SYSTEM OF MONITORING AND CONTROL FOR THE AUTOMATION OF INDUSTRIAL WASH MACHINES

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This paper presents the architecture and the functionalities of a system which allows monitoring and control for the automation of the industrial wash machines. The most important advantage of this type of systems is accessibility, the software application can be executed from any computer connected to Internet or from a mobile device compatible Java (which have the software application installed). It is not necessarily that the user to be on the place where the server is for seeing the progress of the industrial process.

The software application communicates through the Internet with the Server which commands the PLC for executing different instructions (commands a door, measure the temperature, measure the water level or anything else which can be monitored or controlled).

The communication between the Server and PLC is realized through the serial port of the computer.

Keywords: industrial, monitoring, control, automation, architecture

1. INTRODUCTION

The project idea was to create a software application which to allow monitoring and control for the automation of the industrial wash machines. The monitoring and the control are realized using a Programmable Logic Controller (PLC). The PLC is connected at a PC through the serial port. The bidirectional communication between the PLC and the PC is realized using it. The system formed by the software application together with the PLC represents a complete system which can be used for the automation of the industrial equipments. In our case the system was developed for the automation of the industrial wash machines.

The programs for the wash machines, which are edited by the user, are saved into a MySQL database. From the database the programs can be loaded, at the user request, for visualization or for being uploaded into the PLC’s memory. A program for a wash machine is formed from a range of operations. Each operation is described by a variable number of parameters. The parameter number is different from an operation to another.

The first and most important advantage of the user is the possibility to execute the application from any computer which is connected to the Internet or through the mobile devices compatible Java. If the user wants to use the application on a mobile
device the first thing which it should do is to install it on the device. Even so, it will not have access to the all functionalities of the application. The miss of some functionalities is due to the limits imposed by the mobile devices, as the screen size, the processor power, available memory etc.

The software application is a client/server type application. So, we will have a server application and a client application. The client application was developed in 2 version: one as an Applet embeded into a Web page and another as a MIDP application (MIDlet) for the mobile devices compatible Java.

In our days, especially into the organisations with low funds, it’s desired to use the free applications. In this way that organisations doesn’t have to spend its money for buying a software application complex and expensive.

The financial investments are done just in case when is needed a specific software application, application which asures to the buyer facilities which can not be found in other application (at a free one). In this case, the organisation should spend the money with that application and will have all the facilities of the bought software application. When are free software applications which offers almost the same facilities as a comercial application, even it have low performances, is prefered the free one.

For this reason, we choose to use the free technologies for the system’s implementing. For the same reason, but not the only, we have chosen to develop the application using Java technology.

The architecture of the system and the way in which are realized the communications between the components of the system are represented in figure 1, showed below.

![Fig. 1 Architecture of the system](image-url)
2. APPLICATION’S SIDES

2.1. Hardware

The PLC is from GLOFA GM7 series and is made by the well-known firm which produces electronic equipments, LG. It’s a last generation PLC which offers to the user many facilities of good quality. The identifying code of this PLC is G7M-DR30A. It has 18 inputs and 12 outputs. The energy supply is done from a source of 220 V.

The size of a program which can be installed on the PLC shouldn’t have more that 64 kilobytes.

The PLC is connected to a PC which has the role of Server for the software application. The communication is done through the RS232 interface.

2.2. The Server Side

On the Server PC was installed a server application: Apache Tomcat Server 5.5. As a server application was developed and installed a Servlet type application.

The server application has the role to wait for user request and to responds to the user’s requests and also for making communication with the PLC.

When the Servlet application receives a request from a user the following steps are completed:

- it’s identified the request type
- are processed the data needed by request
- the results of the processing are send, as response, back to the user

For the database connection we used JDBC (Java Data-Base Connectivity). The database server used in this project is MySQL, but it can be any other database server.

For implementing the communication with the PLC was used a special archive which contains a collection of Java classes (RxTxcomm.jar). The commands for the PLC have a well defined format.

When the user request for uploading a program into the PLC, every operation of the program will be uploaded into the PLC’s memory in the order from the program. The parameters which defines an operation will be written into a memory area determined by the operation’s position into the program.
2.3. The Web based client application

The application was developed as an Applet integrated into a Web page. For security reason the user must authenticate before using the application. For that a login page was implemented.

If the authentication process is realized successfully a new dialog, which contains all options of the application integrated into menu, is opened.

The user has the possibility to create and edit new programs, to view and modify the existing programs or to upload the programs into the PLC’s memory.

In the program’s editor the user can chose the operations and insert the characteristic parameters.

![Fig. 3 The program’s editor](image)

2.4. The mobile client application

The version of the client application developed for the mobile devices compatible Java is different, as interface, that the previous one and have less functionalities.

The user has the possibility to open the existing programs and to upload them into the PLC but he couldn’t edit them. We have abandoned the possibility of editing because of the disadvantage that the mobile devices have a screen which allows being view only a small area.
The mobile device should be configured for enable access to the Internet through
the Mobile Phone Operator.

The address to the server, where the application has to connect during execution,
is specified into a special page of the application. The address is saved into the
memory phone and the user doesn’t have to reenter it at every execution of the
application.

Fig. 4 The authentification page
3. CONCLUSIONS

The application can be used not only at monitoring and control of the industrial wash machines but at any industrial equipments or series of equipments which can be automated.

The advantage is huge because the programs can be saved into a database (which is limited as size only by the free disk space of the computer where it’s resides) and can be loaded from there at any time then it is needed.

The most important advantages of the system are:

- mobility – the application can be executed from any PC connected at Internet or from any mobile device which have the application installed;
- portability – the application is cross-platform and cross-browser (the Java platform assures this advantage);
- security – the access to the system’s application is made using a username and a password;
- low cost – the technologies used for implementation were free (by example: Java, MySQL, Apache Tomcat Server).

4. REFERENCES