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VIRTUAL CREATION OF PHYSICAL PROCESSES IN «LABVIEW» SOFTWARE

Abstract: *The methods of virtual designing of laboratory works were investigated in the "LabVIEW" program in industrial factories and also in all educational areas. In the "LabVIEW" program, the possibilities of using the technology of designing virtual laboratories in the educational processes are investigated. The processes of changing the vibration parameters of high-frequency signals in industrial factories according to the law of vibration of low-frequency signals are collected in the LabVIEW program, and the management of these processes is investigated. With the help of this assembled program, it is possible to control the frequency and amplitude of the signals which is learning in laboratory work performed by students who are studying in educational areas.*

Key words: *information technologies, animations, dynamic models, LabVIEW, Modulation, Electric signal.*
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Introduction

Computer modeling of physical processes and experiments is one of the prospects for the use of information and computer technologies in physics education. Computer models can activate these traditional and non-traditional teaching processes, it makes it easier for the teacher to conduct the lessons and clarifies the physical processes. It will allow the teachers to show laboratory work to students on a monitor and repeat it several times.

In addition, the appropriateness of the use of information technologies in the educational process, the connection with the content, form and methods of teaching today can be distinguished with the following criterias. Laboratory works in physics, chemical technology, biotechnology, electronics, mechatronics and robotics and sciences at technical schools, engineering institutes, chemical technological institutes of production organizations and universities of electronics and instrument engineering are designed using programs such as Multisim, Proteus, EdrawMax, PheT and LabVIEW [1], [2], [3], [4], [5].

By creating programs such as Multisim, Proteus, EdrawMax, PheT LabVIEW, laboratory work can be performed virtually and in case of 2D 3D view, the teacher will have a number of advantages by connecting physical phenomena and processes to complex programs.

- Save time;
- To increase the level of "mastery" of students during the educational process
- Individual approach of students;
- Level of "mechanization" of pedagogical methods.

Now we will look at the possibilities of using the "LabVIEW" program technology for conducting physical experiments in the educational process. The LabVIEW program consists of two front and back panels. To start the program, we select the "Windows show" panel from the menu to switch to the structural scheme from the front panel. When creating a new object in the front panel, select the Controls palette: "Windows show controls palette". A rectangular icon will be created in the object created in the front panel, and we can enter the desired text into it. We can continue the work in this sequence [6], [7], [8], [9].

The processes of providing hot water using solar energy are also being studied through modeling in the LabWIEV program [10], [11], [12].

The processes of providing hot water using solar energy are also being studied using the LABWIEV program[19].

Analysis and results.

In LabVIEW, only front panels are used when working with ready-made virtual instruments. From the right side, we can open a new window using the News command. We need the LabVIEW block diagram to create the AND mathematical logic operation. From the front panel, we can control the assembled program using logical operations by connecting to the signal input part of the "AND" logic operation and to various elements in the signal output parts. Output elements have digital indicators, graphic screens and other elements. When you start LabVIEW, the main window opens. In the left part of the window previously collected virtual lab works are saved.

In the LabVIEW programming panel, we can control the tools we need with the right mouse button. So we enter the "Show" section from the "Windows" section, and from this section we can use the tools we need using the "Tools Palette" command. To manage functions, we can use the Functional panel and Structure sets from the menu [16].

Figure 1. LabVIEW Programming Panel

We have a need for automatic counters for long-term experiments or for counting goods in factories. We can use the LabVIEW programming panel to automatically control complex processes. We start the LabVIEW program with the "New project" command. Using the "Show Front Panel" command, right-click on the front panel and select the "Execution Control" section from the "Express" section. Then we select the command "While Loop" from this section and create it in the back panel in the size suitable for us. Select the "Loop Iteration" indicator from the resulting "While Loop" and use the right mouse button to create the "Create Control" command.

