SOFTWARE APPLICATION USED TO STUDY INDUCTIVE SENSORS

Cercel Constantin, *„Constantin Brancusi" University of Targu Jiu, Romania*
Ilie Borcoși, *„Constantin Brancusi" University of Targu Jiu, Romania*

Abstract: In this paper is presented a software application used for testing inductive displacement sensors through a digital system. The application allow to control the movement of the magnetic core of inductive sensors and measure the values of the inductivity. The software communicates with a data acquisition system and is designed to measure and draw graphics the characteristics of the inductive displacement sensors analyzed.

Keywords: software, inductive sensors, data acquisitions, system, displacement

1. Introduction

Inductive sensor operation is based on a variation of the inductance of a coil supplied with alternating current [1].

The inductive sensors are used in various applications because the sensors does not require physical contact and it is particularly useful for applications where access presents challenges or where dirt is prevalent [7].

Are several variants adopted for inductive displacement sensors:

- mobile core type;
- mobile "I" core type;
- two differential coils type.

2. The hardware system

The software presented in this paper use a hardware system allows the tracing of the characteristics of the inductive displacement sensors model with two coils and a mobile ferromagnetic core.

The general structure of the hardware system is presented in figure 1.

This system has included the following components:

- a displacement control system to control movement with high precision of the mobile core;
- a data acquisition system to measure the output signal from the sensor without affecting the measurement accuracy by introducing

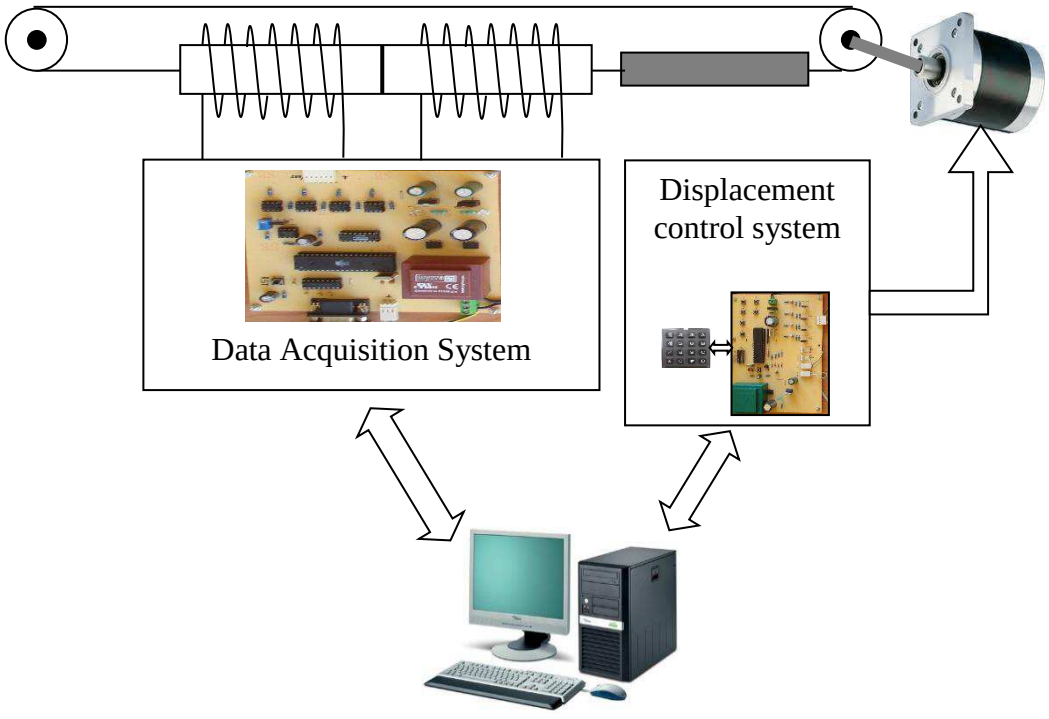

Fig.1. The hardware system

additional errors;

- a manual control of the movement in case we wants to make experiments with resistive sensors but without using software;
- two sensors with which it can be determined the starting positions and the final position of movement so that the system can be recalibrated according to the length of the displacement inductive sensors.

