GENERIC COMPONENT CLASS IN JAVA FOR CYCLOTRON CONTROL SYSTEM

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Abstract

A generic Java class-structure comprising of a number of Cyclotron oriented control components with effective control features has been constructed for use in the universal MMI[1], The usable components are of four distinct categories i.e. Boolean Monitor, Boolean Control, Analog Monitor and Analog Control. They can be inter-linked in a tree structure. Operational safety interlocks can be implemented in step-by-step operation. An important component " Multi-Channel Selectable Graph", with some of the above functionalities has been implemented. Boolean components are useable as digital control components for switching of pumps, valves and to monitor status of components like pressure switches, etc. Analog components are designed for set point control and measuring equipment to monitor Voltage, Current, Pressure and Temperature, etc. Object declaration is very uniform for all kinds of control, needing only Type, Name and tree position to be passed as arguments.

1 INTRODUCTION

This development is aimed at making a number of Java Classes available for components which are very common in any Cyclotron Control system. These components, when incorporated in a Control System based on Java Virtual Machine, can be controlled over the network, making the control system flexible and secure. However, it needs an actual server which will take care of the process interface part and will actuate the devices. An important point is that, with these Java classes, control systems can be designed fast with a number of flexibilities. These Classes have been successfully tested in the laboratory in a simulated environment.

2 DEVICES

At present the Classes have been tested on Java Virtual Machine on an Intel PC with WIN-NT4.0. Basically, it needs a Java Enabled Browser like Netscape or Internet Explorer to run the Client. The server should run an HTTP daemon to let the Applet run from any Browser from any machine over the LAN.
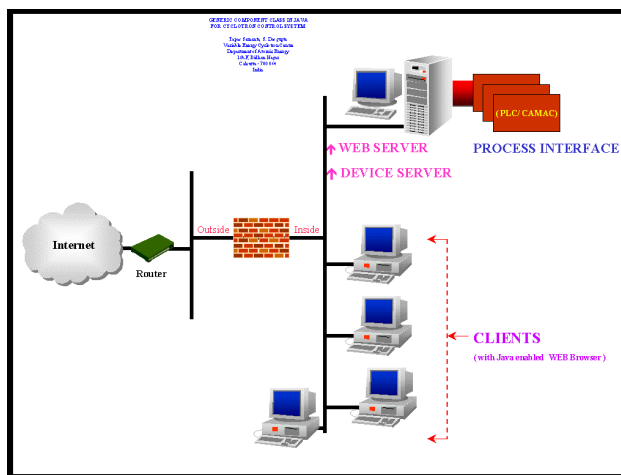
[Fig-1]

3 SOFTWARE PLATFORM

Microsoft Visual J++ 1.1 is used to develop these classes. An echo server was used to test the client/Server interface. The classes are platform independent in that no platform-specific Java class is used to develop these classes

4 CLASS DESCRIPTION

Basically there are two categories of components (Fig-1).

- Digital
- Analog

There are two types of Digital control classes, Controlling Equipment and Monitoring Equipment.

Controlling-Equipment Classes are used for those components which are basically on/off controls. They have the following parameters to monitor

1. ON/OFF Status Flag.
2. Previous Interlocking Equipment's List

3. Later Interlocking Equipment's List
4. Enable Flag
5. Time-Stamp of last switching on.
6. Equipment Type (Individual Category)

Monitoring-Equipment classes are same as Controlling Equipment Classes, except they don't have the "Enable Flag", and they are always disabled as far as the user interaction with them is concerned. They can be used to monitor the status.

Analog Control Classes also fall into two distinct categories, namely Controlling Equipment and Monitoring Equipment.

Controlling Equipment classes are used for equipment which need to be controlled by varying the set point. They have the following parameters, which can be modified.

1. Process Parameter Actual Value
2. Process Parameter Set Point Value
3. Range
4. Units
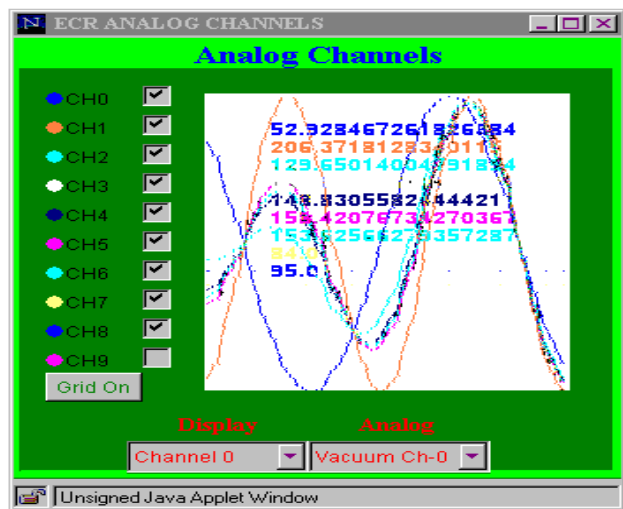5. Calibration Factor
6. Scan Interval.

