

# Data acquisition and analysis of real signals experiments

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**Abstract.** *We are trying to develop our studies on gathering, organizing, representing and analyzing the experimental data extracted from the real world from under the frame of the Socrates-Comenius “Hand’s on Science” (110157-CP-1-2003-1-PT). We are still using our data acquisition board NIDAQ 6013 which explores the real world: the uniform rectilinear motion of a racing car, the intersection of two cars, the impacts study using the Force sensor (bought by the HSCI Network), the oscillatory motion using the force sensor, the simulation of the alternating current circuits, the coil in AC, the capacitor in AC, the sonic interference, the magnetic field using the Magnetic Field sensor (bought by the HSCI Network), the boiling of water, etc.. This paper shows a short presentation of these experiments, of the way of gathering and analyze the real signals and the fantastic impact they have on our lessons.*

**Keywords.** LabVIEW, DAQ-data acquisition, DAQ-software, VI-virtual instrument.

## 1. The study of the frictional force

The shortest way for demonstrating the variation of the frictional force during the traction of the sheet of paper under the wooden cube is shown in Figure 1.1. The force sensor coupled with the data acquisition board is used as a dynamometer.



Figure 1.1

The registered signal can be observed in the Figure 1.2

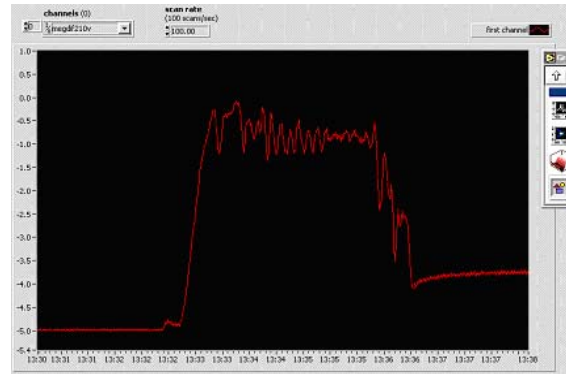


Figure 1.2

## 2. The oscillatory moving

By using the force sensor we can see how the amplitude of spring pendulum oscillations depends on the resistance of the medium, on the friction. It's an illustration of the oscillating regimes. The experimental set up is shown in the Figure 2.1, and the amplitude of the pendulum in air and water is shown in the Figures 2.2 and 2.3.

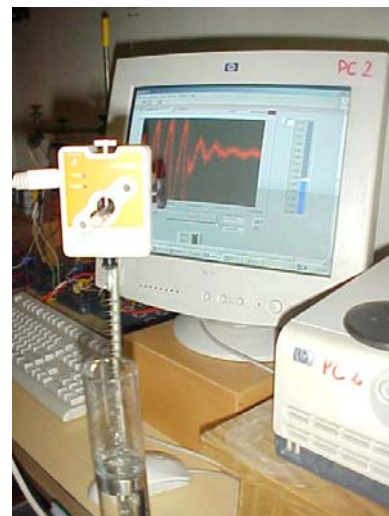


Figure 2.1

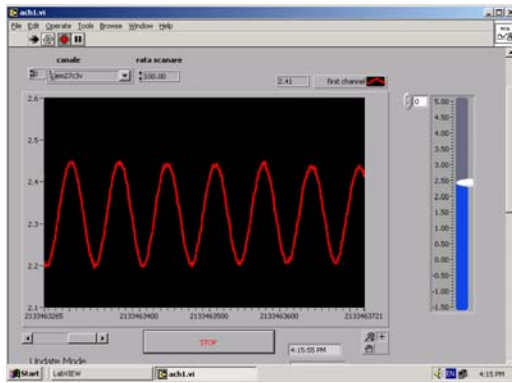


Figure 2.2

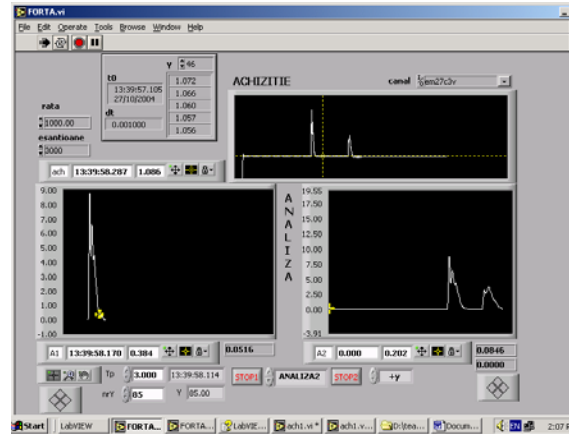


Figure 3.2

Method 2- The experimental set up is shown in the Figure 3.3. The car collides the force sensor which is fixed on the table. For the determination of the speed of the car we have used a photodiode and a led

