Grado en Ingeniería Electrónica de Comunicaciones

LabVIEW Programming

ASSIGNMENT

Temperature Control with LabVIEW

Contents

Figures

Introduction

In this work, you will develop a software control to manage the oven temperature. You will use a DAQ board and the oven simulator board that was used in the past exercises course.

The user must be logged to let perform the operations such as:

Monitoring & control the temperature system save the last monitored Temperature data to file, load and display a previously saved data file.

In order to control the oven temperature, you must fix one maximum temperature (*Temp. Max*) and one minimum temperature (*Temp. Min*). Both temperatures can be set in a window of the program. The control software will be able to maintain the oven temperature between the two values.

Specifications

Your Temperature Control software must meet the minimum specifications (student is free to increase specifications) described below in order to receive a passing grade. If the student/s improves these specifications, it will be marked adequately. The Menu window shown on the Figure 1 could be based to the Exercise 5 of the Lesson 3 or an Events structure, similar to the example than you have studied in the Exercise 6 of the Lesson 3: Experiment with design patterns (Events.vi).

The software must be a view like the Figure 1. The controls must be always adequately enable and disable.

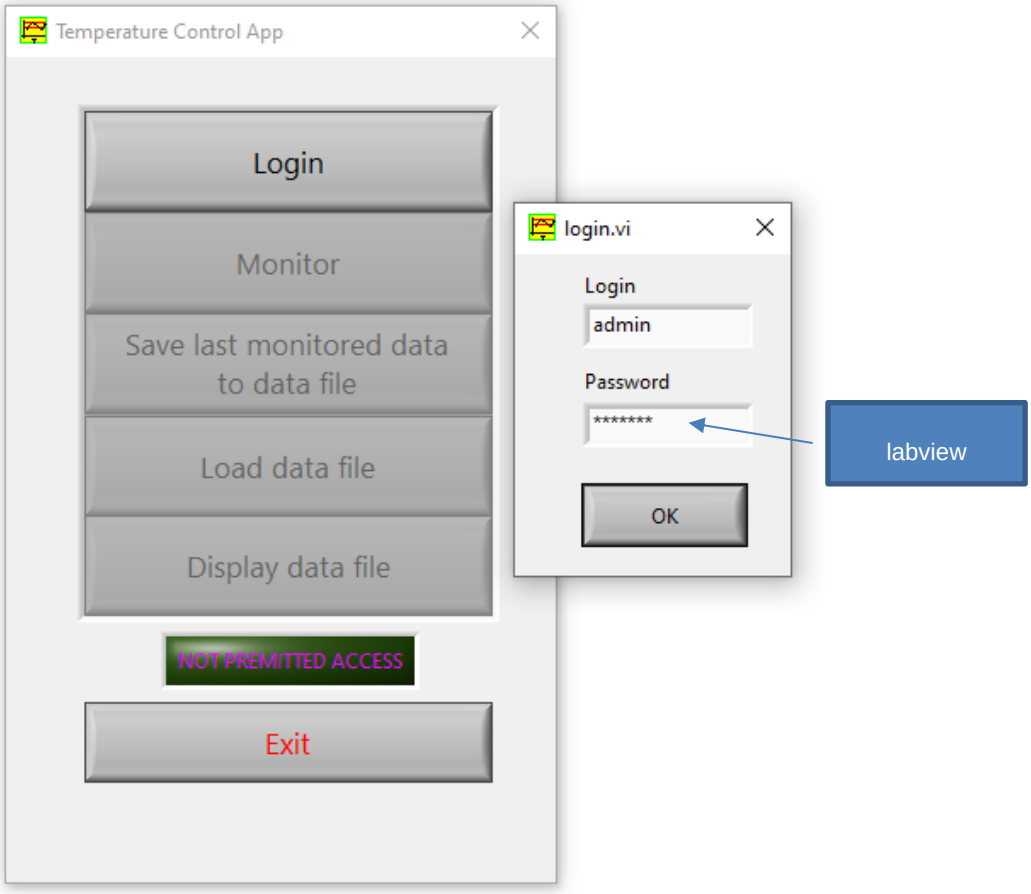

Figure 1: Menu window of Control T (simulated Hw).exe

When the user was logged the controls will be enabled to start the Monitoring, Save data, Load data and Display data (this operation will be enabled if there are previously loaded data file). It is shown in the Figure 2.

