

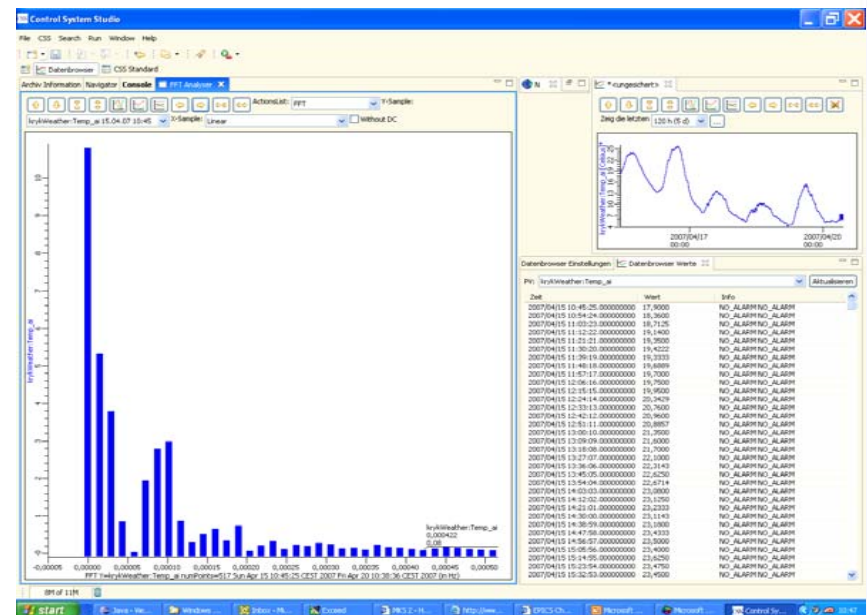
CSS Post-Analysis Tool: FFT, Correlation Plot, Gaussian, etc.

EPICS Meeting – Control System Studio
DESY, April 2007

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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**

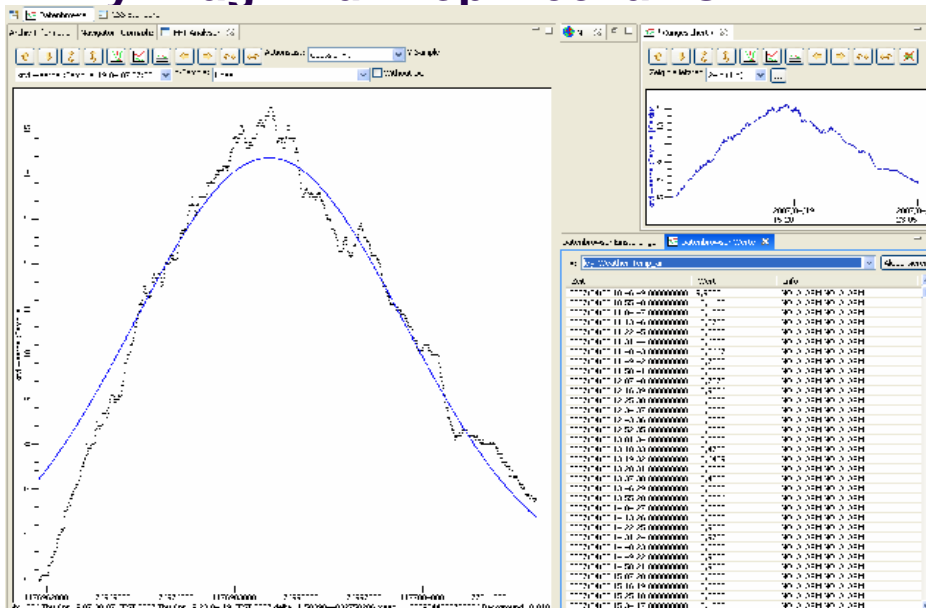
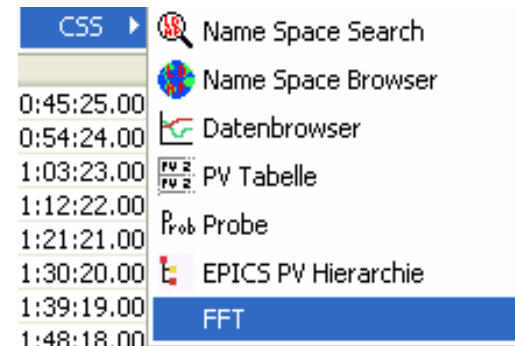