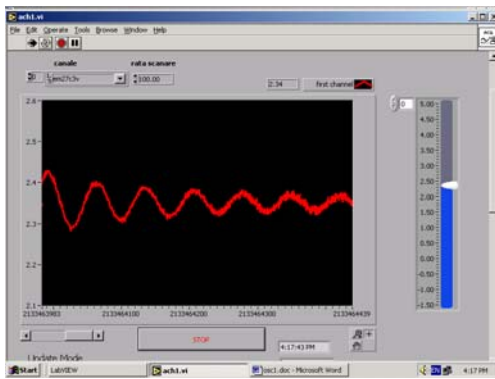


Figure 2.3



Figure 3.3

### 3. The study of the collisions

Method 1



Figure3.1

The Force Sensor helps us to register the dependence force versus time during the collision of a metallic ball that free falls over the sensor, (Figure 3.2). The experimental set up is shown in the figure 3.1. By analyzing the registered signal we can calculate the variations of the momentum and kinetic energy.

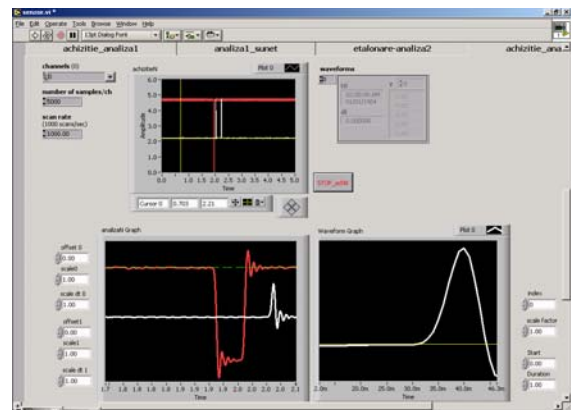


Figure 3.4

### 4. Hooke's Law

The experimental set up is shown in the figure 4.1. The force sensor will work as a dynamometer and will measure the stretching force from the spring and from the elastic band. The values of the stretch are measured using a simple line. The dependences of the stretch

versus the stretching force are represented in the Figure 4.2



Figure 4.1

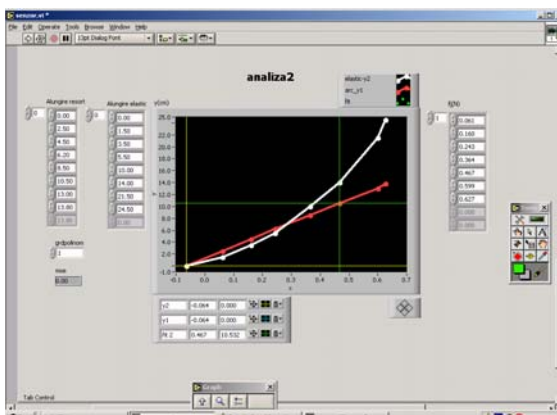


Figure 4.2

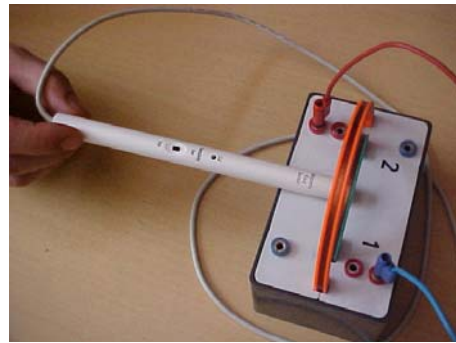


fig.5.2

The Scale of this teslameter looks like the figure 5.3.



Figure 5.3

## 5. Magnetic Fields

The magnetic field sensor shown in the Figure 5.1 could be calibrate for measuring the magnetic induction in different fields (figure .5.2).



Figure 5.1

## 6. AC circuits



Figure 6.1

The experimental set-up for producing alternating current is shown in the figure 6.1. The basic principle is the electromagnetic induction. The triphase current is shown in the figure 6.2. If only one pair of terminals is connected, than we are speaking of monophasic current, figure 6.3.