2.1. Displacement control system

The displacement of the mobile core is made by displacement system which transforms the rotation of an action element in translation move. For the acting element there are more solutions: alternative current motor, continuous current motor, stepper motor, and brushless motor. In this application the rotational velocity and torque are small and also that it need a precision movement, was used a stepper motor.

The stepper motor used is a 12VDC motor with five phases motor and the rotation step is 1.8 degree.

The system is based on an AT89S52 microcontroller which controls the stepper motor and the two sensors for any stopping.

2.2. Data acquisition system

The data acquisition system was developed around a microcontroller core from ATMEL AT89S52 family using a 12-bit analog to digital converter ADS7841 and a MAX232 circuit for achieving communication between the acquisition system and the application software running on PC. Data acquisition system receives a command to perform measurements for each of the input channels whenever the movement control system announces the software that he made a number of steps to the last command received.

3. The software application

The software was made so that they can be drawn automatically the characteristics of the inductive displacement sensors analyzed. Also with this application may reveal the influence of the measurement system transfer characteristic. The proposed system has the possibility to connect to each channel of an analog meter to view the degree of influence desired to be analyzed. To implement the software application was used the programming environment LabWindows/CVI which is a software development platform for applications-oriented instrumentation. CVI provides us with an interactive environment to develop applications for Windows. Thus combines the advantages of visual programming type language with the advantages of simplicity and flexibility of C.

On running application a windows like in figure 2 will appear and has available the following functions:

- Button "Resetare Zero" take the cursor to "zero" , respectively take the mobile core to zero.
- Default value of the numeric control "Increment deplasare" is 2mm, but can be set to any other value, setting how many millimeters system will move at one step.