A Mechanism to Receive Data

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

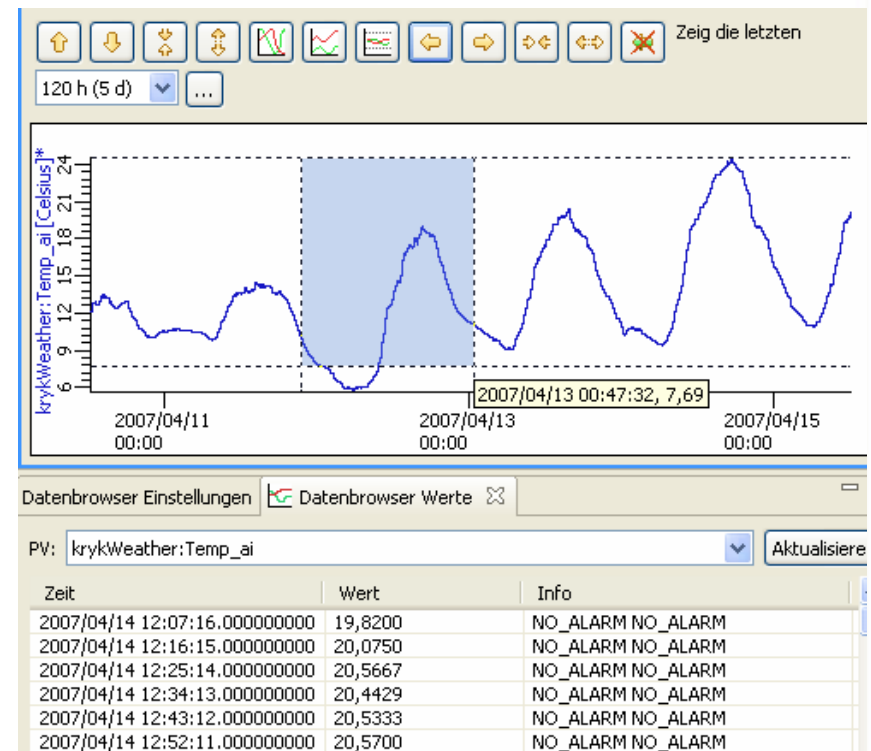


Internal data contribution mechanism

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

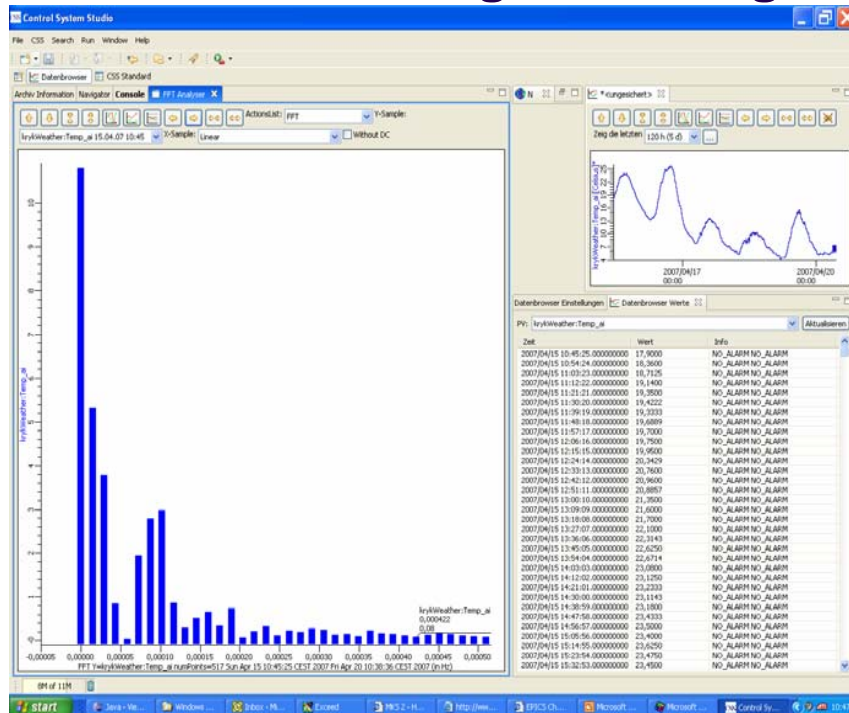
- `double[]` `sampleValue`, `timeStamp`;
- `String[]` `Status`, `Severity`
- `double` `low`, `high`
- `String` `egu`

