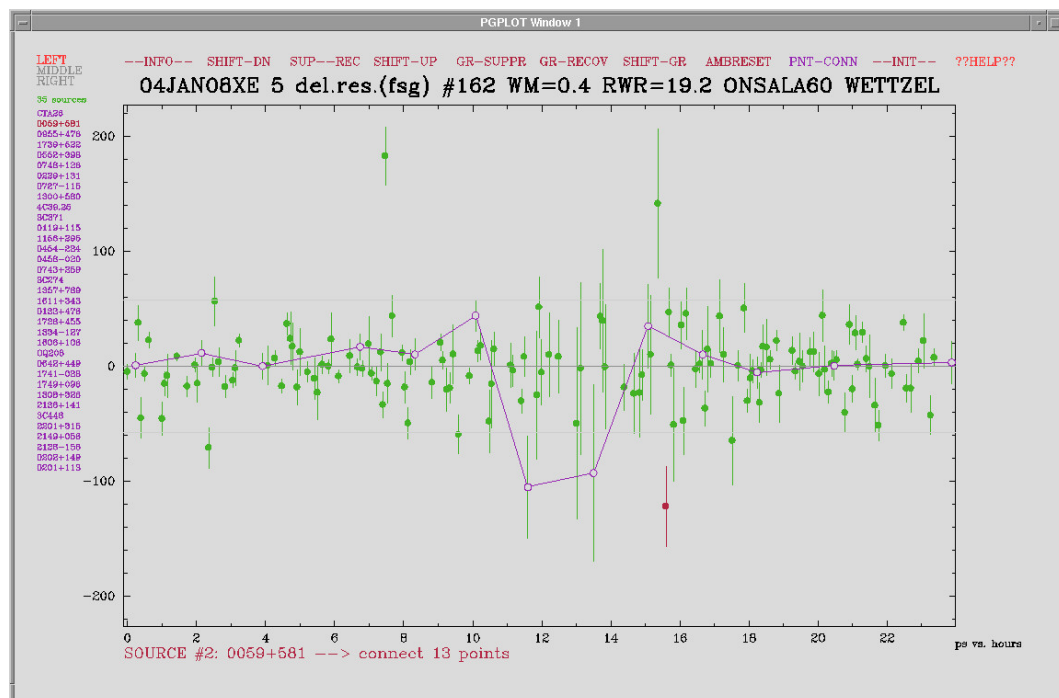- **browse through baseline plots**
- **change plot area**

Figure 4. Third Level - Baseline Pages.

5.   Future Plans

Together with the whole Calc/Solve package the program REPA will be ported to the LINUX operating system.

References

[1] Thorandt, V., Engelhardt, G., Residual Plotting and Ambiguity Resolution (REPA), In: Proceedings of the 16th Working Meeting on European VLBI for Geodesy and Astrometry, held at Leipzig, May 09-10, 2003, edited by W. Schwegmann and V. Thorandt, Bundesamt für Kartographie und Geodäsie, Frankfurt/Leipzig, 2003.

[2] Petrov, L., Release of Mark 5 VLBI Analysis Software Calc/Solve from Sep. 25, 2003 (web-reference: http://gemini.gsfc.nasa.gov/solve).