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ARCHITECTURE OF AUDIOVISUAL SYSTEM IN INTERNET OF THINGS

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АРХІТЕКТУРА АУДІОВІЗУАЛЬНИХ СИСТЕМ В ІНТЕРНЕТІ РЕЧЕЙ

У статті наводиться огляд проблематики в питанні аудіовізуальних систем у системах Інтернету речей в контексті безпеки, енергоживлення, сумісності із наведенням технічних рішень.

A review of issues in the issue of audiovisual systems in Internet of Things (IoT) systems in the context of security, power supply and interoperability.

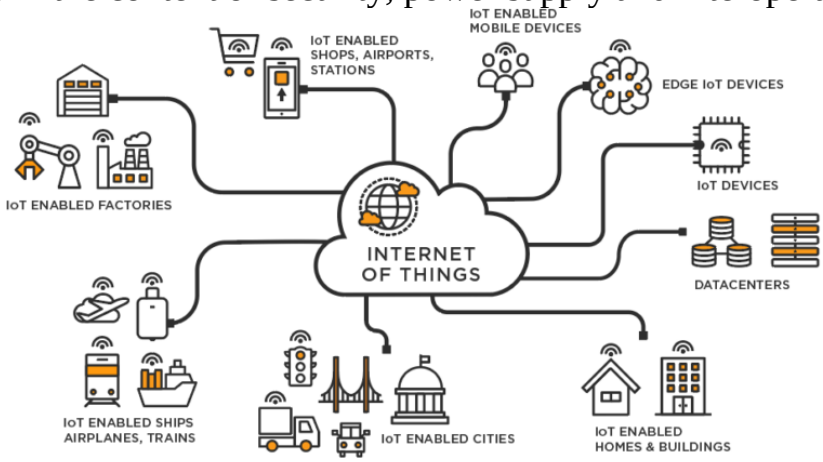

Fig. 1. Possibilities of IoT.

The Internet of Things is a key element in shaping modern frameworks in various areas of life, contributing to improved efficiency, reduced costs and enhanced security [1]. The audiovisual framework in the Internet of Things encompasses a range of tools, including video recorders, sound modules, displays, detectors, and applications for data manipulation and transmission. Even in the field of audiovisual technologies with significant potential, several issues hinder the optimal application of audiovisual systems in the Internet of Things [2]: compatibility and integration; security; high network load; energy efficiency [3].

New technologies are actively being introduced to tackle these challenges. AI automates system configuration and optimizes audio and video signal processing [4]. The implementation of 5G and fiber-optic networks minimizes data transmission delays, which is especially vital for streaming services and interactive platforms. Blockchain technology enhances intellectual property security, while energy-efficient algorithms help reduce resource consumption, improving overall system efficiency. Additionally, these systems are built based on specific models.

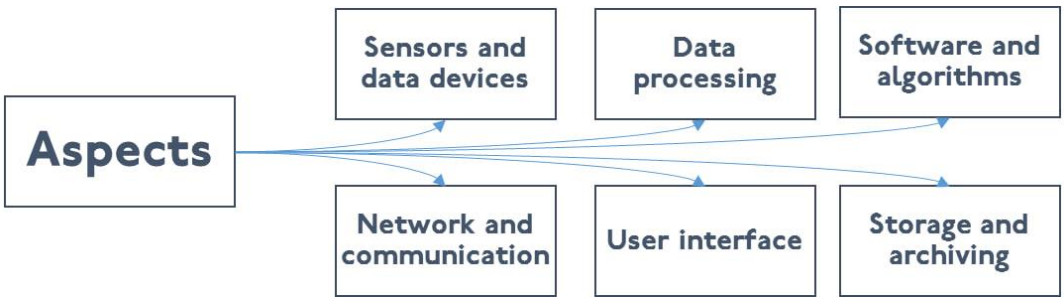

Fig. 2. Aspects of audiovisual systems (AVS).

The main models of audiovisual systems include systems with video and audio integration, where simultaneous transmission of image and sound enables full two-way communication, commonly used in video conferencing and surveillance. Another category consists of systems with sensors and interactive devices, often found in IoT applications such as security systems that utilize cameras and speakers to monitor activity and notify users. Additionally, audiovisual technologies play a key role in multimedia entertainment and advertising, supporting interactive exhibitions, marketing campaigns, and large-scale media events.

Despite technological obstacles, video and sound systems on the Internet have high potential for improvement. The generation and synchronization of images and audio through AI helps automate tasks in various industries, such as journalism, healthcare, or smart city settings [5].

Fig. 3. Architecture levels AVS in IoT.

Such innovations can contribute to more engaging and personalized experiences for users, for example, flexible multimedia systems that respond to the user's emotions or physical functions through specialized devices.

Video and audio equipment are a key function of Internet connectivity today, and they grow more useful every year. Identifying technical and security obstacles will allow these networks to achieve unprecedented achievements, improving the lifestyle of global citizens.

Modeling an audiovisual system involves two main approaches: simulation modeling and full-scale (physical) modeling. Simulation modeling relies on mathematical or software models to predict system behavior, assess noise impact, and evaluate sound and image transmission quality without creating physical prototypes. Tools like MATLAB, Simulink, and Python libraries (SciPy, OpenCV) enable virtual simulations of signal processing and distortion correction, allowing for early-stage optimization and error prevention.

Full-scale modeling, on the other hand, involves building a real prototype and testing it in actual conditions, considering factors like lighting, acoustics, and external interference. This approach ensures accurate evaluation of cameras, microphones, and displays, identifying real-world challenges such as signal delays or noise. While simulation provides a cost-effective way to refine system performance, full-scale testing validates its practical reliability. Combining both methods enhances the accuracy and efficiency of audiovisual systems.

The integration of audiovisual systems into the Internet of Things (IoT) offers great potential but also presents challenges related to security, power efficiency, and interoperability. Advances in AI, 5G, blockchain, and energy-efficient algorithms are helping to address these issues by optimizing data transmission, enhancing security, and reducing resource consumption. Additionally, the combination of simulation and full-scale modeling ensures both theoretical optimization and real-world validation of system performance. As these technologies continue to evolve, overcoming technical barriers will lead to more interactive, efficient, and intelligent audiovisual solutions, ultimately enhancing user experiences and fostering smarter, more connected environments.

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