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DEVELOPMENT OF TECHNICAL CREATIVITY OF STUDENTS WITH THE USE OF INFORMATION TECHNOLOGIES

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Abstract
Robotics is a science-intensive industry. Success in its development depends on progress in other areas of technical knowledge, as well as progress in fundamental sciences [1, p. 95]. Based on modern scientific and technological achievements, studying the interaction of robotic systems and people, creating new embedded sensors and sensor networks, developing new human-machine interfaces, including new ways to use gestures and voice interfaces to control computer and robotic systems, etc. the task is set.

Keywords: technical creativity, technique, technology, modern tool, elements of robotics, Arduino board.

INTRODUCTION

One of the important tasks of the modern school is to guide the development of students' creative initiative and independence, building and rationalization skills. This relationship with the ideal person The role of technical creativity in shaping the growth is increasing [68, p. 74] . Teaching original technical creativity in the development period is a necessity for scientists, teachers and psychologists a lot of yearly experience He finds a way in it .

Currently, technical education is one of the important aspects of economic development trends. In this situation, it is a requirement of the time to introduce and develop the achievements of technical education in the educational process of secondary schools [4, p. 5]. In this sense, it should be noted that the application of the achievements of robotics, widely used in the education system of developed countries, in the educational process of general education schools in our Republic is one of the most pressing issues today. The formation of a personality capable of setting independent educational goals through the use of modern scientific and technological achievements in the educational process, the development of methods for teaching, monitoring and evaluating scientific and technological achievements, working with various sources of information, their evaluation, the ability to independently think and observe on this basis is decided the task of educating the personality of a creative student.

Today, robotics in education can be viewed as interdisciplinary activities that combine science, technology, engineering, creativity, programming and help develop technical creativity from kindergarten [1, p. 16] . This process led to the fact that robotics began to be taught in general education schools as part of technology lessons or extracurricular activities (clubs) to involve primary school students in creative activities.

Analysis

The development of students' interest in inventive and research activities in the process of engaging in technical creativity is one of the urgent problems today [9, p. 819] . To implement these tasks, it is necessary to create the necessary environment in the educational process, taking into account the age of students in secondary schools, to form the skills to analyze the use of robotic devices in production processes , to acquire the necessary theoretical knowledge and be able to apply them in practice.

Based on the experience of developed countries, it is necessary to implement the following goals and objectives in the field of robotics in secondary schools of our Republic.

Technological Goals:

• Creation of a modern educational environment for teaching design, models, schematic and technical elements and the basics of programming, the formation of inventive abilities;

To study the opportunities available for children to achieve success in school and out-of - school educational institutions [10 , p. 14374] .

Based on these goals, the organization of training in robotics in secondary schools has the following advantages:

• Implementation of an approach to the interactivity of the information environment, multifunctionality and other areas of activity;

• Ability to provide multifunctionality and proactive approach;

• Increasing the flexibility of the structure of the educational process;

• Information and communication technologies the formation of literacy .

Observations have shown that students with increased interest, faced with different levels of complexity, are looking for ways to solve it using their own ideas. The continuity of technical creativity serves to increase the interest of children. Continuity can be traced in the design of tools of different levels of complexity.

Arduino "STARTER" is designed for students of secondary schools. The 12+ curriculum is widespread. The purpose of using this curriculum is to develop students' competencies in the field of electronics and programming.

A device on an Atmel Atmega 328 microcontroller is connected to the Arduino UNO device platform.

The main purpose of a device is to allow the computer to interact with physical devices outside of the virtual world. When using Arduino -based devices, it consists in obtaining information about the environment using various sensors, as well as establishing interaction with the help of executive and control devices. This device can be used for various connections.

At present, when teaching physics, computer science and technology in general education universities, based on the concept of modernization of technical education, it is necessary to fully reveal the possibilities of each subject in mastering the basics of robotics. The content, teaching methods, methodology and technology of using robotics in the educational process while providing a technical educational orientation of training in these subjects involves conducting a study as a special pedagogical study [4, p. 5]. Today, in our republic, research on the use of elements of robotics in the development of technical creativity of students is at the initial level. In this regard, it is necessary to solve a number of problems.

Discussion

As one of the areas of technical training of students, the assimilation of teaching materials on robotics serves to consolidate knowledge in the subjects taught in secondary schools, the formation of practical skills, and the development of students' competencies related to modern technologies. technology. Students will receive modern knowledge. Robotics plays an important role in interdisciplinary integration. The knowledge gained from robotics , physics , computer science , mathematics , drawing and other subjects is memorized [6, p. 18] . This knowledge plays an important role in understanding the principles of how robots work and in their independent design and construction by students. The integration of knowledge gained from mathematics, computer science and technology is of particular importance in the implementation of many projects.