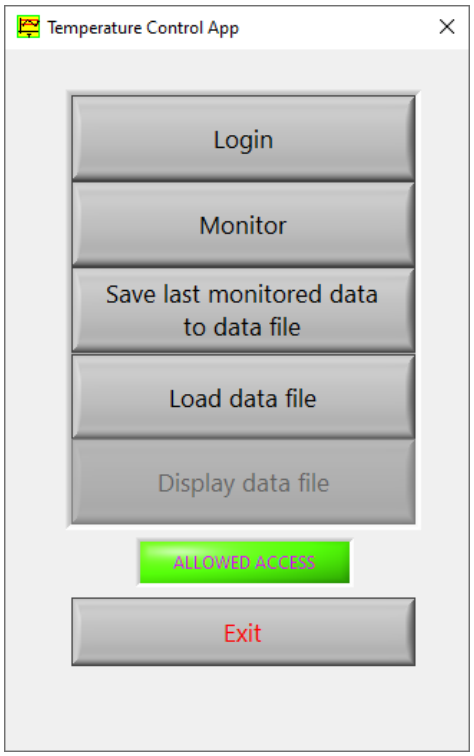

Figure 2: Menu window of Control T (simulated Hw).exe after logged

When the user selects the *Monitor control*, the *Oven control* software must do the following:

- The software will show a front panel similar (student is free to make changes) to the Figure 3.

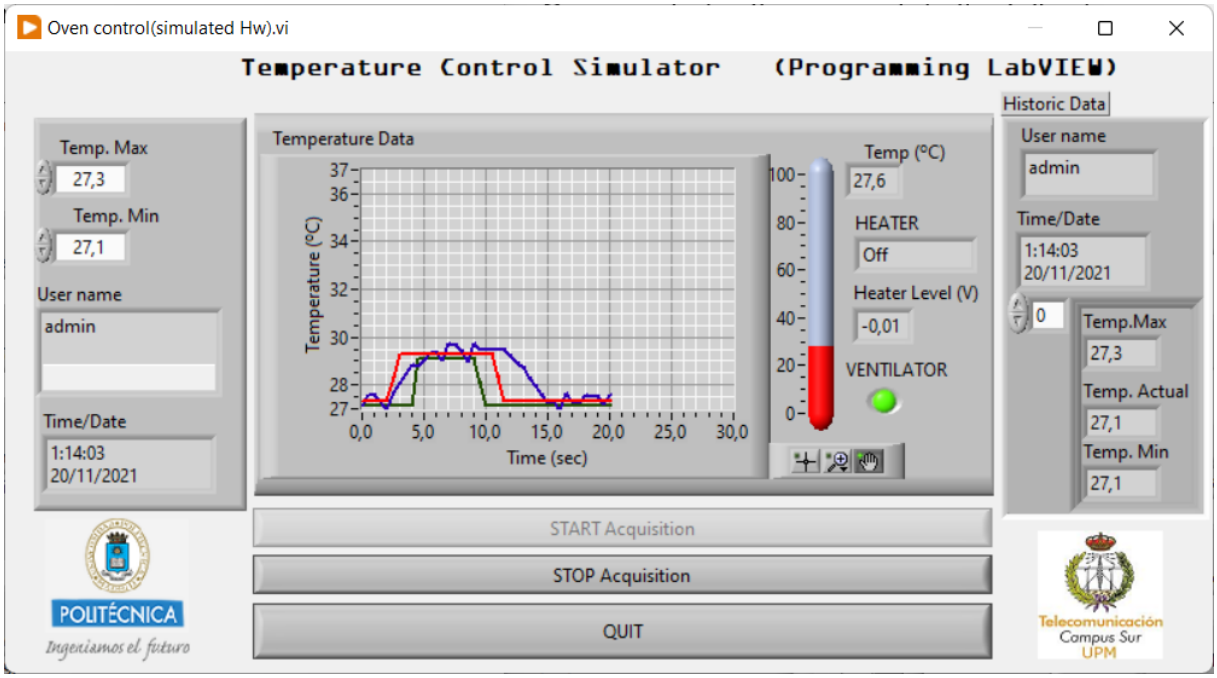

Figure 3: Monitor Window, Oven control

- The *Temp. Max* and *Temp. Min* controls will have default values when this window appears, and the user name indicator will have the same information as the first step above, prompting for user name and password.
- The software must have the following control operations:
  1. The *Oven control* software will read the oven temperature every aprox. 500 ms
  2. The *Oven control* software will show in "real time" the actual temperature (*Temp*), the maximum set temperature (*Temp. Max*) and the minimum set temperature (*Temp. Min*).
  3. The user must be able to vary the temperature controls (*Temp. Max*) and (*Temp. Min*), each time.
  4. If the actual oven temperature (*Temp*.) is lower than the minimum temperature (*Temp. Min*), the system must turn on the *HEATER* with the maximum excitation value (*Maximum*). The *VENTILATOR* must be off.
  5. If the actual oven temperature (*Temp*.) is between the maximum and minimum temperature (*Temp. Max*) and (*Temp. Min*) the system must turn on the *HEATER* with the medium excitation value (*Medium*) and turn off the *VENTILATOR*.
  6. If the actual oven temperature (*Temp*.) is greater than the maximum temperature (*Temp. Max,*) the *Oven control* software must turn on the *HEATER* without excitation, and the ventilator must be on.

