O‘ZBEKISTON MILLIY UNIVERSITETI XABARLARI, 2024, [1/7/1]
ISSN 2181-7324

FALSAFA
http://journals.nuu.uz
Social sciences

UDK:379

Oksana FOTINA,
Perm State Agro-Technological University named after Academician D.N. Pryanishnikov, Perm, Russia
E-mail:oksanafotina@gmail.com
Denis PONOMARYOV,
Perm State Agro-Technological University named after Academician D.N. Pryanishnikov, Perm, Russia

Based on the review of B.Rakhimov, professor of the GulSU

КВАНТОВЫЕ ТЕХНОЛОГИИ В ОБРАЗОВАНИИ

Аннотация

Технологии, в основе которых лежит квантовая физика, существуют уже почти 80 лет. Понимание квантовой физики твердого тела послужило толчком к изобретению в 1947 году знакомого всем транзистора, а понимание квантовой оптики – лазера. Человечество научилось манипулировать сложными квантовыми системами на основе их индивидуальных компонент: ионов, фотонов и атомов. Можно отдельно контролировать квантовое состояние каждого компонента квантовой системы, а также изменять и измерять их состояния. В статье описаны возможные области применения квантовых технологий в образовательных целях.

Ключевые слова: Кубиты, высокая точность, доступность, квантовые системы, криптография, интерактивная квантовая симуляция, обучение.

TA’LIMDA KVANT TEXNOLOGIYALARI

Kvant fizikasiga asoslangan texnologiyalar deyarli 80 yildan beri mavjud. Kvant qattiq jism fizikasini tushunish 1947 yilda tanish tranzistorni ixtiro qilishga turtki bo‘ldi. Insoniyat murakkab kvant tizimlarini ularning individual komponentlari: ionlar, fotonlar va atomlar asosida boshqarishni o‘rgandi. Kvant tizimining har bir komponentining kvant holatini alohida nazorat qilish, shuningdek, ularning holatlarini o‘zgartirish va o‘lchash mumkin. Maqolada ta’lim maqsadlarida kvant texnologiyalarini qo‘llashning mumkin bo‘lgan sohalari tasvirlangan.

Kalit so‘zlar: Kubitlar, yuqori aniqlik, mavjudlik, kvant tizimlari, kriptografiya, interaktiv kvant simulyatsiyasi, trening.

QUANTUM TECHNOLOGIES IN EDUCATION

Annotation

Technologies based on quantum physics have been around for almost 80 years. The understanding of quantum solid state physics was the impetus for the invention in 1947 of transistor, and the understanding of quantum optics led to the invention of laser. Humanity has learned to manipulate complex quantum systems based on their individual components: ions, photons and atoms. It is possible to separately control the quantum state of each component of a quantum system, as well as to change and measure their states. The article describes the possible areas of application of quantum technologies for educational purposes.

Key words: Qubits, high-precision, accessibility, quantum systems, cryptography, interactive quantum simulations, learning.

Quantum technologies are a rapidly developing field in science and technology, based on the laws of quantum mechanics. They allow us to work with quantum states of systems that can be described by quantum bits (qubits). Quantum technologies can be used to solve complex problems that cannot be solved by classical methods. In recent years, there has been significant progress in the development of quantum technologies, including quantum computers, quantum sensors, and quantum teleportation.

Quantum technologies consist of three main components:

• Quantum bits (qubits)

• Quantum gates – the analogs of classical logic gates in quantum computers. They are used to manipulate the qubits.

• Quantum algorithms – programs written to perform tasks on a quantum computer. They use quantum properties to solve problems much faster than classical algorithms.

Key concepts of quantum technologies. Quantum technologies are based on the laws of quantum mechanics and quantum physics. The key concepts in this field are quantum systems, cryptography, quantum computing, qubits, quantum teleportation, quantum sensors, quantum optics, and quantum information theory. Quantum computing uses qubits, which can be in multiple states simultaneously. Unlike classical bits, which can only be 0 or 1, qubits can take on any value between 0 and 1, making quantum computing much faster and more efficient in solving certain problems. This superposition of qubits allows for solving problems with more variables in much shorter periods of time than classical methods. Qubits can be used to create quantum networks that can provide a more secure transfer of information in the form of quantum states, which makes it impossible to intercept without distortion. Cryptography also becomes particularly important in light of the emergence of quantum computers, which can crack classical ciphers. Quantum teleportation allows for the transmission of quantum information between remote quantum systems, while quantum sensors use quantum phenomena to measure various physical quantities. Quantum optics studies the interaction of light and quantum systems, and quantum information theory explores the use of quantum phenomena for the transmission and processing of information.

Using quantum technologies. Quantum technologies have a wide range of applications, including the development of new drugs, optimization of transportation systems, improvement of cryptography, and the advancement of artificial intelligence. Some examples of the use of quantum technologies include quantum computing for solving complex

problems, quantum cryptography for protecting confidential information, and the use of quantum sensors for increasing the precision of measurements in various fields, from medicine to materials science.

For example, in a city with a population of one million, each resident has a name up to 10 characters long and a 7-digit phone number. The phone book consists of 17 million entries and takes up about 17 megabytes of data. This is a lot of data. It is possible to record all of this using quantum mechanical methods in just 17 qubits. These qubits will contain the names and phone numbers of all the city residents in an entangled superposition.

Advantages of using quantum technologies in education. The use of quantum technologies in education has numerous advantages, such as increasing the efficiency of learning, creating interactive quantum simulations, improving the visualization of complex concepts and theories, and the potential to reduce learning time. Additionally, the use of quantum technologies in education provides students with the opportunity to acquire new skills and knowledge in the forefront of science and technology, which can enhance their competitiveness in the job market.

Examples of quantum technology applications in education. There are numerous examples of quantum technology applications in education. One of them is the use of quantum computing for modeling and analyzing quantum systems, which can help students better understand the principles of quantum mechanics. Additionally, virtual and augmented realities built with the help of quantum technologies can create unique and interactive learning environments that allow students to gain a deeper understanding of complex concepts and phenomena. Quantum technologies can also be used for processing large amounts of data, which can help in the education of artificial intelligence and machine learning

Challenges and prospects of applying quantum technologies in education. The use of quantum technologies in education faces challenges such as technical complexity, high cost, and the need for integration with existing systems. In addition, the use of such technologies requires training of educational personnel. However, the use of quantum technologies can lead to new opportunities in creating educational materials, modeling systems, analyzing data, and creating more accurate sensors.

REFERENCES

1. Злобин А.Д. Квантово-виртуальный метод дистанционного обучения. Современные исследования социальных проблем, 3(03) (2010): 28-33
2. Preskill, John. Quantum Computing in the NISQ era and beyond. Quantum 2 (2018): 79.
3. McGeoch, Catherine C. "Adiabatic quantum computing and quantum annealing: Theory and practice." Synthesis Lectures on Quantum Computing 5.2 (2014): 1-93.
4. Harrow, Aram W., Avinatan Hassidim, and Seth Lloyd. Quantum algorithm for solving linear systems of equations. Physical Review Letters 103.15 (2009): 150502.