The study of the light interference with the aide of the digital technology

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ABSTRACT

The society of the future will be computerized, that is why the computer and the Internet are more and more extensively used on a daily basis and in school as well. This enables students to go over materials in their own rhythm, to select information and faster understand the subjects they are to study. Educational software also allows all students to involve in studies through differentiated approaches of notions, depending on each student's level. The lesson thus becomes a dynamic process, adjusted to students' particularities, needs, preferences and endurance, at the same time encouraging their participation in lesson making. Consequently, the student not only does s/he understand science, but also they feel the thrill of studying it. For this reason, the paper focuses on presenting a physics lesson assisted by digital technology.

Keywords: Young device, Computer, Lab View

Modern education develops a methodology based on action and interactive approaches, meant to involve students' thinking mechanism, intelligence, imagination and creativity. An 'active' student is the one who makes efforts of personal reflection, inner and abstract, and who takes mental action towards search, research and truth rediscovery, and towards elaborating new items of knowledge. The stress is placed on the formative component, developing cognitive process, students' capability of using what they learned being of utmost importance.

The teacher is the one to find the most effective ways to stimulate each student's creative potential. The teacher's creative behaviour is one of the major factors to ensure students' creative potential development. Teaching as creative process is supposed to let the teacher mediate between students and their surrounding world. Not only must he organize space and activity, but also participate with students in knowledge elaboration, encourage co-operative interaction among them, and guide them on how they should use time, space, equipment and materials, helps individuals or groups extract the right information and values from experiments and help them properly interpret and assess information.

All these desiderata involve a change in position in regard with the student and re-dimensioning teacher's role. The main stress is placed on the student, seen as an agent of their own learning process, more than on the teacher as knowledge provider; hence student's learning autonomy develops. An active and creative student is the one who side-by-side participates in their own formation with the teacher. Taking an actor's role in the education act, students can efficiently project learning, build up knowing by taking risks, being aware of necessary efforts to make, choosing learning strategies, managing own time and retorting to formative evaluation.

Within teacher – student relationship, emphasis is on dialog, negotiation process, mutual support and cooperation. We can therefore assume that students can any time intervene in learning decisions, how they are going to use the acquired knowledge, evaluation ways, while the teacher is the learning and self-formation facilitator as well as students' partner in an interactive educational relationship.

In the given context, evaluation strategies include multicultural values, thus favouring diversity of methodological options. Evaluation is meant to enable students to

enhance their own activity and develop learning autonomy. The emphasis is not on control and penalty, but on improving learning and on making students responsible, as they have to shape up their own learning objectives and to participate in setting evaluation criteria, methods and techniques.

Being student-oriented, school can prove its preoccupation to make genuine skills and competence in students to enable their fast integration into society and to orient them towards attitude- formation, action-taking and permanent development of intellectual skills.

It has been noticed over the years that classical learning is sometimes painstaking, without notable results and mostly time-consuming if acceptable performance level be desired. Every student has the right to school success and to reaching the highest possible curricular standards; that is why adequate customized pedagogic approaches must be found. So, this does not mean we have to quit using chalk, blackboard and sponge, the textbook, or problem-solving and performing live experiments; through direct links between practical experience and theory, studying physics contributes to making the right ability of students' self-developing and developing the society they belong.

To sum up, we can state that, in order to achieve high-quality education and to get the best results, we should use both classical and modern teaching, learning and assessment methods!

Over the millennia, sun light has been linked to the very life existence. Ancient civilizations were so impressed with the sun that they would worship it as if it had been a god. Thus, ancient Sumerians, Egyptians, Babylonians, Romans and other cultures attributed sacred position to the sun. In ancient Egypt for instance, the pharaoh was 'responsible' with sunrise every morning, the Incas would pray the sun, in their opinion a solar eclipse being an apocalyptic omen, while ancient Indians used to have a religious cult to worship the sun; they would also use their knowledge on the sun, acquired at that time, to apply in agriculture.

The sun has an essential role in daily life, not only to light up the Universe, but also to support life on Earth, with influence on some of the most important industry fields. Sunlight is an energy source to support life on Earth, from tiny creatures to the complex human beings. Light is part of the most important life aspects and it has been playing an essential role throughout human existence.