When the user clicks on *START Acquisition control* the *Oven control* software will monitor the temperature. When the user clicks on *STOP* control, it will stop acquiring data. The software must then input the acquired data to the *Historic Data* indicator, so all data is available to the user until he exits. When the user clicks on *QUIT* control, it will stop acquiring data, and the *VENTILATOR* and *HEATER* will turn off. The *Monitor window, Oven control* software will be closed and the program will return to the *Menu window*.

The *Oven control* software must be implemented like the States Machine of the Figure 4. Although it could be modified it the students want add upgrades.

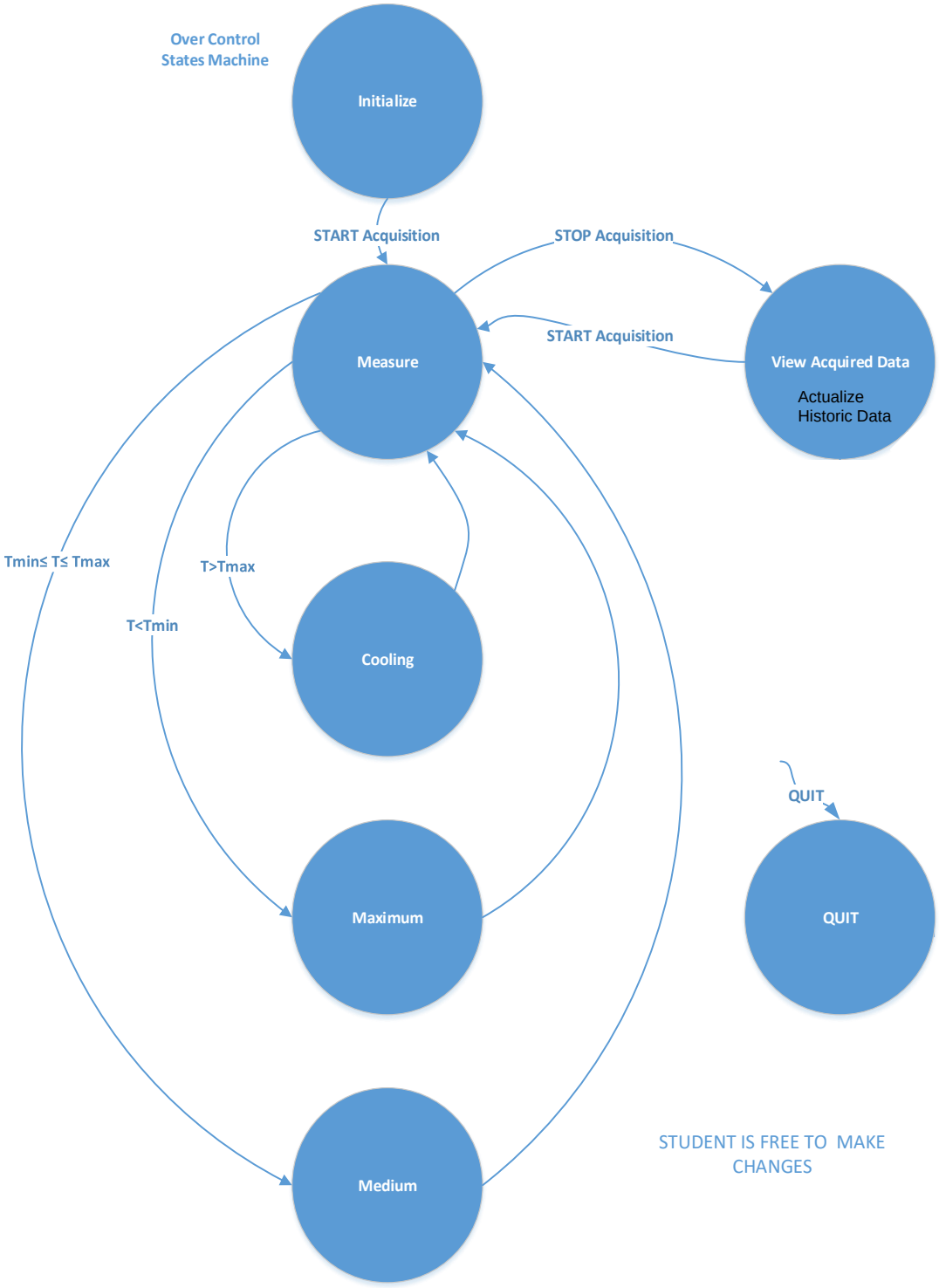

Figure 4: State Machine of Oven control

From *Menu window*, the user will be able to *Save the last monitored data to data file* with the most recently acquired data.