In the near future, the development of robotics will lead to significant changes in the way people live. Their living conditions are getting easier. In the new environment, a green person will need a new level of thinking and behavior, a willingness to maintain and update modern robotic technology. In this regard, two socio-pedagogical problems have been identified in pedagogical science, the solution of which is associated with important socio-economic and political consequences: 1) training qualified personnel for the production of robots and robotic complexes; 2) the formation of classes of users of the services of the robotic environment and the development of their socio-technological culture .

As a result of observations , the following tasks are identified that await the solution of the development of technical creativity of students based on elements of robotics :

1. Establishing the development of pedagogical mechanisms for teaching robotics and technical elements in methodological associations of teachers of district and regional departments of public education.

2. Educational robotics “... as a new interdisciplinary field for schoolchildren, integrating knowledge in the field of physics, mechatronics, technology, mathematics, computer science and allowing students of different ages to be involved in the process of innovative scientific and technical creativity. "

Development of directions, methods and techniques for using robotics for high school students.

4. Creation of teaching aids designed for the use of robotics by students of different ages in the educational process . Creation of working groups for the creation of textbooks and teaching aids for students on robotics on the basis of educational and regulatory documents of general education schools of our republic and the deployment of their activities.

5. Dissertation research on the problem of organizing the educational process using elements of robotics in secondary schools is still at an early stage. The publications of the authors of these studies mainly include concrete experience in the use of robotics in the educational process of the university . Elimination of general pedagogical and methodological problems of using robotics tools in extracurricular activities with schoolchildren.

Attention to the mutual integration of robotics research in foreign countries with the current pace of development of research conducted in this area in our Republic. Orientation to the wider use of STEM (Science Technology Engineering Mathematics) education in the educational process based on foreign experience [8, p. 57] .

7. Take into account that the content, methodology and technology of using robotics in the implementation of technical education in a secondary school will be the subject of systematic

and targeted research in the methodology of teaching subjects in our Republic . The use of robotics not only in extracurricular work with students, in the effective organization of the educational process, but also in the development of each subject, taking into account the versatility of robotics as a field of technical knowledge.

As a direction of technical innovation, the study of elements of robotics should be included in the content of physics, computer science, mathematics, technology and other subjects taught in general education schools , as well as in the content of optional lessons and extracurricular activities. with students. In each university, taking into account its direction, a comprehensive program for the introduction of elements of robotics into the technical training of schoolchildren should be developed. The purpose of such a program is to form the technical culture necessary for school graduates to work effectively in the robotics environment in the near future.

In the classroom, students can be given the task of assembling a motion sensor. The teacher gives appropriate instructions and necessary recommendations to the students. Information about the completion of the task is given to each student.

In this activity, students build a motion detection system using a passive infrared sensor. Also different from this device, for example: sending messages through the light, changing the location of something, "Welcome home!" when approaching the front door. can be used to perform tasks such as the appearance of text.

Required components: Arduino board , LED , breadboard , piezo buzzer , PIR motion sensor sensor HC-SR501 (Figure 1) .

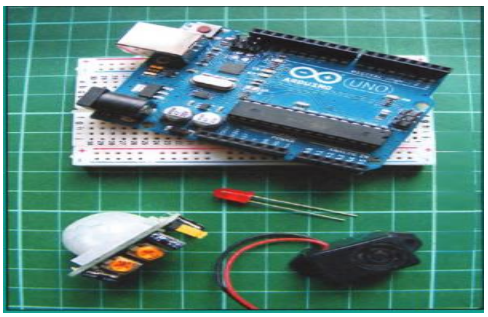

Figure-1

Workflow : This project is based on the workflow of the HC-SR501 sensor. The sensor must be installed in such a way that when a person appears in front of it, the light bulb lights up and the piezo distributor sounds (Figure 2). It can be adapted and used for other purposes [3 , p. 72] .

Figure-2

Any peso dispenser will do for this project. The main thing is to observe the polarity: the red wire must be connected to a 5 V supply, and the black wire to ground. Other similar motion sensors will work for our project, but it is important to check the location of the contact sensor of your model, as their classification files may differ. All sensors must have a power supply, ground, and data output. The pins on this model are not visible at a glance, but if you remove the outer lens (which is held in place by screws and can be easily removed) you can see the pin marks as shown in Figure 3.

Motion sensor with lens removed.

