

HELP SYSTEM FOR CONTROL OF JAERI FEL

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ABSTRACT

The control system of JAERI FEL has a help system to provide the information necessary to operate the machine and to develop the new user interface. As the control software is constructed on the MS-Windows 3.x, the hyper-text feature of the Windows help system can be accessed. It consists of three major parts: (1) on-line help, (2) full document, and (3) tutorial system.

1. Introduction

The FIR FEL development using the superconducting linac at Japan Atomic Energy Research Institute (JAERI) reaches its final step in this summer [1]. The control system for the FEL system is constructed and its basic functions are examined now. Its design and implementation has been described elsewhere [2,3], and this article presents the documentation style of the control system.

The enough information about all items of the JAERI FEL system should be provided in the help system ideally, however the current effort is restricted to the topics about the control system and the related hardware components. The control system is implemented on the DOS machines and the MS-Windows 3.x environment. So it is natural to choose the Windows help facility for retrieving the information and as the basis of the FEL control help system. By employing these user interfaces, the time to learn the usage would be saved.

In the following sections, the outline of the control help system and the resource of the help information are described.

2. Outline of help system

The help system consists of three major parts.

(1) On-line help :

It is a usual Windows help file with hyper-text feature. It consists of the topics with short sentences and the bitmap pictures which explain the selected topics with mutual links.

(2) Full document :

This is a long write-up of the control system and a reference manual of the system. It is a collection of the reports and it may be hard to read on smaller CRT screen.

(3) Tutorial :

The tutorial is used to learn the user interface and the basic information. In this section, the topics are series of activities to control some devices.

They are accessed from the main executive window by choosing the appropriate menu command as shown in Fig. 1.

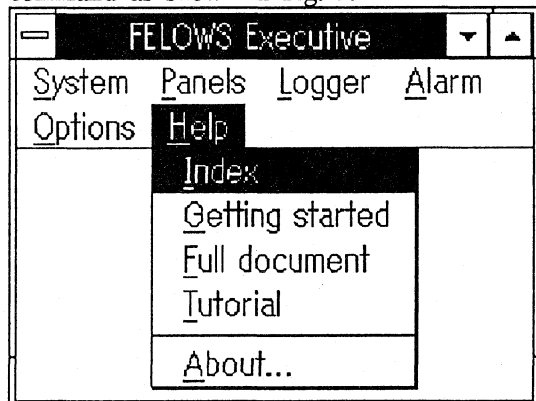


Fig. 1. The pull down menu of help system.

The contents of the help topics are shown in Fig.2, and their descriptions are as follows:

(A) Specifications of the hardware devices

Each device has the static and the dynamic characteristics and these informations are contained in the system database. The help topics cover the wiring and the cables connecting the devices, too. From the point of view of the control system, the device address (LAN node, CAMAC station, GPIB address) ; the range of the control variables, the unit of the reading variables, and the

allowed states of the device are the major information.

(B) Abstraction model of the devices

The devices are organized in a hierarchy of the classes, which are the abstraction of the actual devices. For example, the current monitors are the instances of the "meter only" class; the solenoids and the quad doublets are belong to the "1 parameter" and "2 parameters" classes, respectively.

(C) Abstraction models of the controllers

The devices have the specific functions to control and monitor them. These functions are abstracted as the virtual controllers and define the corresponding methods for each class of devices. Currently, three types of functions, "setting integer", "reading real", and "switching status", are only considered in the FEL control system. The other types of functions, such as "set of setting values" or "set of reading values", will be required to handle the wave form information, in near future.

(D) Abstraction model of user interfaces

The control system can give multiple user interfaces depending on the user needs. The command key-in from the console is one of the conventional user interface. Nowadays, a GUI interface is more popular, and it is a standard interface in our control system.

(E) Usage of the panels

The user interface of the control system consists of a series of the control panels, which graphically simulates the hardware control device, such as the switches, faders and meters, as shown in Fig.3.

(F) Usage of the help system

The usage of the help system must be included to access the necessary information as fast as possible.

(G) Development steps of control software

The source codes contain all informations of the software development, however, the sequence of the activities, the relations between the process states, and the message flow are described little. The block diagrams or tables are necessary to show them properly. Fig.4 shows a part of diagram for electron gun panel.

(H) Troubleshoot and alarm signals

There is a hard-wired interlock system in the facility and it sometimes causes a panic to

the unskilled operators. The possibilities of the reasons of the troubleshoots or fault alarms can be provided as a help message.

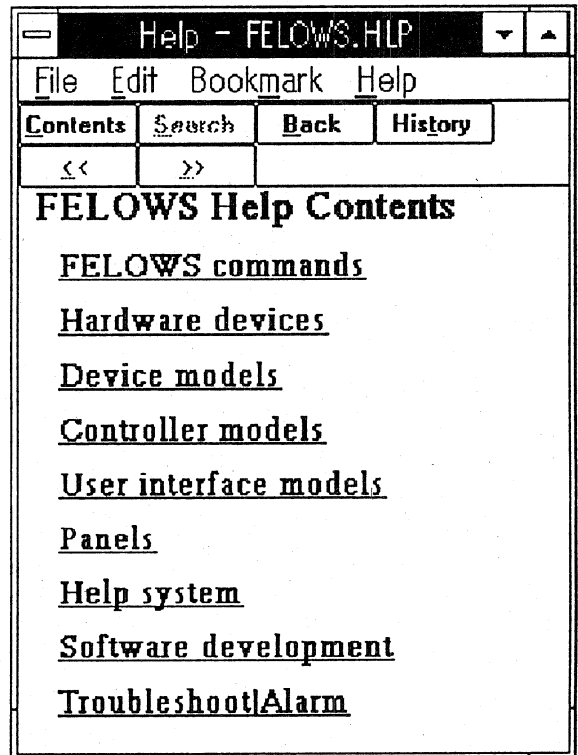


Fig. 2. The contents of the on-line help system.

