Index Panel

SLC Control Program

SLC INDEX

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Median Filtering for History Plots

November 1, 1994

Author: *Ron Chestnut* **Subsystem:** *History Buffers* **User Impact:** *Small*
Panel Changes: *Few* **Documents:** *This Article* **Help File:** *None*

The Median Filtering algorithm demonstrated by Fang Tian in her MATLAB program has been included as an option for History Buffer Displays. This feature is available through the 'MEDFILT' option from the button which previously allowed the 'STANDARD' and 'IGNRFLYR' choices. This button is not on all history buffer panels, but can be found, for example, on the GENERAL HISTORY panel, reachable from the SPECIAL DISPLAYS panel.

The median filtering algorithm consists of sliding a narrow window (in this case of width five data points) over the data set, generating a new set by replacing the data point in the middle of the window with the median of all the points.

The options 'IGNRFLYR' and 'MEDFILT' are now sticky, i.e. they remain in force until toggled off, even if you execute history buffer plots from other panels. The Y-axis label has '(MEDIAN FILTERED)' appended to the data label to indicate that that option was selected. Fixed scaling, log scaling, and fixed log scaling can also be used with median filtering. History buffer histograms will also be generated with median filtered data if the option is selected.

History Correlations Upgrades

November 21, 1994

Author: *R. Chestnut, G. White* **Subsystem:** *History Correlations* **User Impact:** *Small*
Panel Changes: *Many* **Documents:** *Yes* **Help File:** *Yes*

The Median Filtering algorithm described in the previous article has been included, along with the long-awaited logarithmic plot capability, in History Buffer Correlation Plots.

In order to add filtering and logarithmic options, the History Buffer Correlations Panel has been rearranged. Instead of selecting options for each variable on its row, options are selected on the top of the panel, as in History Buffer Plots, then attached to the relevant variable via the new

USE OPTS buttons. Legends at the far right of the row reflect the current options for each row.

The Manual Scaling option has also been changed to reflect the way History Buffer Ploting works: there is one button, ENTER MANUAL SCALE, for entering MIN and MAX at the same time.

When a variable is attached from History Buffer Plots via the ABC ATTACH LAST button, the scaling and filtering options from the History Buffer panel are brought with the variable and displayed in the variable's legend. A useful new button, RESET ALL clears the History Correlation panel and resets the options to the initial defaults: Linear, Automatic, No Filtering.

Many button macros use the History Correlation panel, and must all be modified. All the button macros used in the last two months which use this panel have been updated. The document DOC$TECH_NOTE:NOV_94_HCRL.TXT shows the modifications made to several button macros to work with the new panel.

Correlation Plots Bad Data Character Suppression

November 22, 1994

Author: *Greg Sherwin* **Subsystem:** *Correlations Plots* **User Impact:** *Small*
Panel Changes: *Few* **Documents:** *No* **Help File:** *Yes*

A new button, BAD DATA CHARS, has been added to Correlation Plots display panels. It can be used to toggle on or off the suppression of characters that represent bad or user-rejected data points. This feature has been automatically incorporated in the composite wire scan software to prevent the characters representing filtered points from obscuring otherwise good data.

Loading Feedback Matrix files from the SCP

November 18, 1994

Author: *Ron MacKenzie* **Subsystem:** *Fast Feedback* **User Impact:** *Medium*
Panel Changes: *Few* **Documents:** *Yes* **Help File:** *Yes*

VAX Fast Feedback Matrix files can now be loaded into the SLC database directly from the SCP Cascade and Calibration panel.

Introduction

In the fast feedback system, matrices are used to perform the real-time feedback calculations. These matrices are based on the SLC model and may include calibrated data. When the SLC model changes significantly it is often desirable to generate a new set of fast feedback matrices either directly from the model or by calibrating the feedback. Every time new matrices are generated for a feedback loop, a new file is created. New matrices are generated only upon user request and rerunning the SLC model does not automatically affect the feedback matrices.

