Electro kinetics Elements – The Laws of Electric Circuits Electric Measurements

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Abstract. Our project presents some basic elements of electro kinetics like simple circuits as well as laws for verifying their correctness, all nicely wrapped in a virtual physics laboratory environment. By comparison with classic presentation methods which imply that the student remember the formulas given and tested by the teacher, if the school has the proper tools, our solution only requires a computer. Thus he will be able to experiment and interact with the circuits and learn by working, without the need of learning some sterile formulas.
Alas, our application doesn't make the teacher obsolete, but only provides a more appealing learning method, which compensates the classic methods.

Keywords. Education process, innovation, interactivity, IT

1.1. Introduction

Our project presents several elements of electro kinetics, like simple circuits as well as laws for verifying their correctness, all nicely wrapped into a virtual environment. The elaborated material is structured into the following key points:

- The realization of experimental assemblages needed for demonstration or verifying of certain laws, following some simple circuit schemes;
- The generating of certain graphs of key interest in physics;
- The experimental determining of unknown parameters for a battery or a resistance;
  - the compensation method for determining the unknown parameters of a battery
  - the measurement of electrical resistances using the ampere meter and voltmeter montages

For the better understanding of the present material, the application also offers theoretical information pertaining to the circuits and the laws verified by these.

For a better integration of our application in the learning process, it also contains an evaluation section, so that the student can verify his newly acquired knowledge.

1.2. Interactivity

The application is fully interactive. The visual support offers a quick and efficient understanding of the studied phenomenon, many hours of explanations being compressed into just a few moments.

The student can create the circuits with which he can experimentally determine the required data.

By modifying the circuit elements to collect experimental data, he will be able to verify the given formulas or demonstrate certain properties.

Following the data collecting, certain required graphs will be generated thus demonstrating certain formulas or properties.

1.3. Feedback

The student will be permanently aware of his mistakes and will be able to correct them because the program will draw his attention towards what he has done wrong.

When the student will have finished the experiment correctly he will be given the correct formula.

To demonstrate that the formulas are correct the program will use experimental data as well as graphs resulting from these.

1.4. Simulation and illustrations

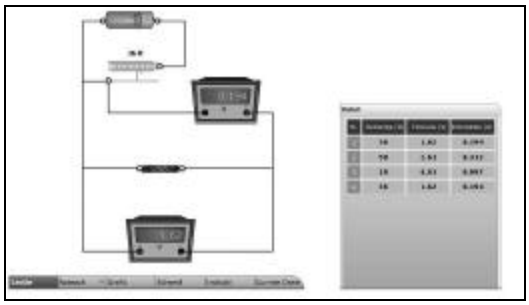

Figure 2.1. Collecting data for formula verification

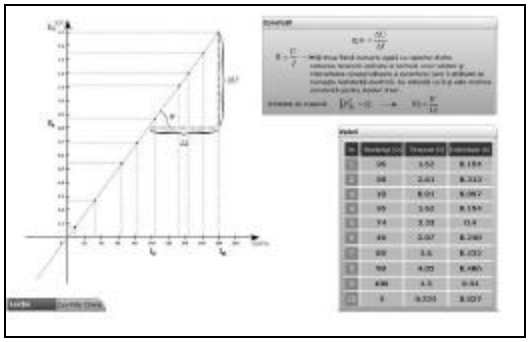

Figure 2.2. Drawing graphs based on the collected data

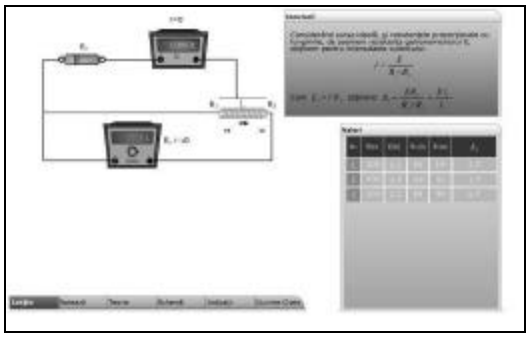

Figure 2.3. Verifying formulas

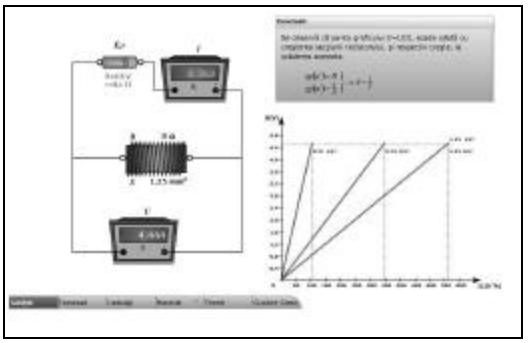

Figure 2.4. Comparing graphs and deducting the dependence between the value of the resistance and the section

Animations offer an optimal feedback, resulting in increased implication of every student in the learning process.

1.5. Conclusions

By comparison with the classic presentation methods which imply that the student remember the formulas given and tested by the teacher, if the school has the proper tools, our solution only requires a computer. The student will be interacting with the computer, eliminating risks of damage to the laboratory apparatus or even the student himself. With the aid of a computer he will be able to interact with the circuits and learn by working, without the need of learning some sterile formulas.

Alas, our application doesn't make the teacher obsolete, but only provides a more appealing learning method, which compensates the classic methods.

1.6 Reference

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