

GRAPHIC INTERFACES FOR AUTOMATION OF HORTICULTURAL PRODUCTS CULTURE AREAS

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Abstract – The present paper shows the development of a graphic user interface, the software engine that was released for automation of horticultural products culture areas.

Keywords: *graphic interface, automation, microcontroller, communication.*

1. INTRODUCTION

For automation of a horticultural products culture area was developed a complex system having 3 controllers with Atmel microcontrollers(ATMEGA 8 and 89C52) disposed like in figure 1.

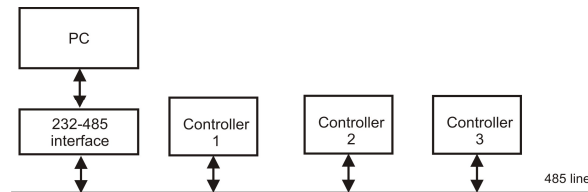


Figure 1: The architecture of hardware system

These three controllers are collecting information from sensorial system disposed in culture spaces, send command to execution elements and communicates with the hierarchical superior level that is a computer. The computer is design to display these information and to make the interface between human user and controllers for sending alerts and parameters for culture process.

2. SOFTWARE ENGINE OF GRAPHICAL INTERFACE

Because all controllers communicates using a 485 line, the packets emitted are signed with an individual signature. The core of Win32 application developed using Microsoft Visual Basic and C++ have to receive these packets, identify them and extract the useful information like temperature, elements state, humidity level or CO₂ concentration. The user can modify all parameters of the process and a package will be sent via 485 line having a

destination address. All controllers will receive this package, but only one will be using it.

3. Application

Starting of the execution of this application leads to the display of a splash-screen followed by the program main window.

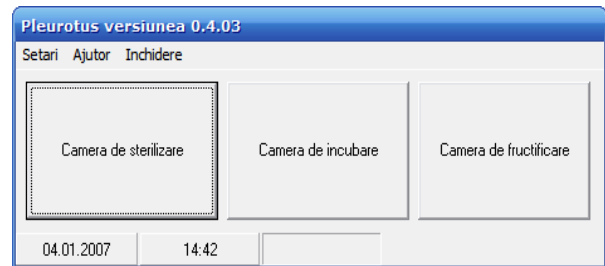


Figure 2: Main window of application

From this window the monitoring windows of the three areas can be displayed and also, the different parameters of the application can be set.

3.1. Serial communication settings

From the menu *Setting* it can be chosen the serial port on which the computer communicates with the interface with the bus 485. The communication parameters of serial port are: 19200baud,8,n,1, but all of these can be modified.