That is the reason why the paper also analyzes the theme of light interference by means of Young's device.

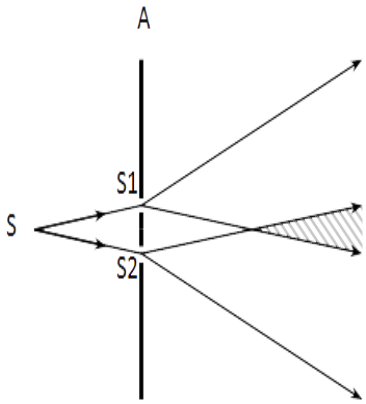
Interference is the phenomenon of overlapping two or more coherent waves in a certain space zone, leading to obtaining a static chart or maximal and minimal values of interference.

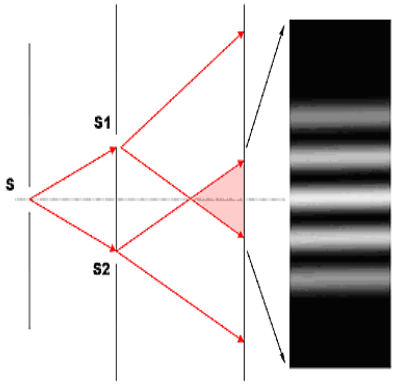
Obtaining coherent waves to achieve interference is made by separating two light fascicles from a monochromatic light source, which afterwards overlap again in the interference zone. For this purpose, numerous devices based on two methods are used:

- wave front division method;
- amplitude division method.

Young's device

Thomas Young's (1773 - 1829) two-opening device, conceived in 1802, is the oldest experimental device for light interference observation. The light emitted by the dot-like source *S* falls on screen *a*, which has two small openings – slits *F1* and *F2* – equally distant from source *S*. According to Huygens's principle, slits F1 and F2 represent two light secondary sources. Because the radiations emitted as F1 and F2 to come from the same source, they are coherent radiations. The radiations overlap in the shaded zone in the picture.





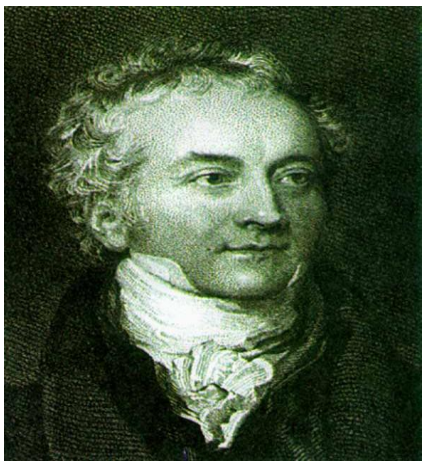
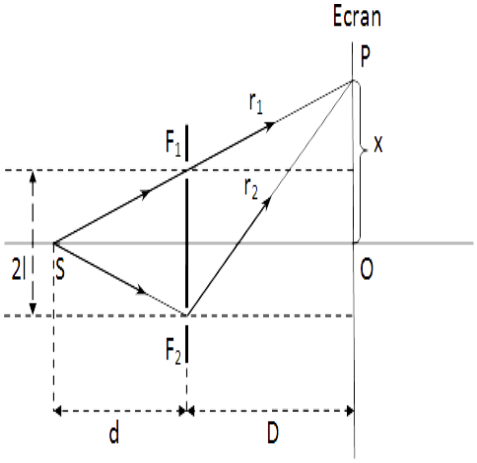
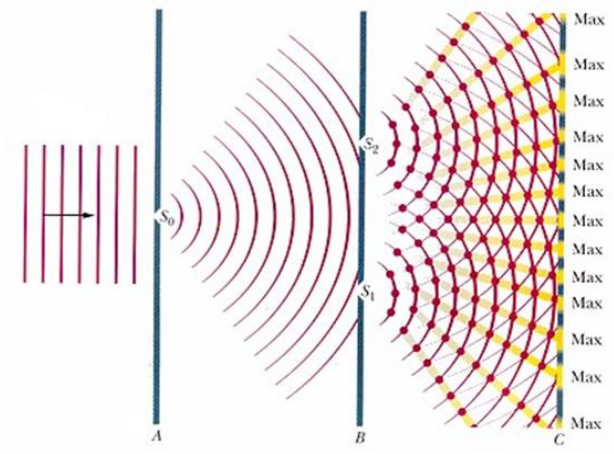