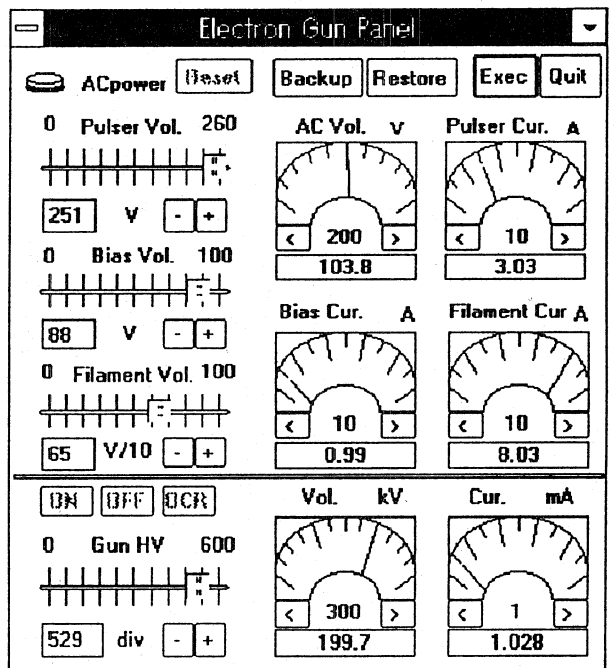


Fig. 3. An example of the control panel window to control and monitor the electron gun.

3. Resource of help information

The important issue to make the successful help system is a choice of the resources from which the information can be retrieved. Basically, there are two kinds of representations of the information: facts and rules. The resource of the facts can be obtained from the written materials or the experimental measurements. The fundamental rules, such as "A is a kind of B", can be derived from the static characteristics. The rules between dynamic variables, such as "beam transmission is maximum if X and Y...", are much more difficult to reduce from other informations. Only for the simplest cases, it can be derived by using some production systems. The main reason to introduce the simulation models to our control system comes from that they may reduce the difficulty to estimate such rules.

As an example, a grid pulser used in our electron gun assembly has only three control parameters (pulsar, bias, and filament voltages) except for the extraction voltage. The fundamental behavior can be evaluated by using the electron gun code and the transient analysis of pulse forming circuit. In the real operations, the unknown or unconsidered effects may influence the results. When these differences are

recognized and formalized, they become a new knowledge and the additional resource of the help system.

4. Conclusion

We have developed the control system for JAERI FEL facility and the control help system. The help system has an important role to make users feel easy to access and modify the control system.

References

- [1] E. Minehara, et al., "Commissioning of the JAERI Free Electron Laser", presented in this meeting, 21-p1.
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- [3] M. Sugimoto, "Control system with a software simulator for JAERI-FEL", Proc. of 14th Int. FEL Conference, Nucl. Instr. and Methods, to be published.

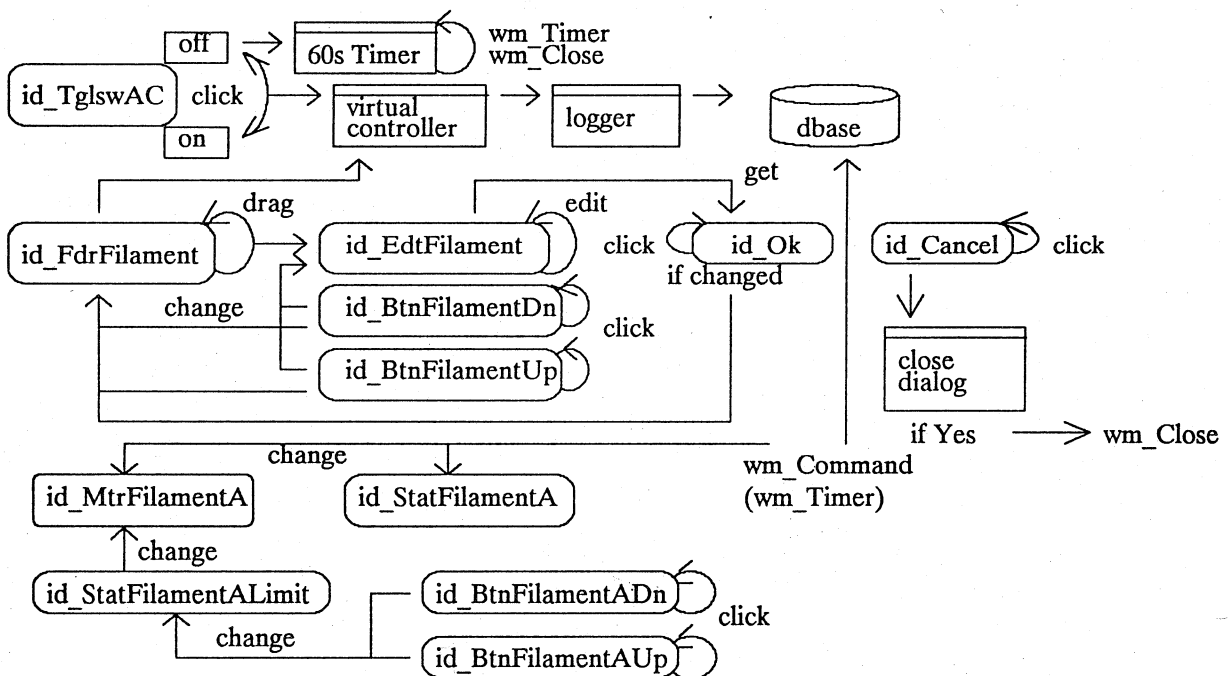


Fig. 4. A message flow diagram of electron gun panel.