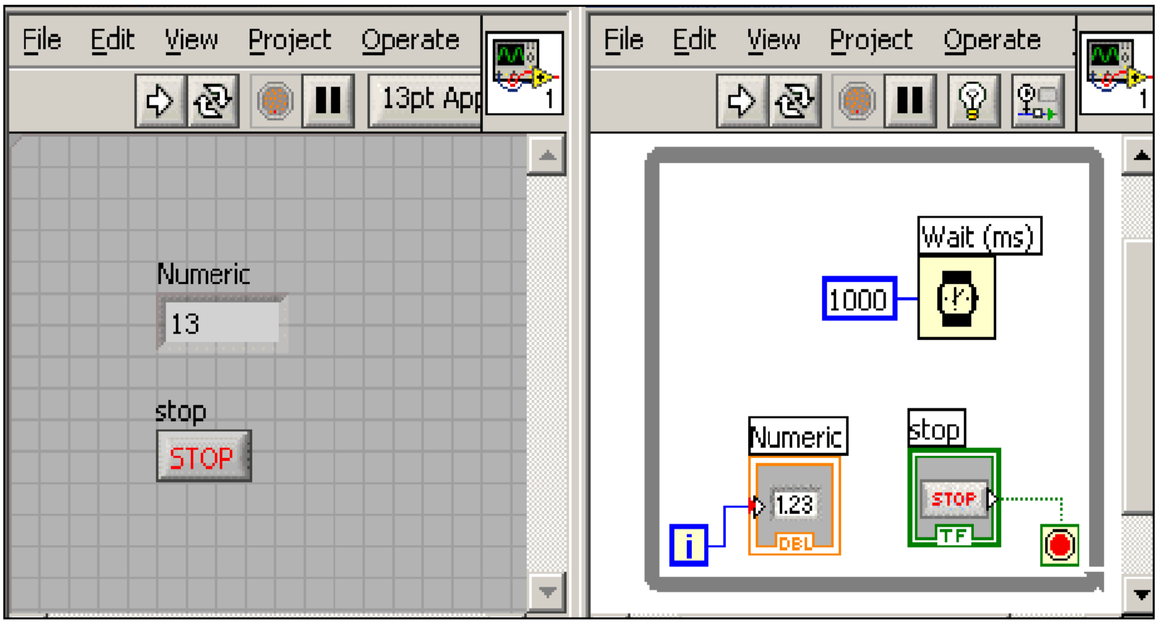

Figure 2. "While loop" front and back panels assembled in LabWIEW.

Indikatorni boshqarish uchun “Loop Iteration” indikatorni “Create Control”ga ulaymiz. Sanash indikatorini vaqtga bog‘lash uchun “Programming Timing” bo‘limida “Wait” funksiyasi tanlab olamiz va uni 1000 qilib belgilab olamiz. “While Loop” oynasidan sichqoncha yordamida “*Stop”* buyrug‘ini aktivlashtiramiz.

To control the indicator, we connect the "Loop Iteration" indicator to the "Create Control". To connect the countdown indicator to the time, we select the "Wait" function in the "Programming Timing" section and set it to 1000. Activate the "Stop" command using the mouse from the "While Loop" window.