Figure 1. The Young's device and Thomas Young

The scheme of the Young device:





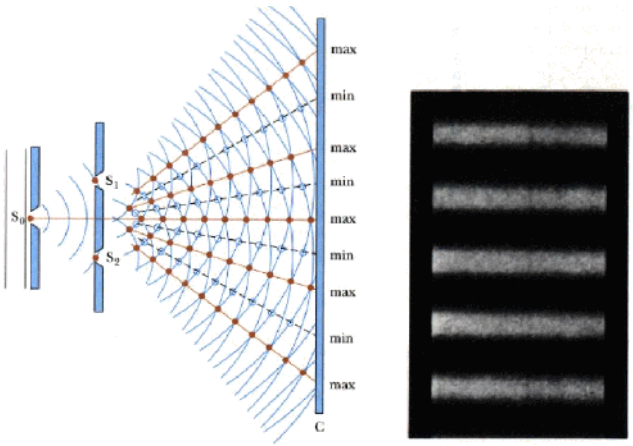


Figure 2. The scheme of the Young device

$r_1^2 = D^2 + (x-l)^2$, $r_2^2 = D^2 + (x+l)^2$

$r_2^2 - r_1^2 = 4xl$

$(r_2 - r_1)(r_2 + r_1) = 4xl$

Because the distances x and l are very small face of the distance D, on can consider

that $r_1 + r_2 = 2D$. $(r_2 - r_1) = \frac{2xl}{D}$, $\delta = r_1 - r_2$, the way difference between waves. $x = \frac{\delta D}{2l}$

If in P on obtain maximum for interference, $x_k = \frac{k\lambda D}{2l}$. If in P on obtain minimum for interference, $x_k = \frac{(2k+1)\lambda D}{4l}$.

In neighbour of the point O appear the bright bands what alternate with the dark bands, equidistance, parallels, named interference franjes. Interfranje is the distance between two maximum consecutive or between two minimum consecutive. In this way, $i = x_{k-1} - x_k = \frac{(2k+1)\lambda D}{4l} - \frac{2k\lambda D}{4l} = \frac{\lambda D}{2l}$.

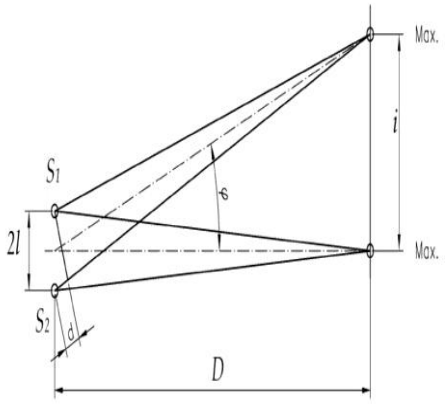


Figure 3. The scheme of the Young device

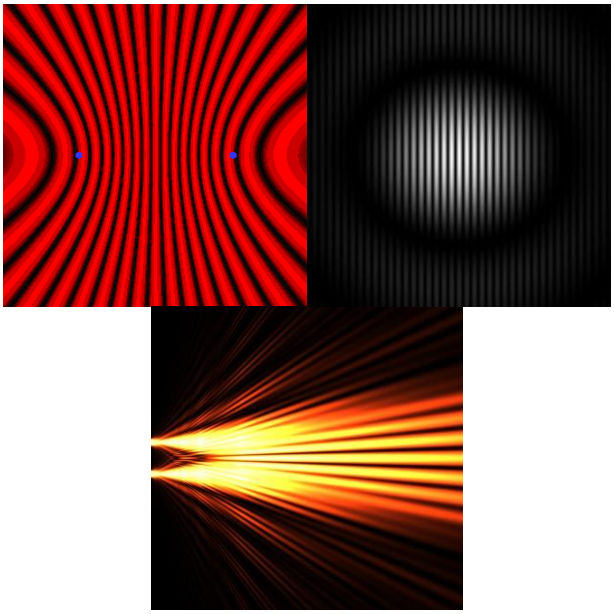


Figure 4. The unlocalizated franjes

This device formed unlocalizated franjes.