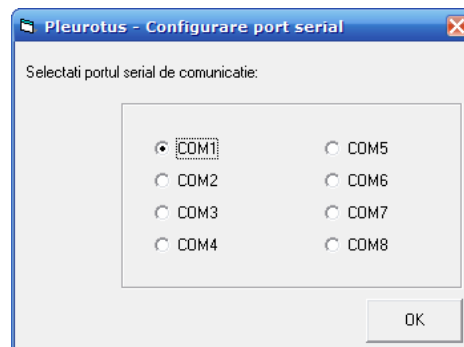


Figure 3: Serial port configuration

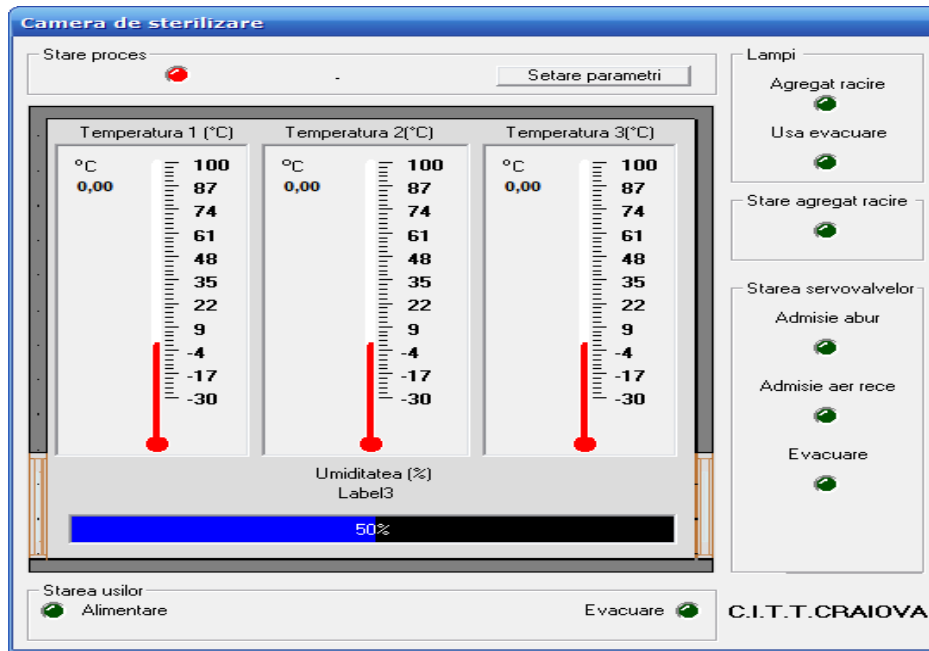


Figure 4. The interface for sterilization room

3.2. Sterilization chamber

Pushing of the button *Sterilization chamber* leads to the apparition of the bellow window. This window enables to see all execution elements (ultraviolet lamps, electro valves, cooling aggregates) as well as the sensors temperature values and values for measuring the concentration of CO₂.

The button *Parameters setting* leads to the apparition of the window of the picture 5.

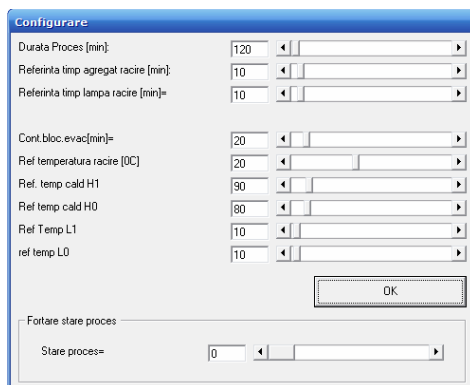


Figure 5. The configuration panel for sterilization

The set parameters are the following:

- The process lasting;
- The earlier time in which the cooling aggregate will start before its use;
- The earlier starting time of the lamp UV from the microbiologic filter;

- The unlocking time of the exhaust door;
- The temperature limits between which the electro-valve will operate
- The temperature at which the room is cooled the steam being exhausted.

The process can be forced to switch in a condition desired by the operator.

Pushing the *Incubation chamber* leads to the apparition of the window showed in the picture 5. The panel for fructification chamber enables the visualisation of the time passed since the process starting and the evolution of the three parameters. There are also signalised the operating condition for all the system execution elements: ultraviolet lamps, electro-valves and the lock door system.

3.3. Incubation chamber

In the incubation chamber, the monitored parameters are temperature, the humidity level the CO₂ concentration. For that chamber was developed another interface presented in figure 6.

All information received from incubation chamber are displayed in the form of application using three thermometer active controls and leds. In that way, the interface is more readable and more expressive.

The button *Parameters setting* displays the form from figure 7. That form gives the control to user to the following parameters:

- Cycle time;
- Time to start ventilation;
- Time to turn on microbiological UV filter;
- Minimum temperature;
- Maximum temperature.

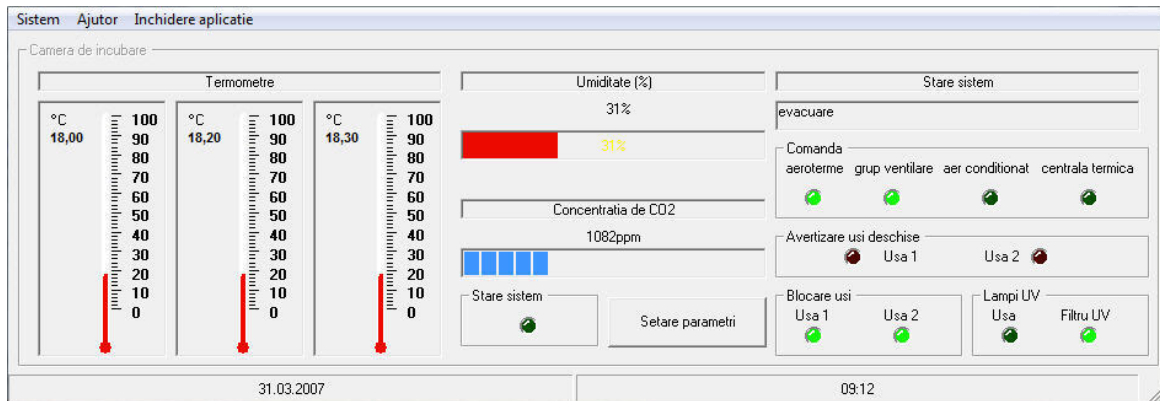


Figure 6. The form for sterilization room

When the user press the button OK, all these new setting are sent to microcontroller witch will command the incubation process.

