

THE SIMULATORS IN ROBOTICS, THEIR INTEGRATION IN OUR LIVES

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The active development of mobile and autonomous robotics over the past decade has helped to find opportunities for their application and solution of problems in the field of Electronics.

Training and working with complex modern robots require simulators. They are a powerful tool for educating and training people, providing a safe environment for practicing and developing skills (Hurrel).

Simulators play a critical role by guaranteeing a safe, effective, and cost-efficient environment for training. They allow users to acquire practical skills and develop critical thinking in a controlled environment. The use of simulation systems has important criteria such as: (Lateef, 2010, p. 348)

- Safety;
- Effectiveness of training;
- Saving resources;
- Standardization of processes;

- Modeling of complex scenarios.

In the modern dimension of simulation systems, there are several main types of simulators, each of which has its own characteristics and applications: (Moiseienko, 2024)

- Live simulations;
- Virtual simulations;;
- Constructive simulations;
- Gaming simulations.

Considering the manufacturability of modern simulators used in Ukraine, it is necessary to note the use of various advanced technologies to ensure the most realistic and effective training, namely: (Peremot, 2024)

- Virtual Reality (VR) technologies;
- Use of complex mathematical models;
- Augmented Reality (AR) technologies;
- Systems for modeling situational actions;
- Interactive simulators.

These technologies ensure a high level of realism and effectiveness of simulators, which contributes to the professional training of Ukrainian specialists.

Several countries are leaders in the development of multi-sectoral simulators due to their advanced technologies and significant investments in research and development. The world leaders in the development of simulators include Japan, the United States, Canada, Israel, the United Kingdom, Germany, France, China, and Australia.

The use of simulators can significantly reduce training costs, as it does not require the use of real equipment and other resources. By providing a safe environment for practicing complex and dangerous operations, which reduces the risk of human injury during them. This is especially important for beginners when practicing with new tools. Thanks to the use of modern technologies such as AI and machine learning, simulations can be adapted to the individual needs of each student,

providing personalized recommendations and feedback. Resulting in a possibility of training of a large number of students at the same time. Modern simulators allow you to quickly create and test new scenarios, which makes it possible to be prepared for various challenges (Bernatskyi, 2024).

Future simulators will definitely include new technologies that will further increase their efficiency and realism. Promising technologies that may appear in the near future include artificial intelligence (AI), the Internet of Things (IoT), 5G technologies, extended reality (XR), additive manufacturing (3D printing and 3D scanning), robotics, and autonomous systems. These technologies have the potential to significantly improve professional simulations, making them more realistic, interactive, and effective in preparing professionals for current and future challenges.

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