A new config-like capability has been added to allow users to display which matrix files are available, and to load older files upon request. For example, if a feedback loop has been calibrated and the model has recently changed, a user may wish to regenerate matrices from the model. But if the previously calibrated matrices worked better than the new model and there is not time to perform a new calibration, the new software allows the user to go back to using the old calibration.

Users are requested to use caution in loading matrix files since, in some cases, old files may be incompatible with the current feedback configuration due to database changes. Users are encouraged to consult an expert when in doubt, and to provide meaningful comments when using this facility.

Background

The process illustrated in figure (1) occurs when the [PUT RMAT MODEL] to DB button or the [PUT CALIB TO DB] are pushed on the SCP Fast Feedback Cascade and Calibration panel.

1. The Online model or calibration data values are written from the database to a file.
2. This input file is processed by MATRIXx in a batch job.
3. MATRIXx creates an output file.
4. The output file is loaded into the FMTX primary in the database.
5. The selected loop is cold started.

```
+--------+    +-------+              +-------+    +---------+     *****
|        |    |Input  |    +-------+ |Output |    |FMTX     |     Cold
|Database|--> |Matrix |--> (MATRIXx)--->|Matrix |--> |Database |--> Start
|        |    |File   |    +-------+ |File   |    |         |     *****
+--------+    +-------+              +-------+    +---------+
                           Figure (1)
```

The New Capability

When the PUT RMAT MODEL to DB button or the PUT CALIB TO DB button are pushed, the user is prompted for a descriptive comment of the matrix file being created. This comment will later be displayed as part of the matrix file index. Users are encouraged to provide a meaningful comment when using this facility.

A new button called DISPLY MATRIX INDEX on the Cascade and Calibration panel, displays an index (i.e. directory) of output matrix files that are available to be loaded.

Another new button called LOAD MATRIX on the same panel, loads one of the files into the database and cold starts the loop.

The New Buttons and What They Do

The DISPLY MATRIX INDEX button displays an index of existing matrix files for the selected loop that were written by MATRIXx. The index is displayed on the GRAPHICS panel with one line per file and is similar in format to the CONFIG index. The format of the display follows:

```
                        Fast Feedback Matrix Directory
.        1  07-JUN-92 12:22  ?      ??
.        2  07-APR-93 02:22  ?      ??
.        3  28-SEP-94 12:34  C    NAME comment comment comment comment
.        4  29-SEP-94 22:22  M    NAME comment comment comment comment
.        5  01-OCT-94 02:22  C    NAME comment comment comment comment
.        6  06-OCT-94 22:22  M    NAME comment comment comment comment
-->      7  07-OCT-94 14:22  M    NAME comment comment comment comment
```

The arrow to the left of the display indicates the currently loaded matrix file. The display is not dynamically updated (it is only painted once when the button is pushed). So, if a new loop is selected or a new matrix file is loaded, it is necessary to push the button again to make the display current.

Files are listed in order of oldest first and newest last. This is consistent with the CONFIG index. The files displayed are the files relevant for the currently selected loop only. The date indicates the creation date of the file.

On each line, the character "C" or "M" is displayed depending on whether the file was created as the result of saving Calibration or online Matrix information.

The comments displayed for each file are be same comments entered by the creator of the file when the [PUT RMAT MODEL] to DB or [PUT CALIB TO DB] buttons were pushed.

When a matrix file exists but there are no corresponding comments available, the display shows question marks in the M/C (Model/Calibration) field and in the comment field. This will be the case for matrix files that were created before the new functionality described in this document was in place.

If no matrix files exist, the words "NO FILES AVAILABLE" are displayed in the graphics window when the [DISPLY MATRIX INDEX] button is pushed.

The [LOAD MATRIX] button allows one of these files to be loaded into the database for the selected loop. When pushed, the user is prompted for the index number of the file to be loaded. The loop is then cold started and left off. A message is issued telling the user that the matrices have been loaded successfully and that they can go ahead and turn the loop on.