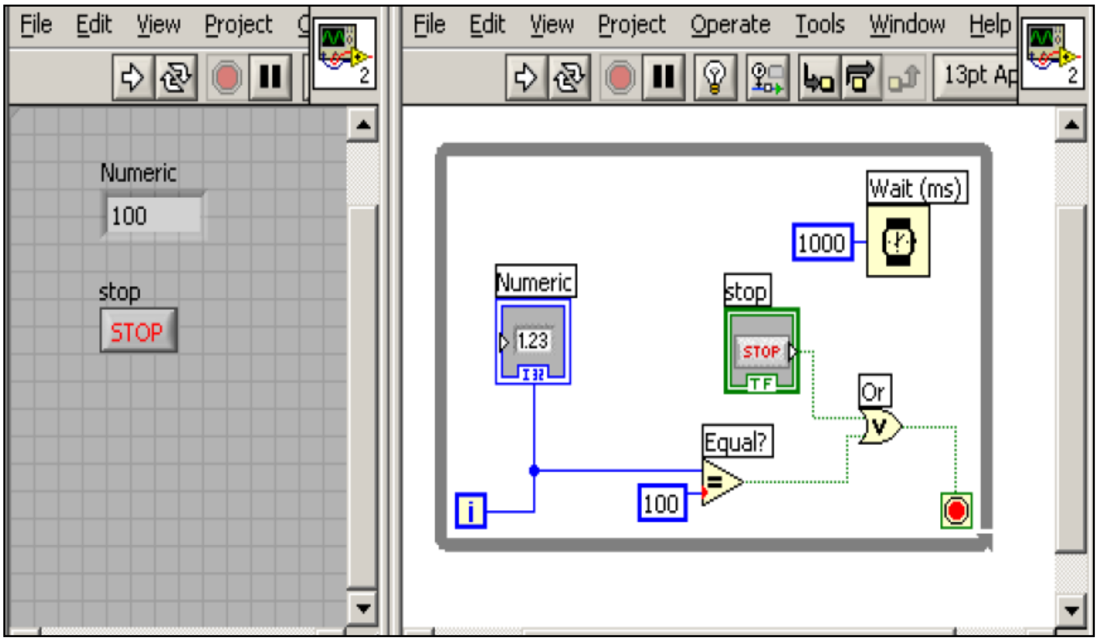

Figure 3. Front and back panels of an automatic counter assembled in a while loop.

To record the result of the calculation, we enter the "Comparison" function from the "programming" section using the right mouse button. From this function, we activate the "Equal" command. ….We connect the command "Numeric" to count the input signals of the "Equal" port. We connect the signal input of the "Equal" port to the second signal input by specifying the constant value command "Constant" from the "Create" function and setting the constant to 100.

To connect the output signal of the "Equal" command and the "stop" command, we go to the

"Boolean" function from the "programming" section with the right mouse button, and load the "or" command from there. We connect the signal input of the "Or" command to the output signal of the "Equal" command and the signal output of the "stop" command. We connect output part of the signal to the "stop" part of the "While Loop" window.

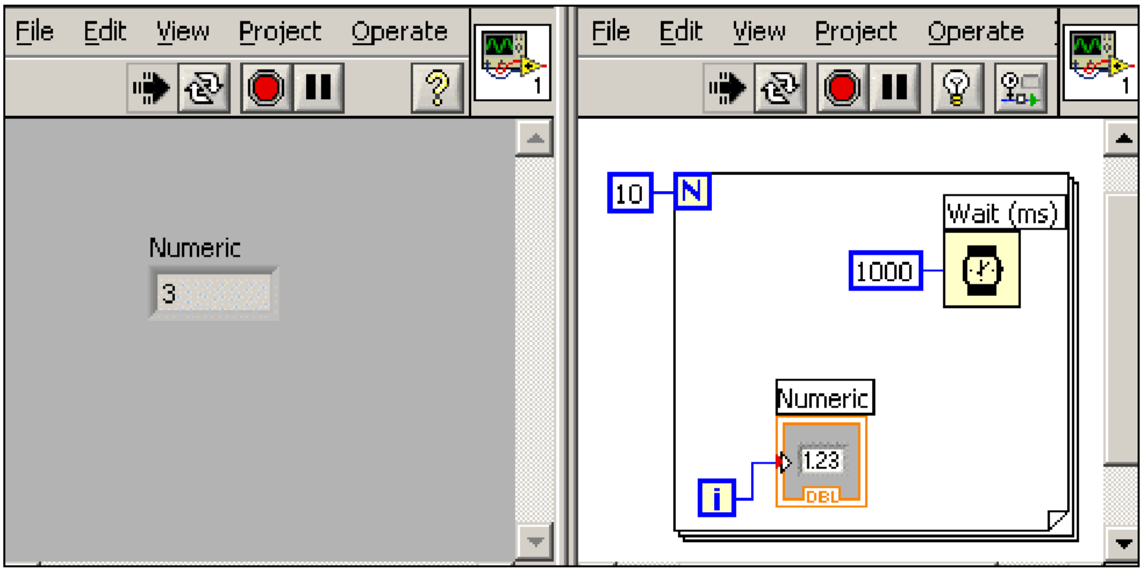

Figure 4. Block diagram and front panel of the "for" loop program

When creating a new object on the front panel, we select the Controls palette, and from this palette we can use the "Windows>>show>>controls palette" command. If we move the mouse to the object palette, the name of the object will appear above the palette. We select the object by pressing the mouse button and it can be moved to any place on the front panel. And a corresponding terminal is created in the structural scheme. When choosing a new object, you can move the mouse over the object and click, or select a right corner shape and press it together with the cursor to place it in the desired place. To delete an unnecessary object in the panel, bring the mouse arrow to the object and press the "Delete" key, then the unnecessary object will be deleted. A rectangular icon will be created in the object created in the front panel, and we can enter any text into it.