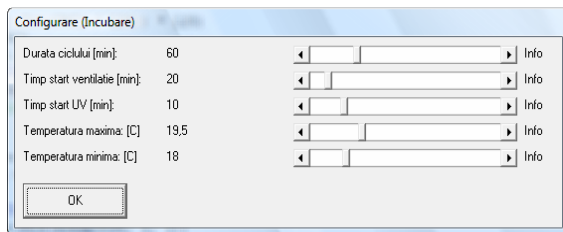


Figure 7. The control form of parameters from incubation chamber

There parameters are three temperature, the humidity level the CO₂ concentration. If is necessary, the user can configure about the humidity level the CO₂ concentration.

To do that, the user have to access the button “Configuration” from the application’s form presented in picture 8. This button gives to the user the possibility to change the range of parameter’s evolution. This setting are sent to controller using a data package via 485 line.

Another information displayed are the states of: access door, ventilation system, cold down and warm-up systems, servo valves and ultraviolet lamps.

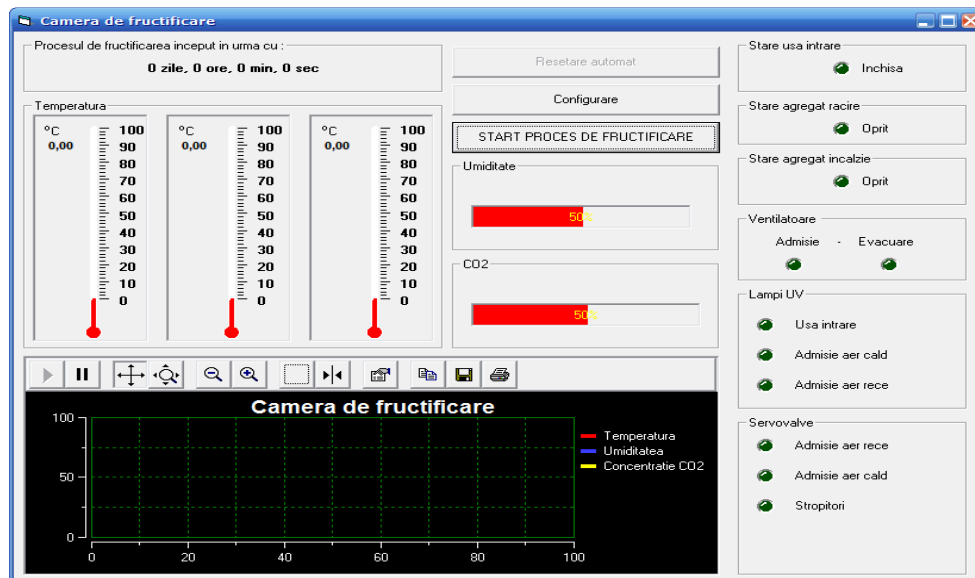


Figure 8. Fructification chamber

3.3. Fructification chamber

In the fructification chamber is running the longest process and most important process. Here all parameters must be strictly monitored and controlled.

For that area it was displayed the history for parameter’s evolution using graphic curves.

All traffic information via 485 line are protected using CRC code protocol. The routine that verify the integrity of information package are written separately in a dynamic library using C++ language.

The controllers hardware system have an output reserved for an alarm device. When a parameter is out of normal evolution range(because an execution element failed) an acoustic alarm is started and a visual one on the computer's display.

4. CONCLUSIONS

All modules of the presented application is running on a Pentium 4 computer with very good results. It makes the interface between cultures areas personal and automation system designed to monitor the environment parameters and to command the execution elements.

The log files created by the application are very useful to examine the monitored processes. In this files are stored information about: date, time, measured temperatures, humidity level and CO₂ concentration, states of execution elements, commands sent to controllers. In need, that application can be completed with a remote administration module to interface with an Java applet in a webpage.

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