

EXPANSION OF IOT (INTERNET OF THINGS)

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Annotation. The Internet of Things (IoT) links physical objects to the internet enabling autonomous interaction. It opens up a wide range of opportunities to optimise processes in various fields. This article explores how IoT can transform daily life and its role in societal digital transformation.

Keywords. IoT, smart home, IoT devices.

Introduction. We have been connecting things around us, such as computers and machines, to the internet for a long time. This is nothing new. What is new are all the things that are now being connected, known as the Internet of Things (IoT). As technology has become cheaper and sensors smaller, potential applications and use cases have increased.

This article aims to explain what IoT is, as well as its significance and benefits for society and its digital transformation. Additionally, it reveals some ideas for expanding the IoT use in its application areas.

Main part. IoT is about connecting and coordinating things. It means that physical objects, such as refrigerators and cars, are connected to the internet and can communicate and interact without human intervention. This can range from recycling stations that notify when they are full, to controlling security equipment and critical infrastructure, streetlights that adjust when someone passes by, or bicycle helmets that detect high pollution levels [2].

IoT is defined as an umbrella term for the development where machines, vehicles, goods, household appliances, clothing, all kinds of objects, as well as people and animals, are equipped with small embedded sensors and processors. This enables these devices to perceive their environment, communicate with it, and thus create context-aware behaviour. This contributes to creating smart, attractive, and helpful environments, products and services [2].

With IoT, society's facilities and infrastructures are equipped with sensors that can detect and collect data on everything from movement and noise levels to external influences and the presence of chemicals and pollutants. The information collected by the sensors is sent via wireless, mobile, or fixed networks to some form of data system or digital platform. The data is analyzed, and the insights are used in various digital services to inform, optimise and control flows and functions.

Let's delve deeper into each of the IoT applications and find out what impact they have.

1 Agriculture and Pest Control.

IoT is revolutionizing agriculture by enabling precision farming and efficient pest control. Sensors placed in fields monitor soil moisture, temperature, and nutrient levels, allowing farmers to optimise irrigation and fertilization. Drones equipped with IoT technology can survey large areas, detect pest infestations, and even spray pesticides precisely where needed. This reduces resource waste, increases crop yields, and minimizes environmental impact. IoT also helps in monitoring livestock health and automating feeding systems, ensuring better animal welfare and productivity. IoT can further expand by integrating AI-driven analytics to predict crop diseases and pest outbreaks, enabling proactive measures and reducing reliance on chemical pesticides [1, 2].

2 Environment.

IoT plays a crucial role in environmental monitoring and conservation. Sensors deployed in forests, oceans, and urban areas track air and water quality, noise levels, and wildlife activity. For example, IoT-enabled devices can detect illegal logging or poaching in real time. In cities, IoT

helps monitor pollution levels and manage waste more efficiently, such as by notifying authorities when trash bins are full. Additionally, IoT contributes to climate change mitigation by optimizing energy use and reducing carbon emissions. Expanding IoT networks to include more remote and sensitive ecosystems, such as rainforests and polar regions, can provide deeper insights into climate change and biodiversity loss [1, 2].

3 Smart Home Applications.

IoT transforms homes into smart, interconnected spaces. Devices like smart thermostats, lighting systems, and security cameras can be controlled remotely via smartphones or voice assistants. For instance, a smart thermostat learns user preferences and adjusts the temperature automatically, saving energy. Smart locks enhance security by allowing remote access control. IoT also enables home automation, such as turning off appliances when not in use, improving convenience, safety, and energy efficiency. The integration of IoT with renewable energy systems, such as solar panels and home batteries, can optimise energy consumption and promote sustainable living [1, 2].

4 Health Care.

IoT is revolutionizing healthcare through remote patient monitoring, wearable devices, and smart medical equipment. Wearables like fitness trackers and smartwatches monitor vital signs such as heart rate and sleep patterns, providing real-time health insights. IoT-enabled medical devices, such as insulin pumps and pacemakers, can transmit data to healthcare providers, enabling timely interventions. Telemedicine platforms powered by IoT allow patients to consult doctors remotely, improving access to care, especially in rural areas. IoT can expand by developing interoperable platforms that allow seamless data sharing between wearable devices, hospitals, and telemedicine services, improving holistic patient care [1, 2].

5 Smart Cities.

IoT is at the core of smart city initiatives, enhancing urban living through improved infrastructure and services. Smart traffic management systems use IoT sensors to monitor and optimize traffic flow, reducing congestion and pollution. Smart streetlights adjust brightness based on pedestrian and vehicle movement, saving energy. IoT also enables efficient waste management, water distribution, and public safety systems. For example, sensors can detect water leaks or monitor air quality, ensuring a healthier and more sustainable urban environment. Expanding IoT to include citizen engagement platforms, where residents can report issues and access real-time data, can foster more participatory and responsive urban governance [1, 2].

IoT adoption is growing in Belarus across agriculture, healthcare, transportation, and energy, with mobile operators like Beltelecom, MTS, and A1 driving smart home and smart city projects in housing and utilities to automate processes and optimize energy use. For example, MTS collaborates with IOTANS for IoT data visualization, while Beltelecom develops a centralized system for monitoring residential resource consumption via fiber-optic networks, highlighting IoT's importance in Belarus's sustainable development and technological advancement [3].

Conclusion. The Internet of Things (IoT) has become a pivotal element in the evolving technological landscape, shaping the future of our society and individual lives. IoT is increasingly interwoven into various domains, impacting our daily lives and the way we interact with the world around us. Furthermore, the integration of IoT with artificial intelligence and big data analytics is poised to unlock even greater potential, enabling predictive insights and more adaptive, context-aware solutions across these sectors.

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