It can be the name of the indicator or the name of the controlling organ. If we don't enter text, the icon will disappear by itself. If we want to reproduce it, we select the "object" menu from the front panel, from which it will be possible to reproduce using the "Show >> Label" command. We create the "Object" menu by right-clicking the mouse cursor when the mouse cursor is on an object in hand or arrow position.

If we want to rename the created object, we select the naming symbol from the "Tools" palette and right-click on the existing symbol field, and after entering the text, press the <enter> button. We can change the size and font using the <Font> window. It will be located at the top of the front panel and structural diagram. To do this, we select the object to be aligned with the mouse arrow, and from its adjuster, it is possible to align the object with the <Align objects> command or distribute the objects with the <Distribute Objects> command. If we want to select several objects, we can use two different methods. The first method - we can expand the selected area in a rectangular shape by pressing the left mouse button on an empty space. The second way - we can control their location by selecting each object by pressing the <Shift> key.

You can change the color of the indicator or controlled object on the front panel. To do this, select the <brush - brush> command from the <Tools> palette and place it on the desired object by choosing an arbitrary color. We receive and distribute thousands of text, tables, graphics, images, motion pictures, and other types of information in our daily lives. In order to transfer information from the first point to the second point in space, we need to load it into some physical process, that is, turn it into a signal. High-frequency vibration plays the role of a carrier of information and thus acquires the status of a carrier.

Thus, modulation is a process that involves oscillations, so it can be frequency, amplitude, phase, etc. From the resulting window, right-click on the "Signal analysis" section and select "Summilate signal" from this section. We get 3 downloads from Summilate signal to the front panel. To select the type of these signals, select the "Sine" section from the "Signal type" section. For the first signal set the amplitude range to the desired size. And set the "Frequency" section to 10.1, and the "Phase (dag)" section to 90. And set the amplitude to 1. From the "Timing" section, set the "Samples per second" (Hz) frequency range to 100000 and also set the number of samples to 10000.

For the second signal set the amplitude range to the desired size. And set the "Frequency" section to 100, and the "Phase (dag)" section to 100. And set the amplitude to 4. From the "Timing" section, set the "Samples per second" (Hz) frequency range to 100000 and also set the number of samples to 1000.

For the third signal set the amplitude range to the desired size. And set the "Frequency" section to 1000, and the "Phase (dag)" section to 100. And set the amplitude to 1. From the "Timing" section, set the "Samples per second" (Hz) frequency range to 100000 and also set the number of samples to 1000.