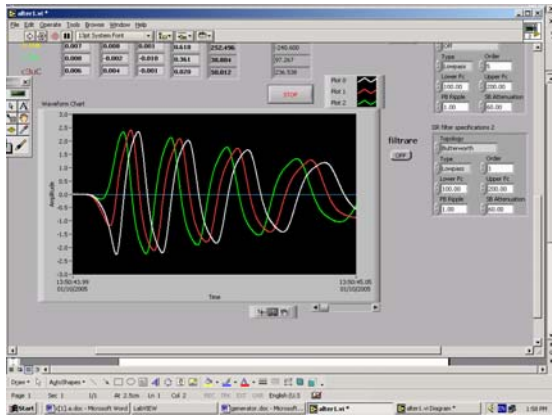


Figure 6.2

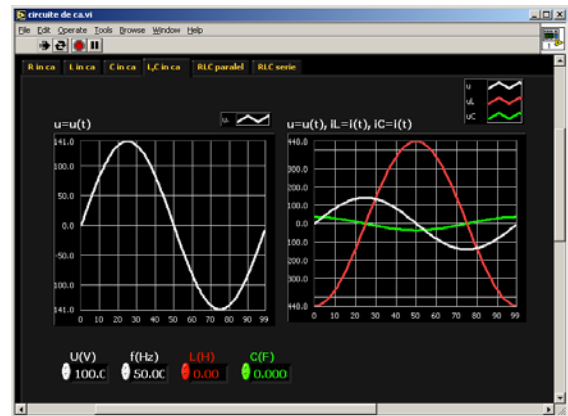


Figure 6.5

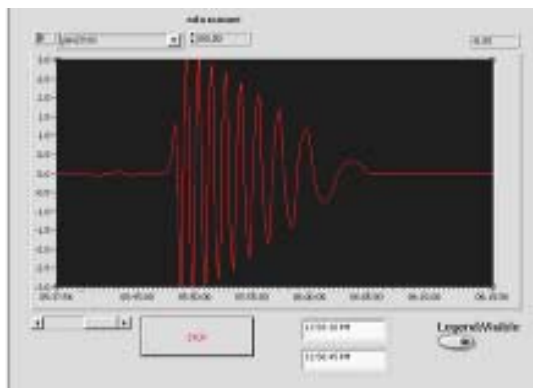


Figure 6.3

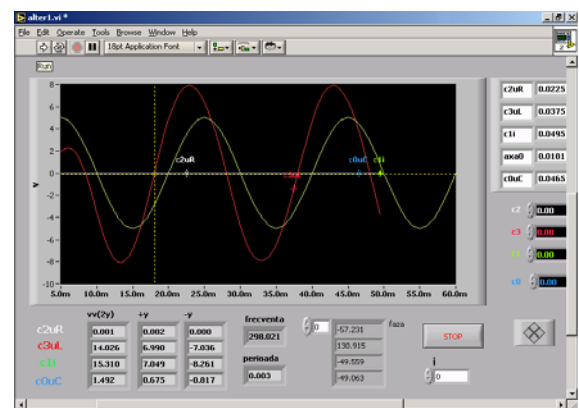


Figure 6.6

Instead of a double spot oscilloscope we can use a virtual circuit ( Fig 6.4 și 6.5) or the data acquisition board NIDAQ-6013 connected in a real one to demonstrate the behavior of the coil and of the capacitor in AC (Fig. 6.6)

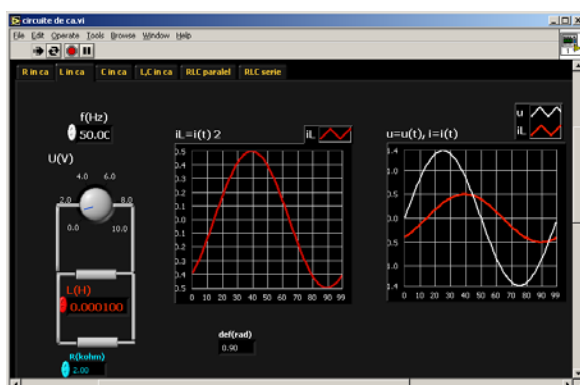


Figure 6.4

## 7. References

- [1] SAVU, T, SAVU G. “ Informatică-Tehnologii asistate de calculator, Editura ALL, 2000
- [2] MUNTEANU M, LOGOFATU B, LINCKE R. ,”Aplicații de instrumentație virtuală – LabVIEW”, București, CREDIS, UB
- [3] NEACȘU I, ”Metode și tehnici de învățare eficientă”, Editura Militară, București, 1990
- [4] NICOLA I, “Pedagogie”, Editura Didactică și Pedagogică, București, 1994
- [5] [www.ni.com](http://www.ni.com)