From *Menu window*, the user will be able a *Load a data file.* When the data file was loaded, the *Display data file control* will be enable. When the user clicks on *DISPLAY data file control* the system will show the windows of the Figure 5 with the data logged.

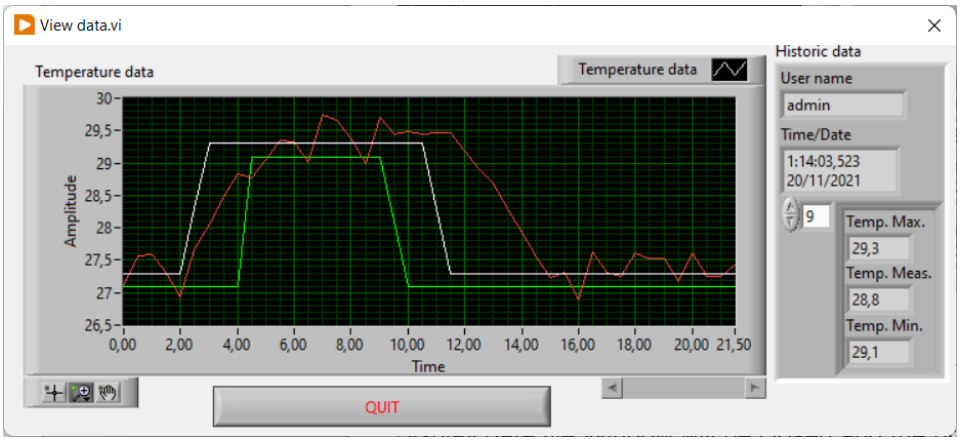

Figure 5: Display data file window

When the user clicks on *QUIT* control The *Display data file Window* (Figure 5) will be closed and the program will return to the *Menu window*.

When the user clicks on *EXIT* control (Figure 6), the *VENTILATOR* and *HEATER* will turn off, and then, the program will be over.

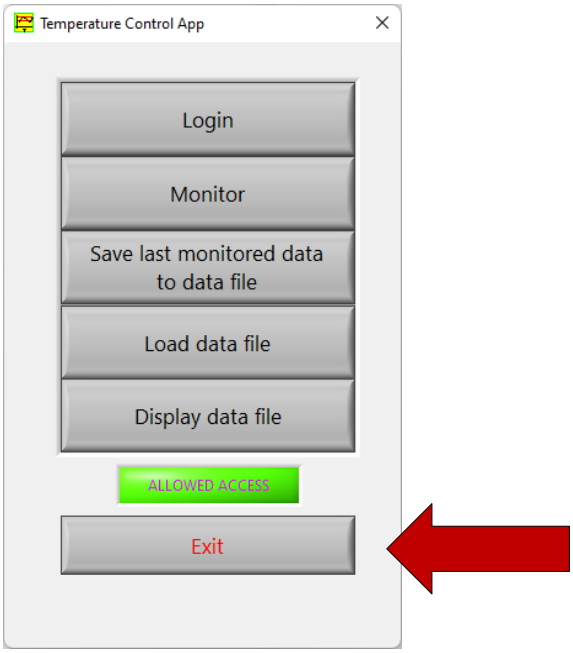

Figure 6: Exit, Menu window of Control T (simulated Hw).exe

The architecture software design is a State Machine.

You can find help about working software in the example of Moodle: ***Control T (simulated Hw).exe***. The program only works if is installed LabVIEW.

Works delivery and assessment

When the program is finished, every group of students (one for group) will send by Moodle (The deadline submission and instructions is set in the Moodle task) an unique file.zip with:

- Detailed description of the chosen software design (States diagram, flow chart …) and the chosen Design Pattern.
- Errors handled by the software.
- All files project

The exam will be individual format individual and the mark obtained by every student will be based in the followings aspects:

1. Functions and improvements made: makes up 40% of the total grade. Feature compliance and improvements included will be assessed.
2. Programming style: makes up 40% of the total grade: The design software, the readable, scalable and maintainable code, the cohesion and coupling of code and the correct use of advanced programming structures will be assessed.
3. Code Documentation and User Interface: makes up 15% of the total grade. Your comments on the diagram explaining what the code is doing, free labels on wires to identify their use, labels on structures to specify the main functions, labels on constants to specify the nature of the constants, and comments documenting the algorithms used on your diagrams will be assessed. The usability and appearance of the front panels will be assessed.
4. Instructor assessment of the student of LabVIEW and the program: makes up 5% of the total grade. The instructor will assess the knowledge acquired by the student. If the instructor feels that the student has not obtained the minimum level of knowledge in points 1 through 3 above, the student will not pass Assessment.