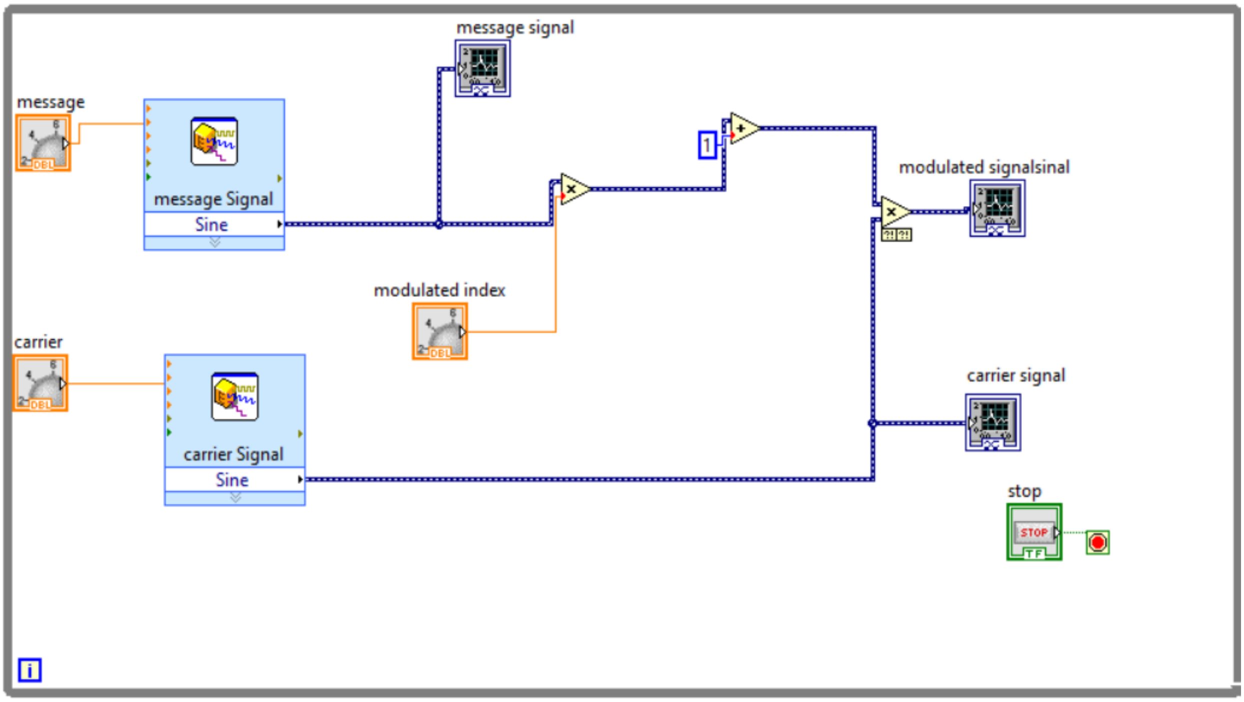

Figure 5. General scheme assembled in the back panel.

Enter the "Functions" section with the right mouse button, select "Express Trigonometric Functions sinusoidal and cosinusoidal" graphs from the "Arithmetic & Comparison" section and download them to the screen. Generated sinusoidal and cosinusoidal signal sensors should be connected to the Sine section of the sensor of the second Simulate signal. Using the right mouse button, enter the "Functions" section, go to the "Arithmetic & Comparison" section, and select the "multiply" command from the "Numeric" section and load two of them on the screen. Then associate this "multiply" command with the first Summilate signal sensor using the mouse. A second Simulate signal sensor is connected to the input of the Express Trigonometric Functions sinusoidal sensor. After that, connect the second part of the "multiply" command from the output of the sinusoidal sensor. Then, enter the "Functions" section with the right mouse button, select the "Arithmetic & Comparison" section, and select the "Subtract" command from the "Numeric" section in this section and load two of them on the screen. Next, connect the Second Simulate signal sensor to the input of the "multiply" command at the output of the "Express Trigonometric Functions cosinusoidal" sensor. Then, connect the output part of the cosinusoidal sensor and the output signals from the "Sine" section of the third Simulate signal sensor together to the input part of the "multiply" command. Connect the output parts of the two "multiply" commands to the input parts of the "Subtract" command in the Numeric section. Move the mouse to the output of the "Subtract" command and select the "graph indicator" command using the "create" command using the right mouse button. Then, using the right mouse button, we enter the "Functions" section.

Enter the "Signal processing" command and from this command enter the "Signal processing" section. From this section, we select "Cross Carrelat" and load it on the screen. We connect the "graph indicator" input to the input of the resulting "Cross Carrelat". Move the mouse to the "FFT-(RMS)" signal output part of the "Cross Carrelat" and select the "graph indicator" command from the "create" command using the right mouse button.

Let's go to the back panel and we can see the Waveform graph (wave signals) created in the first "graph indicator" created in this window. We can see the modulated graphs of the Waveform graph (wave signals) generated on the graph indicator connected to the FFT-(RMS) signal output of the Cross Carrelat.