Currently this Datatype is
accessible only in
databrowser sample Table .
Should be extended to main
databrowser window as well.



FFT

We provide normal FFT and most popular window functions
 Bartlett, Hanning, Hamming



ActionsList: FFT Y-Sample: krykWeather:Temp_ai 15.04.07 09:32

- FFT_Hamming
- FFT_Hanning
- FFT_Blackman
- FFT_Bartlett
- FFT_Blackman_Harris

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

SSS Help - CSS

Search: GO Search scope: All topics

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CSS Applications

DFT and FFT algorithm.

While the DFT transform above can be proportional to the square of the number of samples (N). The only requirement of the FFT algorithm is that the computing time for the radix-2 FFT is proportional to N log N. Note that in reality computing time is also dependent on their relationship to the hardware and operating system.

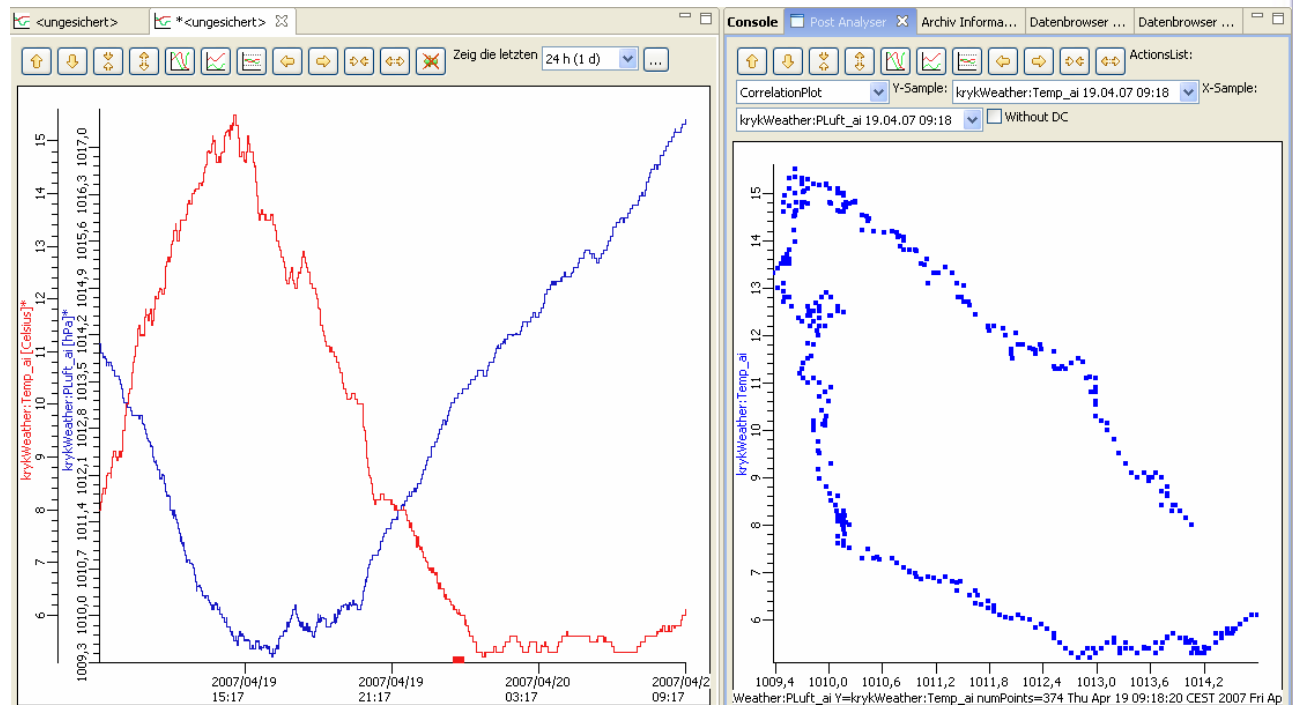
We defined the FFT as:

$$FFT_N(k, f) = \sum_{n=0}^{N-1} f(n) e^{-j2\pi kn}$$

If N is even, the above sum can be split into two sums:

Correlation Plot

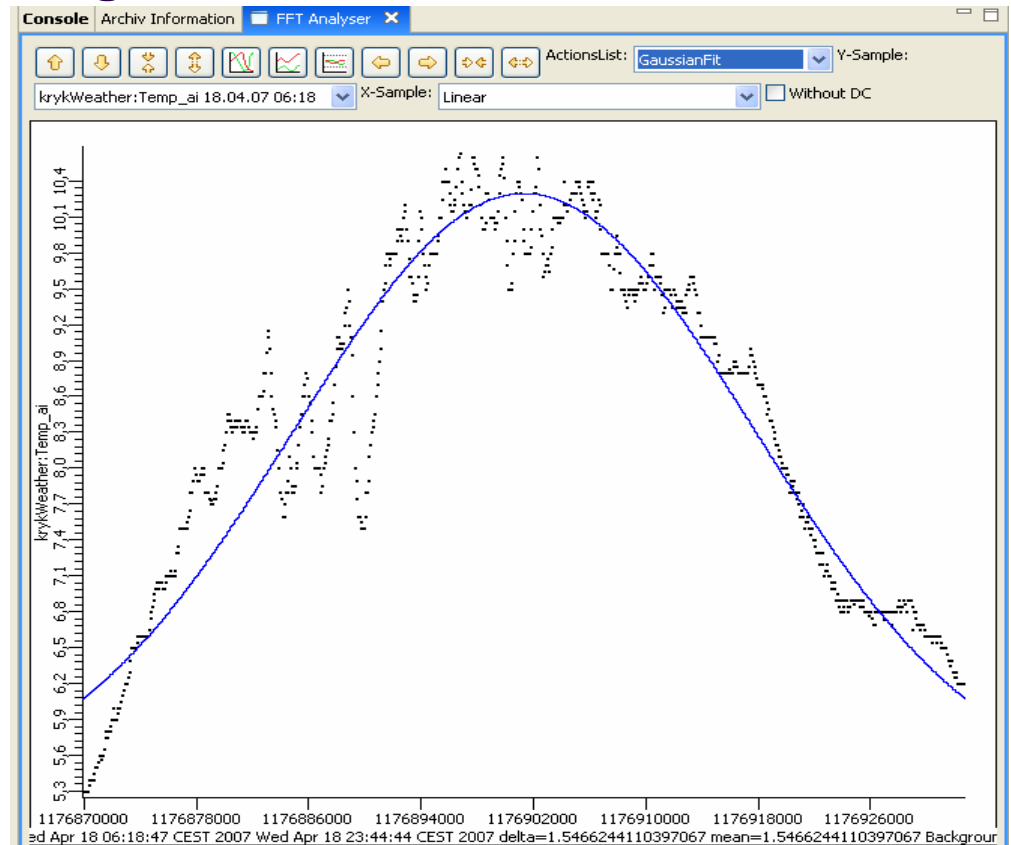
CorrelationPlot creates XY-plot
 from 2 archive samples $x(t)$ $y(t)$:



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?**