Fast Feedback Access to BPM Gold Orbits

November 11, 1994

Author: *Daniel Van Olst* **Subsystem:** *Fast Feedback* **User Impact:** *Small*
Panel Changes: *One* **Documents:** *No* **Help File:** *Yes*

In order to allow consistency between fast feedback gold orbits and BPM gold orbits, a new feature called `IMPORT GOLD ORBIT` has been added to the `GOLD ORBIT PANEL` (available off the `FEEDBK SYSTEM INDEX`). This new feature eliminates the need for users to manually enter values from BPM gold configurations into fast feedback.

'Importing' a gold orbit saves a gold orbit configuration. BPM data for the save is 'imported' from the current gold BPM configs associated with the selected feedback loop. (Non-BPM data for the save comes from the currently loaded reference values for the feedback loop.)

After the save is completed, the user is given an option to load the just-saved config for immediate use by fast feedback. If the just-saved config is loaded, the feedback loop will attempt to steer the beam to the gold orbit recorded in the config.

FAST FEEDBACK AVERAGING TIME CONSTANTS

November 21, 1994

Author: *Phyllis Grossberg* **Subsystem:** *Fast Feedback* **User Impact:** *Small*
Panel Changes: *Few* **Documents:** *No* **Help File:** *Yes*

The number of exponential-averaging time constants used by fast feedback has been increased from one to three. Until now, fast feedback used one exponential-averaging time constant per loop (enterable from the Gold Orbit Panel) for three separate purposes:

1. averaging the measurements for stabilizing gold orbits;
2. averaging the states for history buffering averages and rms values, and also for use with correlation plots;
3. averaging the states during calibration.

Current interest in history-buffered rms values prompted a request that the time constants be consistent across feedback loops with an averaging period of 1 second. This posed a conflict with the gold-orbit use of the time constant. It had also been noted that large time constants set for gold-orbit purposes or for history-buffering purposes frequently caused the time it takes to do a calibration to be undesirably long.

Thus, two additional time constants have been created so that there is now a separate one for each of the three needs outlined above.

1. The existing time constant will continue to be used for averaging measurements for gold orbits. It will also be used for averaging actuator values. Current database values for this time constant will remain as is and values can still be changed via the existing data-entry button on the Gold Orbit Panel.
2. A second time constant will be used for averaging states under normal running conditions and for calculating rms values for jitter studies. This time constant will also be used in conjunction with correlation plots. These values initially have been dbedited for an averaging period of one second for each loop and are changeable via a new data-entry button on the State Panel.
3. A third time constant will be used for averaging states during calibrations. These values initially have been dbedited to 20 for each loop. These values are changeable via a new data-entry button on the Cascade and Calibration Panel.

It is important to note that history buffers of state rms values may change suddenly when old state time constants are replaced by new ones. This will occur for each loop as micros are IPL'd after release of micro code on November 21, 1994.

BPM Buffered Aquisition Data Channel Selection

November 16, 1994

Author: *Sandra Bes* **Subsystem:** *SCP* **User Impact:** *Small*
Panel Changes: *Few* **Documents:** *No* **Help File:** *Yes*

Buttons have been added to the BPM Buffered Aquisition Panel that allow the user to select a Data A or Data B channel from a list of possible channels. [SELECT DATA A] [SELECT DATA B] The list of possible channels corresponds to the selected Unit A or B. Note that selecting a channel from the Select Data button will cause the data channel on Toggle Data A or Toggle Data B buttons to change correspondingly.

Unmodified Pulse I.D. from BPM Buffered Acquisition

November 18, 1994

Author: *Mike Zelazny* **Subsystem:** *BPM* **User Impact:** *Small*
Panel Changes: *Few* **Documents:** *No* **Help File:** *Yes*

The SCP BPM Buffered Acquisition panel now provides a machine wide pulse identifier during the data collection cycle. This pulse identifier can be used as a time base for plots or tabular displays available from this panel. Try pressing [TOGGLE TIME BASE]. More importantly, this data may be transferred to Correlation Plots buttons and **MATLAB** files.