CSS Post-Analysis Tool: FFT, Correlation Plot, Gaussian, etc.

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ArchiverData Analysis

- CSS has access to Archive Data (Databrowser).
- What’s about immediate Analysis? (vs. Matlab, Mathematica etc)
- Small plugin for that was written.
- Preliminary name –”Post-Analysis”
- Currently we can handle
  - FFT (normal and Hamming, Bartlett, etc)
  - Correlation plot
  - Gaussian fitting
A Mechanism to Receive Data

How data coming from Databrowser to PostAnalysis Plugin?

We’re using 2 comfortable way –

1. By Mouse Button Click pull-down Menu (Object Contribution)
2. By Drag And Drop Mechanism
Internal data contribution mechanism

Special Datatype under `org.csstudio.platform.internal.module` was created

- `double[] sampleValue, timeStamp;`
- `String[] Status, Severity`
- `double low, high`
- `String egu`

Currently this Datatype is accessible only in databrowser sample Table. Should be extended to main databrowser window as well.
We provide normal FFT and most popular window functions Bartlett, Hanning, Hamming

On-line internal CSS-help with some FFT theory currently available:

DFT and FFT algorithm.

While the DFT transform above can be proportional to the square of the number of points involved, the only requirement of the the computing time for the radix-2 FFT is proportional to the speed increase. Note that in reality computing hardware and software.

We defined the FFT as:

$$FFT_N(k, f) = \sum_{n=0}^{N-1} f(n) e^{-2\pi i kn/N}$$

If N is even, the above sum can be split into
Correlation Plot

CorrelationPlot creates XY-plot from 2 archive samples $x(t)$ $y(t)$:
Gaussian Fitting:

GaussianFit tries to find best fit to
Using LSF (least squares fitting algorithm)

\[ f(x) = ae^{-(x-b)^2 / c^2} \]
Conclusion: To do/enhancements:

- Extend SampleDataType for main Databrowser Chart Window.
- Add ToolTips or another Labels for CorrelationPlot
- Get data from other plugins (i.e. waveforms in SDS)
- Another Transformation (for example Linear Fitting?)
- Formulas support (i.e. draw \( C = (PV1 - PV2)^2 \))
- Any other ideas?