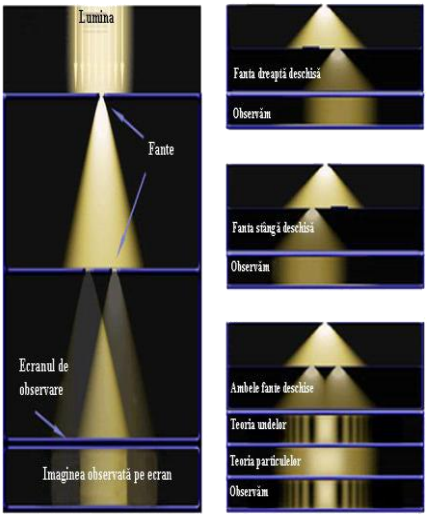


Figure 5. The unlocalizated franjes

$I = I_{\max} * (1 + \cos\frac{2 * \pi * 2l * x}{\lambda * D})$, where 2l=a, the distance between slits, I, the intensity of used radiation.

The interference of the light with the Young device was studied with the Lab View simulation.

The programming in Lab View accustoms the students to use the simulation

method on the computer a physics phenomenon in teaching and learning process. This method develop the skills for modelling on the computer a physics phenomena, promoting of the new attitudes and new modalities of the work, have a friendly graphical interface, develop a visual culture, its a modern teaching, learning and estimating method, have more facilities for processing the information, for accomplishing the calculations, for displaying the results, for making the graphics, the tables, the virtual experiments. Also this method achieving a time and teaching aids economy, involving the motivation for the study of physics.

One application made in Lab View contains two windows:

- The panel which represented the graphical interface with the user, the window which the user will be sees when will be access the application achieved. Through the agency of elements on the panel the application receives the input information and displays the output information which resulted in trace of the show.
- The diagram is the windows which the programmer describes the algorithm after which the application will be accomplish the calculations and reasoning necessary for processing the information.

The panel contains the controls for input the information and pointers for display the results. They find in Controls palette.

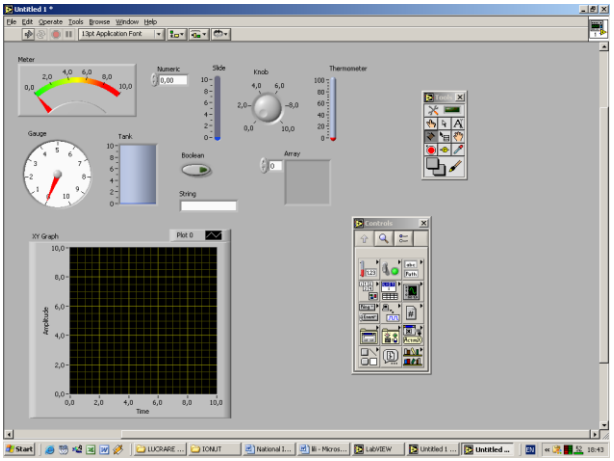


Figure 6. The panel of the Lab View program

The diagram permits achieved the connections between the components, through the agency of the functions in the purpose of the execution of the calculations or the specific operations on the basis of the algorithm establish so the programmer. The functions are finding in Functions palette.