Analog Monitoring Classes are the same as the Controlling Equipment classes, except they don't have the "Process Parameter Set Point Value"; therefore they can only be used to monitor any Analog Process Value (basically measuring equipment).

[Fig-2]

All the Classes have a distinct visual identity and they also reflect their visual status online depending upon their type and category.

Each class instance will have it's own serial identity tag, which can be passed as parameter to any corresponding class instance to activate interlocking.

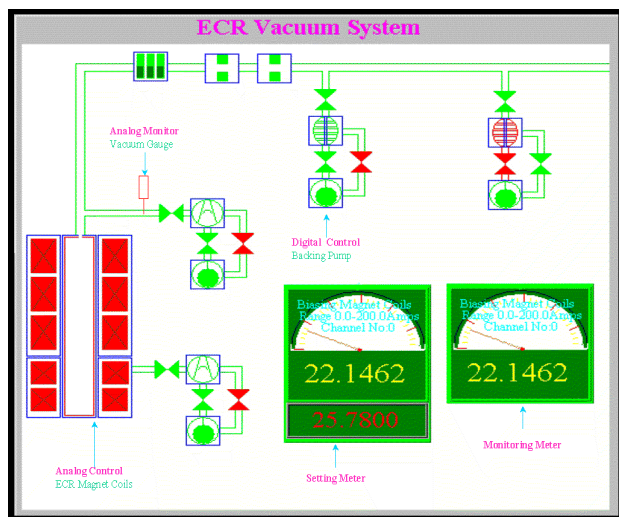Thus an interlocking tree can be implemented to avoid any mistake by the user.

Two metering classes (Fig-2) are used for monitoring and adjusting set points online. They can be placed on the visual display of any instance of the Analog Classes and it will then be able to access (modify) the parameters.

One TCP/IP Client class is there to take care of the Data communication with the Device Server online from an applet running on a browser over the LAN.
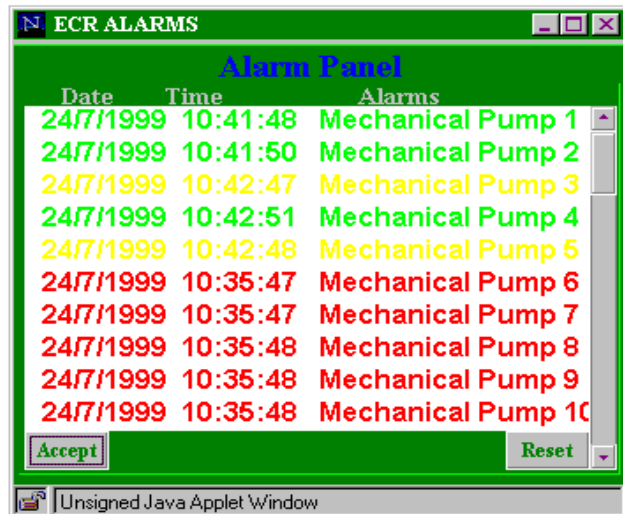

[Fig-3]

A Multi-channel graphic display class (Fig-3) is used to display analog parameters displaying. The analog parameters can be selected from an available list of analog channels. Visual attributes are selectable.

[Fig-4]

The Alarm class (Fig-4) is used to generate and log events online. It also informs visually if any fault occurs.

5 DISCUSSION

The project has been carried out mainly to develop some Java components classes which can be used in universal MMI[1] developments and also to develop a Client for our Electron Cyclotron Resonance Ion source's Computer control system at VECC. The Classes have been tested in the laboratory with simulated conditions and an actual client is under development.

6 CONCLUDING COMMENTS

The individual classes, which run as a separate thread, are to be tuned while in actual use. The number of actual instances of these classes can not be unlimited in a particular application.

REFERENCES

[1] S.Dasgupta, "Sharable Graphical User Interface Objects for the Operator's Console", p.p.528, Proc. Int. Conf. On Accel. And Large Experimental Physics Control Systems, 1997, Beijing.