GS68-APC: A new and simple Programming Environment to simulate, test and apply, in non critical applications, Process Control Solutions

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Basic Purpose

The growing need for process control solutions in the semiconductor industry requires a huge amount of simulation and development:

- to select the best algorithms for certain applications,

- to investigate new innovative algorithms,

- ...

PS68-APC tries to simplify and speed up this work by providing a fully programmable environment with usable basic algorithms, graphics and data storage.

Overview: Applicable Areas

- Main focus of GS68-APC is actually FD (fault detection) using univariate and multivariate SPC (statistical process control).

- Further extension to other FD possibilities like neuronal nets, satistical distance based or model based methods will be done.

- Beside FD also Classification of faults based on various methods will be established.

- A further extension will be towards R2R (run to run) control solutions.

Overview: Functionality

- GS68-APC framework allows rapid development of test applications using python scripts.

- Testing and comparison of different algorithms is easy to achieve.

- Test applications can use data analyzing algorithms, data storage and visualization tools → test applications can be very similar to production applications.

Main Components: Data Analysis

- The data analyis and process control is centered around:

  – Univariate Methods

    - A stream resembles the raw data for a single parameter.
    - A chart holds the data necessary to describe the mean or standard deviation or another statistic calculated from a sample in a stream. A chart object can have various samplings called shewart, ewma ... that are calculated and potentially monitored. For each sampling limits can be defined.

  – Multivariate Methods

Data Storage and Visualization

- The framework includes a Mysql database that can hold the status of all parts of the system.

- There are visualization tools for univariate streams and charts.

Used Software Tools

- The used programming language is Python.

- Most statistic is done using R, a GPL licensed statistic package.

- GUI and visualization is done using PyQt and PyQwt.

Status and further Development

- The univariate streams and charts are mostly finished and tested.

- Multivariate Charts (Hotelling T2) are finished, but extensions like adaptive methodes as well as data reduction methods need to be implemented.

- Other areas like neuronal nets and classification is not yet started.

- The total system needs to be improved especially regarding stability and partially performance.