SOFTWARE PACKAGE DASYLAB SUPPORTING RESEARCH AND TEACHING

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Abstract: The teaching of subjects connected with electricity, such as electrotechnics or electronics is an important part of school and technical university curricula. Due to the recent development of computer technology, the traditional laboratory classes can be now complemented with measurement simulations carried out in the virtual environment. The paper presents such a simulation process of a measuring system in the software environment DasyLab.

Keywords: teaching, electricity subjects, simulation, DasyLab environment.

1. INTRODUCTION

The recent years have witnessed a fast technological progress in the field of computer science. Due to the development of information technology and electronics a concept has appeared of a device not existing in reality but performing a certain function for the user, and employing both material and non-material means. All the functions of a traditional measuring device are performed by its hardware, in the case of a virtual device or system it is not so. In a computer measuring system with a graphic interface, what is performed by the hardware is the acquisition and processing of data and what is performed by the software is the functions of the graphic user interface. This term has been created also to refer to new software devices for the computer-supported designing of measuring-information systems [1,2]. Such devices enable the use of an instrument or a system by means of the graphic interface. The choice of content to be represented and the way of representing it on the particular panels of the virtual device are up to the user. The software is a crucial component of the measuring system and determines the way and extent to which the device is utilized. It enables convenient monitoring of the measuring process, archivization of and access to data, its analysis and processing and presenting results in the required form [3,4,5].

The evolution of measuring devices has taken place due to the fast development of science and technology. Changes could be observed in the methods of processing measuring signals, the principles of designing devices, the ways of utilizing measuring equipment and levels of interaction among the particular devices in a system. The next generation was that of the so called systemic devices [1,2,6], which could be either used as an independent measuring device or it could be remotely controlled by providing channels of external digital communications, i.e. digital interfaces. The current generation of measuring devices, consists of a general-use computer with software and systemic devices or measuring devices of a new generation, such as measuring cards.

2. THE DASYLAB SOFTWARE PACKAGE IN THE TEACHING OF ELECTRICITY SUBJECTS

The traditional classroom or lab for teaching electrotechnics and electronics consists of a number of terminals for conducting previously prepared experiments. The experiments are about connecting a number of measuring devices and performing measurements in the so obtained system. Students’ task is to select the devices properly and to connect them in accordance with the instructions provided. After performing the measurements, students write down the results in a protocol, on the basis of which they prepare a report. The report additionally includes calculations, tables and graphs representing the results, as well as conclusions from the experiment. Due to the fast development of computer technology it is possible to employ various computer programs in teaching. Two main tasks of these programs are:

− simulating the operation of electrical or electronic systems in the computer independently of the hardware or connecting it to the traditional measuring device,
− controlling traditional measuring devices by means of a computer program, which displays a virtual control panel for the user. Results can be recorded directly in the program. On the basis of the results it is possible to perform any operations involving their processing or graphical representation.

2.1. Properties of software package DasyLab

DasyLab software package is relatively simple to use and allows you to quickly familiarize with system capabilities. There are programs with much greater capabilities such as LabView. Getting familiar with them to take advantage of it takes a lot more time. It also requires a lot of experience, which cannot be acquired in the course of teaching. DasyLab program can be regarded as a simplified but more affordable version of the software branded by the same manufacturer National Instruments. DasyLab software is available on the manufacturer's website in a full trial version to use for a period of 28 days. During this time, you can familiarize yourself with the system and know its characteristics. This time is sufficient for use of the software package as part of student's individual work. Later,
The experience gained can be used in laboratory where licensed software is available. The DasyLab system enables the user to tackle all problems connected with data acquisition and processing. What is innovative is the great simplicity of using the program by constructing a scenario for the analysis by means of icons. Connecting icons represents the path of data flow and its analysis, constituting the data flow worksheet shown schematically in [7,8,9].

The ease of creating the measuring schema required for the analyses we need and the possibility of representing them graphically in real time are an important advantage of the software. DasyLab makes it possible to create one’s own application for data acquisition and analysis within a few minutes. It also makes it possible to solve even complicated acquisition-control problems without any additional programming [10,11,12]. The symbols of modules required are simply placed in the worksheet window and connected. The modules represent input blocks, output blocks, displays, and each of numerous operations which can be performed by the program [13,14]. The DasyLab software package constitutes a unit as a measuring system with a measuring card and a PC computer. The computer performs a central role by controlling the processes of data acquisition, its processing and analysis, and then the presentation of results in a form chosen by the user. Results can be also archivised so that access to them is possible at any time they are required for further examination.

