and your business from cyber threats. Cybersecurity education is an investment in our digital future. By educating ourselves about cybersecurity, we can make the internet a safer place for everyone.

Literature:

1. Blythe, J., & Shoesmith, D. (2019). Cybersecurity education in schools: An exploratory study into the current state and challenges. Computers & Education, 129, 78-88.

2. Ikeda, M., Nakamura, T., & Takeuchi, A. (2015). The importance of educating users on information security behaviors: Empirical study of individual's computer use at two Japanese universities. Computers & Security, 49, 315-327.

3. Muxtarov , F., Turdimatov , M., & Mominova , M. (2023). UMUMIY O'RTA TA'LIMGA KIBERXAVFSIZLIK FANINI TIZIMLI ISLOH QILISHNING USTUVOR YO'NALISHLARI. Engineering Problems and Innovations.

4. Muxtarov, F., & Sadirova, X. (2023). KORXONADA AXBOROT XAVFSIZLIGINI TA'MINLASHNING ZAMONAVIY USULLARI. *Engineering Problems and Innovations*.

5. Papastergiou, M., Nikolakopoulou, V., & Gerodimos, R. (2017). Cybersecurity education in Greece: A survey on school practices and stakeholder opinions. Journal of Information Security Education, 10(1), 40-49.

AUGMENTED REALITY IN ROBOTICS: MERGING WORLDS FOR THE FUTURE

Jomurodov Dustmurod Mamasolievich,
Ulashev Asror Nasriddinovich
Jizzakh branch of National University of Uzbekistan
jomurodovd77@gmail.com

Abstract : This article explores the use of augmented reality (AR) in robotics. Explores interactive programming lessons, allowing students to interact with virtual robots in real time, changing code and seeing the results of their actions. Simulation of real scenarios of robot operation in a virtual environment is also discussed, which simplifies the understanding of the principles of operation and programming of robots. These innovations make learning more interactive, enhancing learning and developing robotics programming skills.

Keywords: augmented reality, robotics, programming, training, virtual robots, interactive lessons, simulation, visualization, education.

Augmented Reality (AR) is a technology that allows you to integrate virtual objects and information into the real world. The application of this technology is expanding into many areas, including medicine, education, the gaming industry, and, of course, robotics [3]. Integrating augmented reality into robotics offers exciting

prospects for improving human-machine interaction and making robots more efficient and usable.

Application of augmented reality in robotics

1. Visualization and Control: Augmented reality (AR) in robotics greatly simplifies data visualization and robot control. Operators can use AR interfaces to visually display information about the robot's status and position. For example, important parameters such as battery charge, engine temperature, or sensor data can be displayed in real time on the screen using AR applications. AR visualization allows operators to view the robot in real time through cameras mounted on the mechanism. This makes the control process more intuitive and allows operators to avoid obstacles in the environment [1].

2. Education and training. The use of AR in robotics enriches the learning and training process. Professionals and students can replicate scenarios of working with robots in a virtual environment using AR applications. This allows them to immerse themselves in simulated environments and learn how to control, program, and interact with robots in a safe and controlled environment. AR also enables the creation of interactive simulators with real robots, where the operator sees the actual robot but simultaneously supplements it with virtual elements, such as programming instructions or visualization of the movement path [2].

3. Improved perception of the environment. AR in robotics improves the way a robot perceives its environment. Robots can use AR interfaces to obtain additional information about obstacles, routes and objects around them. This data improves navigation algorithms and helps avoid collisions and effectively interact with the environment.

AR also allows the creation of layers of visual and information processing, making robot perception completer and more informative.

4. Collaboration between humans and robots. AR encourages a more harmonious interaction between humans and robots in collaborative work environments. With AR, a person can see how the robot perceives the world around it, which improves understanding of its actions and promotes effective teamwork. Operators can communicate with the robot using AR interfaces, making it easier to convey instructions and tasks [4].

Collaboration in an AR environment improves the efficiency and accuracy of operations, especially in environments that require synchronized actions between humans and machines.

5. Studying programming in robotics using augmented reality. Augmented reality greatly simplifies the process of learning programming in robotics. Using AR, students can visualize and manipulate robots and software code in real time. This creates an interactive and enjoyable environment for learning both the basics and advanced principles of robot programming.

Students can create virtual models of robots, program their behavior, and observe the results of their work directly in the AR interface. This promotes a deeper understanding of programming and facilitates the application of theoretical knowledge in practice.