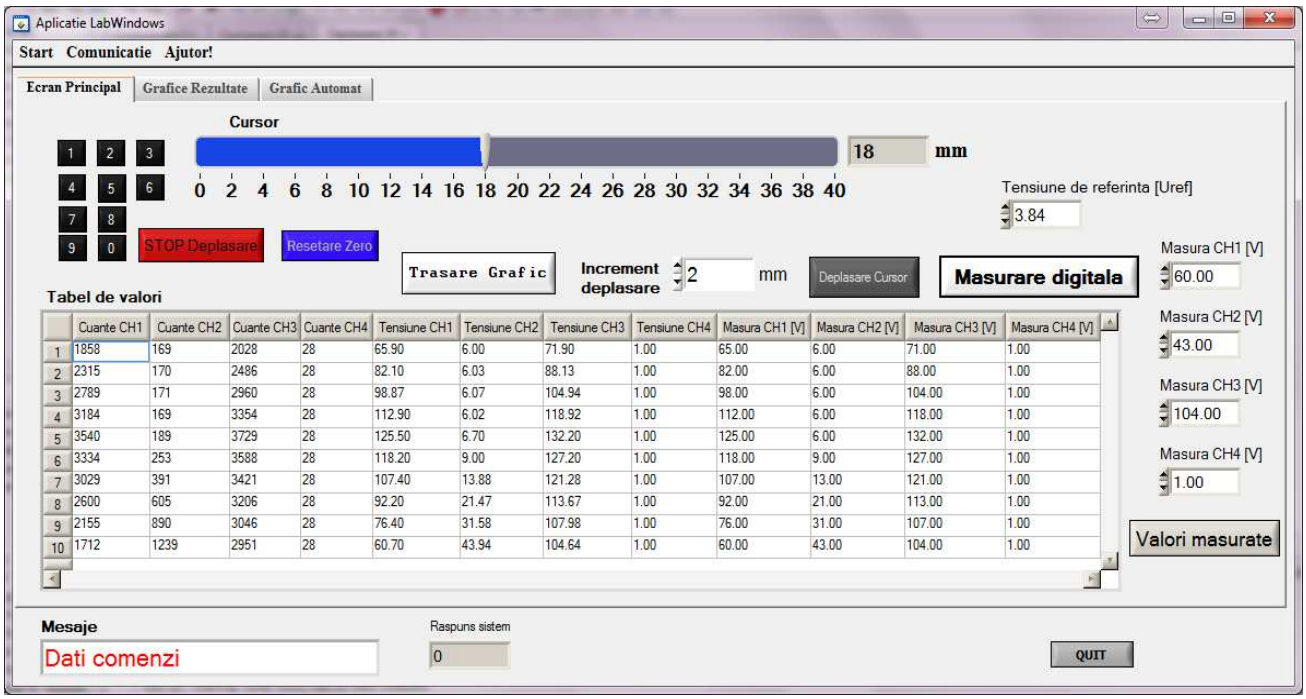

Fig.2. The main user interface of the application

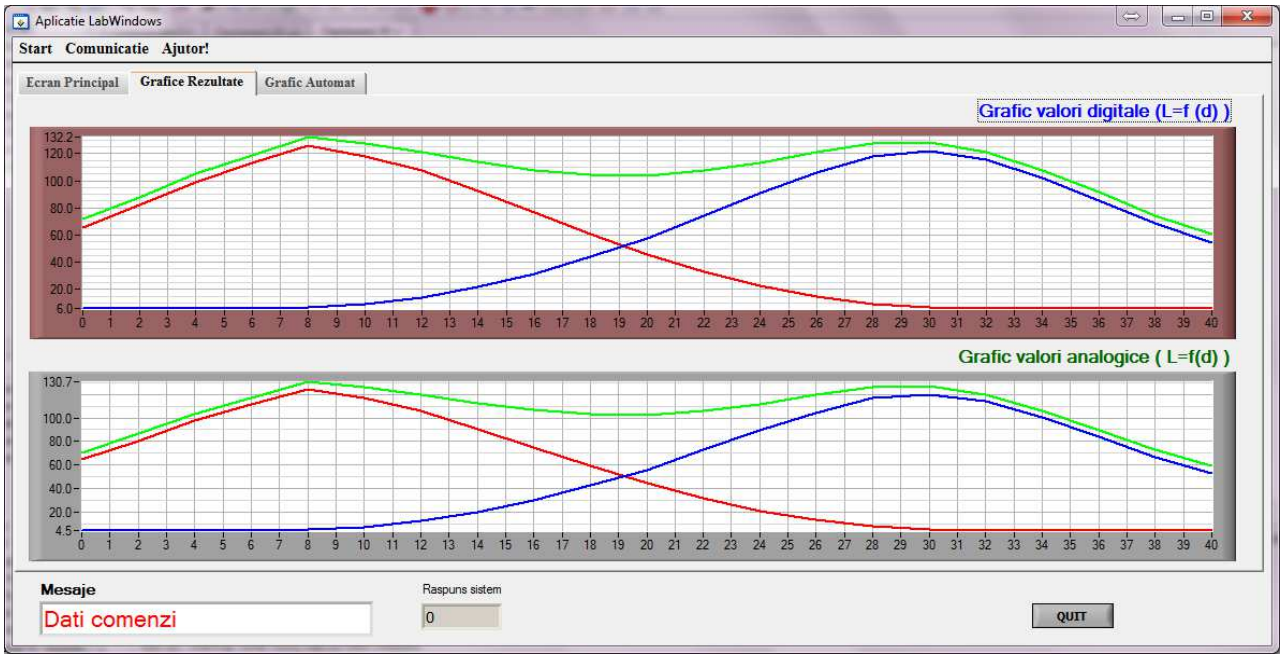

Fig.3. The result of the measurements

- Button "Masura Digitala" put the read values from the acquisition system to the value table, and the numeric controls "Masura CH1[V]", "Masura CH2[V]", "Masura CH3[V]", "Masura CH4[V]" allow to introduce the values from the analog LCR meter for each channel.
- After all values was introduced by pressing button "Trasare Grafic" will generate the characteristics with both read values, from the acquisition system and from the analog meters. These characteristics can be view selecting the "Grafice Rezultate" tab (fig.3).

4. Conclusions

Because the magnetic core movement and values of the output signal of displacement sensors are correlated in time with the application running on PC, can be easily pulled out of the sensor characteristic according to the movement magnetic core.

Using the software application all values can be recorded, saved and exported for further processing.

The inductive sensors have a good immunity to vibration and can be used in applications that require control loops.

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