2.2. Application of measuring system

The measuring system based on the DasyLab software was constructed for the acquisition of measuring data from an inductive sensor for measuring of anti-corrosion coatings. These coatings are used to protect steel components from harmful effects of corrosive environmental conditions. On the basis of this, a laboratory terminal was developed for laboratory classes in the subject Measurements of Non-electric Quantities by means of Electric Methods taught at the faculty of Electrical Engineering, Częstochowa University of Technology.
The DasyLab environment can be used for modelling various measuring and simulation systems created within the measuring system on the basis of the programming modules available.

For example, for the measurements of the coating thickness with the inductive converter, a measuring system was modelled as presented in Figure 1.

2.3. Modeling data analysis system for measurement

Particular stages of modelling the system for coating thickness measuring are presented below. Such a system can be built during the simulation class with computers with the DasyLab package. This system can be subsequently examined in the virtual environment before it is used in laboratory classes or employed for measuring real industrial objects.

In order to adjust DasyLab to the requirements of the measurements of the coating thickness, a measuring system was especially designed. At first a system for generating a signal feeding the sensor was built together with the measuring part, representing results on the display as temporal waveforms or as values in the case of using the digital display module (Fig. 2).

The signal simulation block consists of a sinusoidal generator of constant amplitude and signal frequency. The signal is generated and then amplified. The signal is transferred directly onto the oscilloscope output as time characteristics. Since the information on the coating thickness is encoded in the amplitude of the sinusoid signal, the amplified signal is brought to the module determining the maximal and minimal values of the waveform examined.
Since the measuring signal is subject to external interference of about a few tens of hertz coming from the grid and of radio frequency from the ambient environment, the system includes signal filtering modules. Here a couple of filters is employed: a low-pass filter and a high-pass filter. In this way an optimal operating spectrum is selected for the measuring system. Filtering can be switched off at any time and both the frequency of the attenuated signal and the type of filter from among those offered by the system can be selected. The operation of the system in the DasyLab environment is illustrated in Figure 6.

This system additionally includes a module adjusting the signal from both filters and transforming the two measuring trajectories into one common signal.

The version of system presented in Figure 7 had the acquisition path of the measuring signal amplitude modified. Instead of the module analyzing the maximal and minimal value of the signal and the module for averaging the two, there is a module averaging the amplitude by analyzing a sufficient number of signal samples. With the signal averaging module it is possible to adjust the parameters during the system operation. In the previous version it was necessary to interrupt measurements, introduce corrections and only then resume operation. In the new version the so called coefficients have been introduced the value of which is input into the system through built-in regulators: knobs, or two different kinds of slides.

So far, the system for measuring the coating thickness is capable of representing a simulated signal whose amplitude corresponds to the sought value of thickness. Naturally, then, the next step is the implementation of this operation into the measuring system.

Again, the value of the coating thickness so obtained in presented in the digital form on the display. The fully extended version of the system is presented in Figure 8.

The system presented above is almost a complete version of a device for measuring coating thickness. What can still be added to it is modules recording results obtained. By using computer-aided learning results achieved not available for learning using conventional teaching methods [15,16]. Many of the systems that you can build and analyze them in a computer program is not can be realized in the classical laboratory because of financial constraints or too little extensive equipment base. The most interesting element, however, remains an immediate opportunity to experiment and test his ideas in a virtual software environment. This allows to achieve very good results both in terms of objectives of teaching and skills acquired during the educational process.

3. CONCLUSIONS

On the basis of the considerations presented above it is possible to draw the following conclusions:

− applying the special-purpose software package offers significant advantages over the traditional teaching methods,

− using the DasyLab software teaches independent thinking, seeking solutions to problems and drawing...
conclusions on the basis of experiments conducted and results obtained,
− a number of systems can be built for the sake of analyzing their operation in a simulated software environment, which reduces cost of conducting such experiments as compared to the traditional electronics laboratory,
− the measuring systems offers an opportunity of experimenting in the virtual software environment.

4. REFERENCES

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PAKIENT PROGRAMOWY DASYLAB WSPOMAGAJACY BADANIA I NAUCZANIE

Streszczenie: Nauczanie przedmiotów elektrycznych takich jak elektrotechnika czy elektronika stanowi ważny element kształcenia w szkołach i uczelniach technicznych. W związku z rozwojem technik komputerowych obecnie ćwiczenia na klasycznych laboratoriach mogą być uzupełniane zajęciami symulacyjnymi w wirtualnym środowisku pomiarowym. W artykule przedstawiono przykładowy proces symulacji układu pomiarowego w środowisku programowym DasyLab.

Keywords: nauczanie, przedmioty elektryczne, symulacja, środowisko DasyLab

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