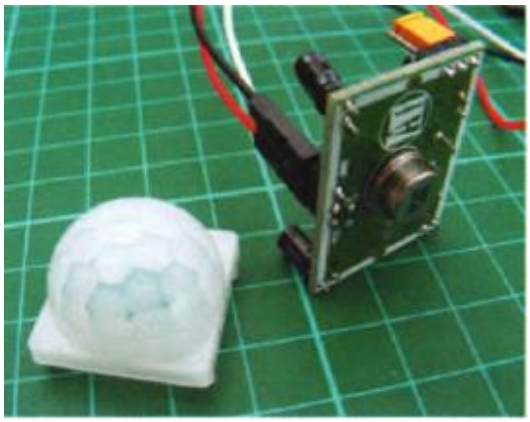

Figure-3

Two orange potentiometers on the sensor allow you to adjust it. In the position of the sensor shown in Figure 4, when an object is detected, the left potentiometer exits the HIGH mode, controls the response time and allows you to set this time in the range from 5 to 200 s. If an LED is connected to the output, the potentiometer determines whether it will light up from 5 to 200 seconds, depending on the setting level. The right potentiometer limits the detection of an object in the range from 0 to 7 m [5 , p. 73] .

Motion potentiometers. The left potentiometer is in the **HIGH** position of the output. (5-200 seconds); and the right potentiometer controls the sensitivity of the sensor (0-7 meters). The sensor detects infrared radiation emitted by warm objects. The crystalline material inside the sensor immediately detects infrared radiation. When it reaches the set level, it drives the output signal of the sensor [7 , p. 81] .

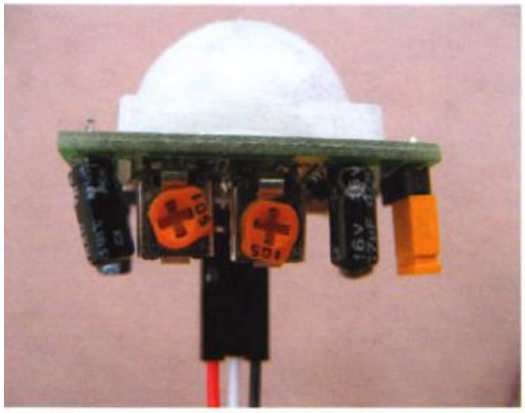

Figure-5

The Arduino board receives this signal as a voltage, so it can be used to turn on an LED . The device must be installed in such a way that an audible signal is emitted during operation .

The device can be assembled in the following order:

1. Connect the 5V and GND pins of the motion sensor to the power rail and ground of the breadboard, respectively, these buses must be connected to the corresponding pins of the Arduino board. Connect the sensor's OUT pin to the 2nd pin of the Arduino board (see Figure 5).

Motion sensor connected to connector

Figure-6

2. Mount the LED on the breadboard and connect the long leg (anode) to Arduino pin 13 and the short leg to GND. In this project, you won't need a resistor to drive the LED.
3. Connect the piezo distributor: red wire to pin 10 of the Arduino board; connect black to GND pin.
4. Make sure your circuit matches the circuit in fig. 6, then upload the code for this project to the

Arduino memory. From the examples above, it can be seen that the interest of students in science and the use of educational materials and teaching aids related to robotics in the development of technical creativity is evidence of the practical application of physics. Students will understand information about the structure and operation of various devices based on the science of physics. Also, giving them such assignments when doing various homework and assignments will help them develop competencies in the design and construction of various devices.

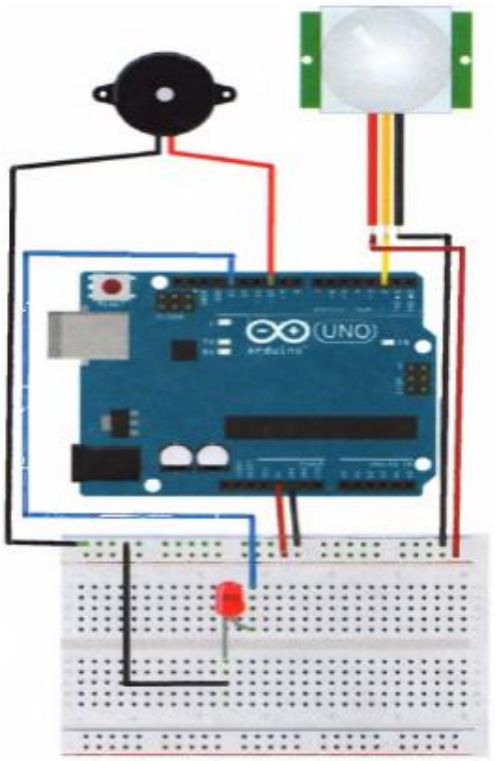

Figure-7

Conclusion

As stated above, as students develop the skills to wire different circuits, they may learn to wire more complex circuits or learn to wire different peripherals. When using elements of robotics in teaching subjects in physics lessons , it is important that students master scientific and technical educational materials and acquire knowledge in accordance with state educational standards.

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