Designing Animations in the Matter of Connection of Serial and Parallel of Batteries

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Abstract: When the research on physics teaching in universities is considered, some important investigations have been performed on the students' efforts to understand the physical world, but they unfortunately show that students could not understand the concepts as expected. The development on the computer technology affecting the physical education significantly are become more important and consequently carrying out of computer aided physics education are inevitable. Many scientific research articles have been reported about making education progress is more exciting and attractive. One of the most impressive applications made on this issue is still computer animation. Through computer animation, students' grip for increased interest in the subject as well as the preparation of this animation style is drawn to stimulate their interest more easily. In this study, animations have been prepared for teaching series and parallel connection of batteries which is a part of general physics laboratory course. It is aimed that topic can be understood by students even faster, more comfortable and easier. In the created animations, it has been shown how to connect the series and parallel circuits. It is intended that topic has been reinforced by the students with the given samples and created graphics

Keywords: Series Connection of Batteries, Parallel Connection of Batteries, Animation, Physics Education.

1. Introduction

The problem of rapid increase in the number of students and controversially insufficient number of teachers in the school, very low rate of teacher per student, very fast expansion of the knowledge had to be considered for the individuals, the increase in the complexity of content has been arisen in recent years. Moreover, gradually and continuously increase of demand for the education has forced the increasing demand for the persons for better education which has made individual learning more and more important. Because of the mentioned reasons above, computer usage in educational progress becomes necessity. Moreover, the usage of computers in the education progress can pointed out some important reasons, such as computers make the students to be more motivated, support lifelong learning, increase the flexibility of learning programs [1, 2, 3].

In physics education, the experimental work done by students is very important for students’ cognitive and sensory learning. But some experiments in the high school level and bachelor's level classes cannot be realized easily because of the following exemplary reasons. One of the reasons is that there is no enough experimental material and apparatus available. Also some of the experiments do not portray the reality of the situation, some experiments are expensive and also dangerous to perform in a simple laboratory environment. Some curricular activities cannot be realized as intended because there is no enough time in a semester and therefore teachers generally omit the experimental work [4].

There are many advantages of simulations over laboratory experiments. Because of the update of the computer software are easier and cheaper than the standard laboratory material. Student’s works in a safer environment using computer environment. With interactive simulations, students can blend their own thoughts with concepts in the simulations. Furthermore simulations help to remove the disconnection between the learning style of the students and teaching style of the teachers [5].

Classical methods of lecturing by the teachers unfortunately make students becoming feeling bored quickly, and cause student loss their attention to the subject. On the contrary, using effective and carefully designed animations in classes can attract the student’s attentions making students more focused on the subject of the lecture and eliminates monotony of the classroom environment [6]. Ebenezer (2001) has noted in a recent research article that animations have some positive effects on learning concepts, discovering concepts, giving meaning to the concepts and getting meaningful learning by the students [7].

Animations make students to develop positive opinions about the class, to think in three dimension and to compete in modern education area. Effective use of the animations make students to access the key concepts directly and remove unnecessary information overload. Moreover, students can create meaningful connections between new information and previously gained knowledge. It can also be said that the teacher's jobs become easier. This technique can creates a strategy in learning process. It increases the reasoning power of the student, objectify the abstract circumstances and create appropriate schemes in the mind. Additively, animations not only increase the cognitive intelligence but also assist the learning visually and auditory. It was reported that a learner remembers 10% of what it reads, 20% of what it hears, 30% of what it sees, 50% of what it either hears or sees [8].

Rotbain at al. (2008) have determined in their research data that students in the experiment groups have very high academic grades compared to the control group students. In interviews records, very helpful feedback from students obtained that the animations greatly help to easy understand the subject and very advantageous [9].

The educational software developed by using animations helps students to get better grasp of the subjects of the lectures [10].

Inaç (2010) has determined in his work that students in the experiment groups have higher academic achievements and better retention levels compared to students in the control group [11].
2. Objectives And Importance Of The Study

In this study, animations were created for better learning and grasping the concepts, and minimize the misconceptions of the students on the subject of serial and parallel connection of the batteries. The use of animations during the class lecturing makes the grasp, understanding and abstract subjects, helps lecture to be more visual and enjoyable. Our work can be used as an environment instead of a laboratory where there is no fully equipped laboratories available since it is very expensive to set such a laboratory. This means that every student will have virtual laboratory and have a freedom for use it. Both either costs of a laboratory can be decreased and time consuming can be reduced.

3. Application

This experiment are realized by using animations and simulations for better, easier and quicker learning and grasping the concepts and minimize the misconceptions of the students on the subject of serial and parallel connection of the batteries [12].

In Figure 1, the entrance screen of the experiment number 6 is called “serial and parallel connection of the batteries”.

3.1. Serial Connection

The flow of the electrical charge through the circuit is provided by the cells and/or generators. As the potential difference between the terminals are increased, the current flowing through the circuit also increases. A setup consisting of serial and parallel connections of the cells are called battery. A serial connection is realized by connecting the positive terminal of a cell to the negative terminal of another cell. The generators are connected one another to get the full setup.

In Figure 2 (a, b and c), cells are connected to the circuit serially (In groups of 2, 3, …, 8). For every serial connection, voltmeters measure the potential difference. A relationship between the EMF and number of cells are given as a graph. When the graphics is examined, it can be seen that there is a linear relationship between the EMF and the number of cells. According to this, as the number cells are increased, the circuit EMF also increases.

3.2. Parallel Connection

If more than one cell are connected to each other with all positive terminals connected together and all negative terminals connected together, you get a parallel connection of circuit. When the cells are connected in parallel, there is no difference in circuit potential. Since there is no voltage change, there also is no current change.
Figure 3. (a) Parallel Connection – 1

Figure 3. (b) Parallel Connection – 2

Figure 3. (c) Parallel Connection – 3

In Figure 3 (a, b and c) batteries are connected in parallel to the circuit (in groups of 2, 3 and 4). For every parallel connection, voltmeters measure the potential difference. A relationship graph between the EMF and number of cells are given as an output. When the graphics are examined, it can be seen that there is no change in the EMF as the number of cells is changed.

4. Results And Suggestions

The lecturing and presenting a class lecture using animation and simulation helps students to understand the subject easily and quickly. Since the students who may previously learn the concepts of the physics in the laboratories can use virtual laboratory applications in decreased cost and less time, schools can use virtual laboratories instead of real laboratories.

The effect of usage of teaching techniques with animation and simulation on the success of the students and increase in permanency of the information can be further researched.

A computer laboratory is necessary for the classes to have access to animation and simulation techniques. This requires renovation and updates in the computer laboratories of the schools.

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