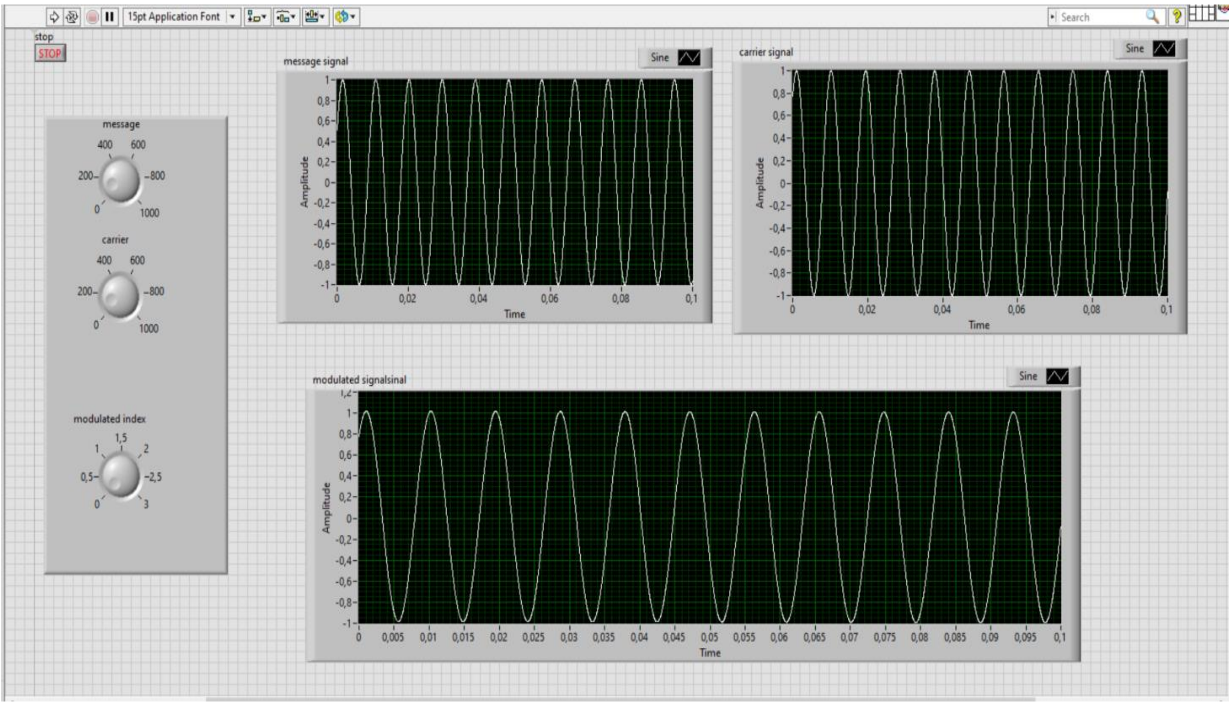

Fig. 6. General scheme assembled on the back panel.

CONCLUSION

Digitization and automatic management of long-term laboratory works can improve work efficiency of students of electrical engineering and other fundamental sciences in electronics institutes, especially who are conducting scientific research. It also allows electronic monitoring of students' laboratory work, full control of each material in independent and multimedia mode, repeated experiments several times [13], [14], [17]. This helps researchers and students to save time and achieve higher efficiency in mastering these subjects. Digitization of the manufacturing processes in industrial factories, automatic counting of manufactured products helps to control manufacturing processes [18], [15], [19].

Enriching traditional methods with modern teaching technologies and programmed pedagogical tools in higher education in physics, chemistry, biology, industrial factories and electrical engineering educational institutes, as well as in teaching electrical engineering and other fundamental sciences, creating the necessary virtual laboratory work, the possibility of improving methods of effective use was shown in this article.

With the help of these assembled virtual circuits, students independently create an electronic version of laboratory exercises and have full control over each material in a multimedia situation, allowing them to repeat experiments several times. This will help researchers and students studying physics, chemistry, biology and electrical engineering to save time and achieve high efficiency in mastering these sciences.