Augmented reality (AR) provides amazing tools for teaching robotics programming. Here are some ideas on how you can make the most of AR in this context:

a) Interactive programming lessons: Using AR in interactive programming lessons allows for the creation of visual scenarios where students can directly interact with virtual robots. They can modify programs and observe the results of their changes in real time. For instance, students could create a program for a robot that needs to navigate around an obstacle. By modifying the code, they can observe how it influences the robot's path, enhancing the learning process in a visual and engaging way.

Let's say you have a virtual robot that needs to move and avoid obstacles. Students can interact with this robot using special AR interfaces to program its movements. An example of simple pseudocode for such a task might look like this:

```
robot.move_forward(10) # Robot moves forward 10 units
robot.turn_left(90)    # Robot turns left 90 degrees
robot.move_forward(5)  # Robot moves forward 5 units
```

Students can change parameters and see how the robot reacts to their changes.

b) Simulation of real scenarios: AR allows you to simulate real robot operating scenarios in a virtual environment. Students can program robots to perform a variety of tasks, such as object sorting, automated transportation, or even medical care. This provides students with the opportunity to understand how robots can be used in the real world and how their programming affects their functionality and efficiency [3].

Let's say you want to simulate the work of a robot that must pick up objects in a room and carry them to another place. Using AR, students can create an algorithm for this task. An example pseudocode could be as follows:

```
while there_are_items_in_the_room:
    item = find_nearest_item()
    pick_item(item)
    move_item_to_another_place(item)
```

Students can visually observe the robot as it works, moves around the room, searches for objects, and carries them to another place using the AR interface. These examples demonstrate how AR can make learning to code more interactive and visual, enabling students to experiment with code and see the results of their work directly in the AR environment.

c) Collective programming: AR can facilitate collaborative programming, where a group of students can simultaneously work on projects in a virtual space. They can see and comment on changes in real time, thus facilitating team collaboration and enabling learning from each other.

d) Visualization of algorithms: AR allows you to visualize the operation of algorithms and data structures using a real example of a robot. Students can observe how their code affects the robot's behavior, helping them to better understand basic programming concepts.

e) Testing virtual prototypes: Using AR, you can create virtual prototypes of robots and test programs on them without the need for a physical model. This saves time and resources, allowing students to experiment and improve their skills without real restrictions.

AR in robotics not only improves the learning process but also prepares specialists for real-life tasks in the field of automation and robotics. Using this innovative technology can be the key to successfully mastering programming in this exciting field.

Benefits of Augmented Reality in Robotics

1. Improved visualization and understanding. Augmented reality (AR) enables operators to gain a deeper understanding of how robots' function and their interactions with the environment and other objects. This capability can lower the chance of errors and enhance operational safety.

2. Greater efficiency of training and learning ability. The use of augmented reality in training and educating robotics specialists accelerates the process of mastering skills and knowledge, which is important in the rapidly developing field of robotics.

3. Interactive interaction. With AR, robot operators can interact with virtual objects in real time, creating conditions for more effective information perception and decision-making.

4. Increasing attractiveness and interest in robotics. The use of emerging technologies, such as AR, is making robotics more exciting for both youth and the general public, stimulating interest in the field.

The future of augmented reality in robotics. Augmented reality is just the beginning of a promising direction for robotics. The future lies in further developing AR technologies, creating more integrated and reliable systems, as well as expanding their areas of application. The fusion of the real and virtual worlds in robotics will lead to the creation of smarter, more flexible, and adaptive robots that can effectively interact with humans and the environment.

References:

1. Abdumo‘minovich S. A., Xolbutayevich T. O., Mamasoliyevich J. D. TO‘LDIRILGAN REALLIK SUN’IY INTELLEKT BILAN KELAJAK TEXNOLOGIYASIGA AYLANMOQDA //International Journal of Contemporary Scientific and Technical Research. – 2022. – С. 187-190.

2. Jomurodov D. Virtual va to‘ldirilgan reallik zamonaviy axborot kommunikatsiya texnologiyalari sifatida //Zamonaviy innovatsion tadqiqotlarning dolzarb muammolari va rivojlanish tendensiyalari: yechimlar va istiqbollar. – 2022. – Т. 1. – №. 1. – С. 166-169.

3. Xolbutayevich T. O., Mamasoliyevich J. D. O‘QUV JARAYONIDA TO‘LDIRILGAN REALLIK TEXNOLOGIYALARIDAN FOYDALANISH //International Journal of Contemporary Scientific and Technical Research. – 2022. – С. 334-338.

4. Turakulov O., Jomurodov D. VIRTUAL AND AUGMENTED REALITY TECHNOLOGIES: DEVELOPMENT, APPLICATIONS, AND PERSPECTIVES //International Journal of Contemporary Scientific and Technical Research. – 2023. – С. 250-253.