VIRTUAL INSTRUMENTS FOR PARAMETER EVOLUTION SIMULATION IN A MILK STOCKING TANK

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Abstract

The purpose of this paper is to familiarize both industrial users and those from the education process, with the possibility of making more efficient the analysis and surveillance instruments.
Flexibility and modularity of the system presented in this article allows more types of simulation and then of real monitoring of important parameters form the production processes in food industry, connected with the virtual instruments represented by the LabVIEW program.
Together with these possibilities, LabVIEW can ease the connection of the DAQ plug – in acquisition boards and of the autonomous digital devices in favor in order to collect data and then interpret it.
***Keywords**: virtual instrument, process stimulation, temperature monitoring, level control.*

Introduction

The domain of monitoring or conducting production processes and automation fully benefits from the extraordinary evolution of the calculation technique through the implementation of some more and more performing control and measurement systems (Sandu, 1999).

Using PCs within these systems one benefits from all available resources, like a very high calculation power, data storage and representation, as well as the special flexibility of configuration or re-configuration of the system by adding new functions.

The use of programs dedicated to data simulation/acquisition and processing make from the PC the ideal solution for these kind of applications (Cottet,2001).

Such a program that answers the higher needs of the increase in the speed of data collection and interpretation from the industrial processes it is enclosed in the *LabVIEW* package developed by National Instruments Company (Kasemir, 2000). The power and facilities of this program allow the realization of complex applications in a very special graphic manner, much closer to the human thinking fact that makes the application easy to be used even by persons that do not have experience in using programming languages (Dunea, 2004).

Therefore, a virtual instrument created in LabVIEW can be used both for stimulating some physical phenomenon and as a real application that takes the data through an acquisition board.

The surveillance of temperature, in the sense of over passing some admitted minimum and maximum limits, is the most frequent industrial application, being presented in applications of following the process (monitoring) parameter evolution, in the automatic regulation systems or in the distance control systems (Dunea, 2004).

In this paper we have developed an application (virtual instrument) o stimulating the acquisition of temperature and level from a milk storage tank

Experimental

The virtual instrument was developed on a LabVIEW 7.0 Express platform, simulating data acquisition and display.

The application consists of the measurement of two parameters – temperature and level – by determining the average values starting from a fixed number of measurements.

The algorithm of this application is the following:

Process regulation program:

Control instruments: the number of measurement points, the minimum and maximum value of temperature;

Indicator instruments: the number of measured points. the average value of temperature, average level, minimum and maximum value of level, and displaying parameter variation graphics.

The mentioned application takes over the temperature information through an automatic device that randomly generates values within an acquisition loop (*Acquisition Loop*) and displays it through the thermometric indicator and their time evolution graphic (figure 1).

The values within the loop are generated similarly in order to stimulate the acquisition for the tank level.

The execution of the program will be done through this window with the help of the execution button (*Run*) that is located in the bar under the menus. This has as effect the production of some instantaneous values that are displayed on the indicator instrument *Thermometer*.

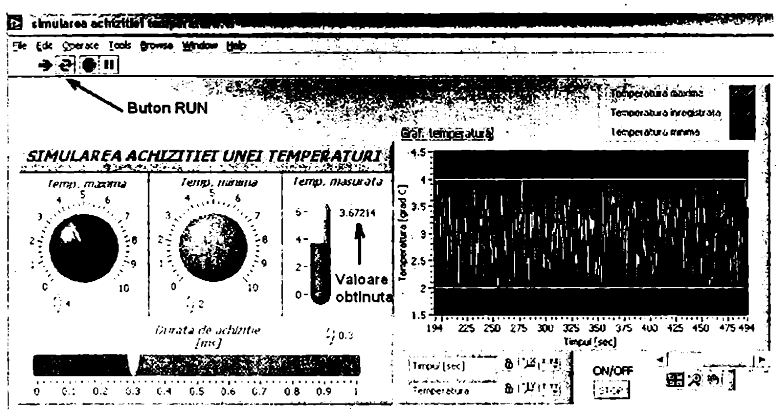

Fig. 1. Front board for the simulation of the temperature acquisition.

It is very important to mention that during the execution of the program a modification of entrance variables acting on the control instruments on the front board is possible to occur.

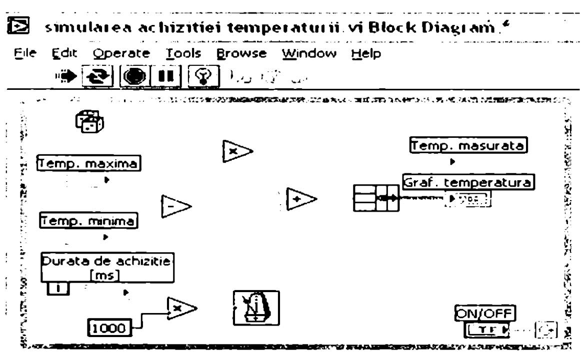

Fig. 2. Block diagram of the application

The first remark that has to be done after the presentation of the front board construction is that together with the placement of *variable* type objects (entrances and exists) they also appear in the diagram window (figure 2).