References:

1. Atoyeva M.F.. (2017). Use of Periodicity in Teaching Physics. Eastern European Scientific JM.F. Atoyeva. Use of Periodicity in Teaching Physics. *Eastern European Scientific Journal*, Düsseldorf-Germany, 2017. № 4, pp. 35-39.
2. Vasil`ev, A.S., & Lashmanov, O.Jy. (2015). *Osnovy programmirovanija v srede LabVIEW*. (82p.). SPb.: Universitet ITMO.
3. Evdokimov, Jy.K. (n.d.). *LabVIEW dlja radioinzhenera: ot virtual`noj modeli k real`nomu ustrojstvu*.

4. Zoirov, S. X., & Bahreyeva, M.F. (2024). Ta'limda raqamli texnologiyalardan foydalanish metodikasi. *Science and Education*, 2024, T. 5, №. 1, pp. 276-280.
5. Atoyeva, M.F. (2020). Didactic foundations of inter-media relations in the training of university students. *International Scientific Journal. Theoretical & Applied Science*. p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online). Year: 2020 Issue: 06 Volume: 86, p.124.
6. Zoirov, S. X., Hamrayev, Y. B., & Bahriyeva, M. F. Q. (2023). Fizika fanini zamonaviy texnologiyalardan foydalanib o'qitish metodikasi. *Science and Education*, 2023, T. 4, №. 12, pp. 515-519.
7. Atoyeva, M.F. (2017). Use of Periodicity in Teaching Physics. Eastern European Scientific JM.F. Atoyeva. Use of Periodicity in Teaching Physics. *Eastern European Scientific Journal*, Düsseldorf-Germany, 2017. № 4, pp. 35-39.
8. Vasil`ev, A.S., & Lashmanov, O.Jy. (2015). Osnovy programmirovanija v srede LabVIEW. (82p.). SPb.: Universitet ITMO.
9. Evdokimov, Jy.K., Lindvall, V.R., & Shherbakov, G.I. (2007). Moskva: DMK Press, 400 p.
10. Xolmuminovich, Z. S., To'ychiyevich, X. Q., & Muxiddin, A. (2023). "LABVIEW" dasturida virtual laboratoriyalarni yaratish imkoniyatlari haqida. fan, *ta'lim va amaliyotning integratsiyasi*, 2023, T. 4, №. 3, pp. 194-200.
11. Atoyeva, M.F. (2017). Use of Periodicity in Teaching Physics. Eastern European Scientific JM.F. Atoyeva. Use of Periodicity in Teaching Physics. *Eastern European Scientific Journal*, Düsseldorf-Germany, 2017. № 4, pp. 35-39.
12. Vasil`ev, A.S., & Lashmanov, O.Jy. (2015). *Osnovy programmirovanija v srede LabVIEW*. (82p.). SPb.: Universitet ITMO.
13. Evdokimov, Jy.K., Lindvall, V.R., & Shherbakov, G.I. (2007). Moskva: DMK Press, 2007, 400 p.
14. Evdokimov, Jy.K., Lindvall, V.R., & Shherbakov, G.I. (2018). *LabVIEW v nauchnyh issledovanijah*. (400p.). Moskva: DMK Press.
15. Batovrin, V.K., et al. (2005). *LabVIEW: Praktikum po osnovam izmeritel`nyh tehnologij*. (208p.). Moskva: DMK Press.
16. Sanjaridin, Z., & Temur, X. (2023). Methods of creating virtual laboratories in the" LABVIEW" program. *Science and Innovation*, 2023, T. 2, №. 11, pp. 519-523.
17. Zoirov, S., et al. (2022). Modeling of physical processes in the LABVIEW program. *Science and Innovation*, 2022, T. 1, №. 8, pp. 775-780.
18. Zoirov, S. (2024). "Yarimo 'tkazgichli tranzistorlarni LabWIEV dasturida yig'ish va foydalanish metodikasi." *Obshhestvo i innovacii* 5.1/S (2024): 154-160.
19. Zoirov, S., Atoyeva, M., & Khoshimov, T. (n.d.). *Providing Hot Water Using Solar Energy*. E3S Web of Conferences. Renewable energy sources and energy efficiency t Retrieved from https://congreentax.time.uz/