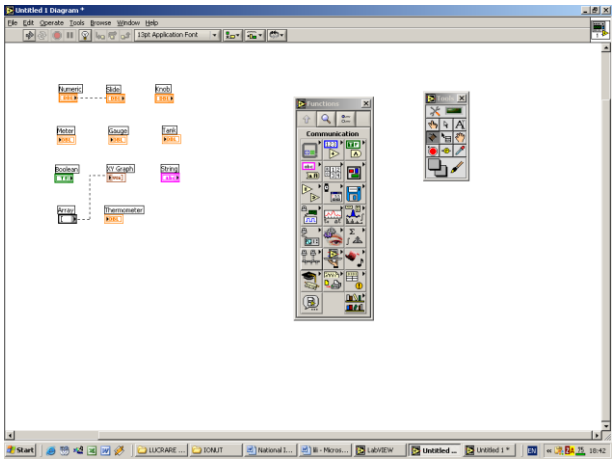


Figure 7. The diagram of the Lab View program

The designing of the educational software supposes:

1. Outline a initially pedagogical project
2. Achieves the algorithm after functions the software
3. Rolls the programme for verify his functions

In time of achieves this project will be estimate next competences, abilities: the work methods, the proper use of the references, the correctness techniques, the proper use of the materials and the equipments, the generalization of the problem the organization of the ideas, of the materials, of the conclusions into the report, the quality of the presentation, the correctness of the numbers, graphics, tables, diagrams.

The Lab View programming medium simplify the tasks of programming so that achieve one programme is made about drawing the logically scheme of the programme, given up to use the directions about used the suggestive graphical symbols. The programmer project:

- The panel which is the graphical interface with the user where are receive the input information and where are display the output information.
- The diagram, the graphical code of the source which contains the algorithm after which will be accomplished the calculations and the specific reasoning.

For can the build the virtual experiments they use the tools palette, the control bars as well the menu of the frontal panel and of the diagram, for to place the objects, respective the terminals, the constants and the associate functions.

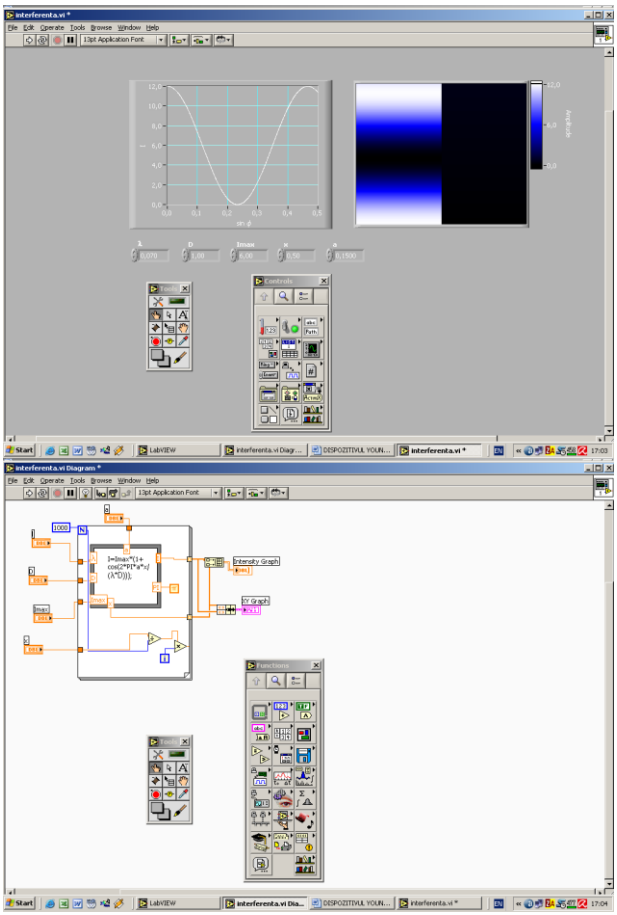


Figure 8. The panel and the diagram of the simulation

This simulation permit observed the interference figure, but the graph I=f (sinφ), where φ is the phases difference between the waves which interference. For achieved this observations the student must introduced the input dates: λ, D, I_{max}, X, a=2l. The advantages of the simulation face to real experiment is achieved of the time and of the teaching aides economy, permit repeat achieved the experiment for understanding the phenomenon, permit the observation of the intensity variation at the modification of the phases difference of the waves which interference.

Using this simulation the students will be learn using the computer, know, understand and practice the mathematics operations, achieve new programs useful in study of physics, gather the experimental dates and follow the modification of the some parameters in real time on base of the graphical representation of the phenomenon, solve the problems and verify the solution with the virtual instrument achieved, from the skills for use the function in the scope to achieve the graphs and their interpretation.

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