Here one can see the terminals that correspond to objects, where the logical connections between the entrance and exit terminals being done

The data flux represented in the functional diagram implicitly specifies also the operations that are done simultaneously. Having a modular design (Savu, 2000) there is the possibility that any other already created virtual instrument can become a component in another one, the LabVIEW constructed programs being defined as virtual instruments.

Results and Discussions

The digital thermometer contained by the *while* structure stimulates the taking over from a temperature acquisition board that are to be transformed by *VI*.

About the *board window*, we can make more remarks:

- Displaying the two curves (temperature and level) is done with the help of the object *Graphic* using two personalized curves that evolve independently;
- In order to establish the areas for the temperature and level parameters the range of commands was used with a different color for the two areas;

Interactive window with the user, named *board window* is represented in figure 3.

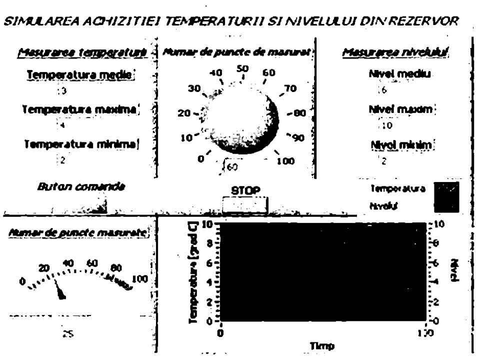

Fig. 3. - Interactive window with the user.

The program for this application, comprising a *while* loop integrated in a *Sequence* structure encloses two stages: *stage 0* is the stage of data acquisition and *stage 1* the one of process interpretation and command. The first step of this structure *Sequence* will enclose two *For* loops for temperature and level control. (figure 4 and figure 5).

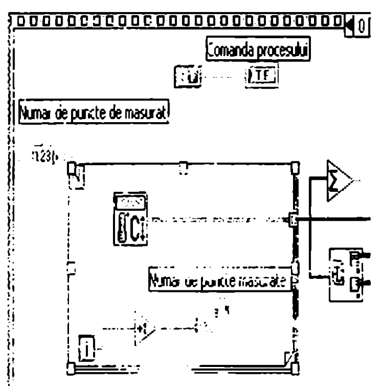

Fig. 4 - Loop *For* for temperature measure

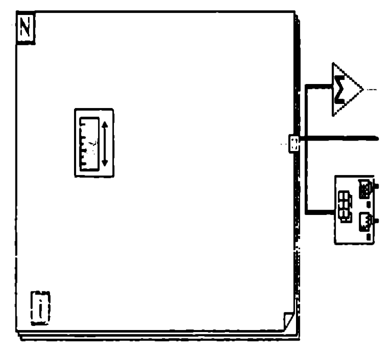

Fig. 5 - Loop *For* level measurement

Contrary to the presented algorithm the two loops are done in parallel as no sequentially is imposed.

At the exit from these two loops one can analyze the exit data – average value – maximum value and minimum value of parameters – with an *Add Array Elements* function (figure 4, 5).

It is important to notice that the different instruments are made of endless loops of *While* type that are stopped by pressing the button *STOP* located in the *board* window of the application. If this structure is not used, it is necessary the execution of the virtual instrument for each data acquisition with the help of the *Run* button.

If the structure *While* loop is used, the pressing of the Boolean *STOP* button from the *board window* leads to the stop of the functioning program. This type of functioning gave the programming language the name of *data flux*.

Therefore the data registered at the end of the *While* loop diagram execution are considered as entrance data in the case of loop re-execution.

Conclusions

Knowing the evolution of phenomena in the industrial processes is essential in their assessment and the acquisition instruments for processing and shaping of parameters are used to extend the results of time and space monitoring.

The results obtained by executing this virtual instrument lay the basis of the continuation of these types of applications. By connecting to the computer an assembly of temperature and level sensors and an acquisition board *DAQ- plug in* the application can pass from the virtual environment to the real one being a relatively cheap instrument common to specialists.

In the close future we wish to make also the instrument part that take over the real data in order to include it in the parameter monitoring and regulation system from the food industry.

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The margins will be: top 3 cm, bottom 2,8 cm, left 2 cm, right 2 cm, header 1,8 cm, footer 2 cm. Notice that the header and footer are different for the odd and even pages.

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Item	**Font**	**Size**	**Style**
Title of paper	TNR, UPPERCASE	12	Bold, Centered
Line spacing after paper title	-	12	-
Authors	TNR	11	Bold, Centered
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Line spacing after affiliation and contact	-	10	-
Abstracts (100 – 200 words)	TNR, Italic	12	Normal, Justify
Keywords (3 – 10)	TNR, Italic	12	Normal, Justify
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Text (single - spaced)	TNR	12	Normal Justify
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Tables Title an Content	TNR	10	Bold Centered at the top of the table
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