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DECISION SUPPORT INFORMATION TECHNOLOGY IN VIDEO SURVEILLANCE AND MONITORING TASKS

Abstract: In the modern world, video surveillance systems are an integral part of security and monitoring measures in various sectors, from public places to industrial facilities. However, with their increasing prevalence, ethical issues arise concerning the use of video data and the impact of these systems on privacy and citizens' rights. In this article, we will delve into some of these issues in detail and propose recommendations for their resolution.

It is important to recognize the consequences that video surveillance and monitoring can have on the quality and effectiveness of decisions made by people. This problem proves to be quite relevant in various fields, including manufacturing, engineering, and others. Video surveillance and monitoring have become an integral part of the modern world, particularly in the areas of security, transportation, urban planning, and ecology, with the aid of advanced video analysis and data processing technologies. Today's video surveillance systems provide a high level of in formation support for decision making, which is why we will explore the key aspects of infor mation technology that support decision making in video surveillance and monitoring tasks, as well as the prospects and challenges of its application.

Keywords: video surveillance, monitoring, information technology, decision support systems.

Problem Statement. In the context of information technology support for decision-making in video surveillance and monitoring tasks, the focus lies on identifying and addressing a range of challenges that arise in the process of utilizing these technologies. Many video surveillance systems utilize complex algorithms for object recognition and behavior analysis; however, the effectiveness of these algorithms may be limited in conditions of restricted resources or complex environmental conditions, necessitating further refinement.

One of the key aspects is ensuring the accuracy and reliability of the information used for decision-making. Even small errors in object detection or behavior analysis can lead to serious consequences. With the increasing volume of collected data, the importance of ethical and legal aspects such as privacy protection, data usage, and information storage also grows. It is necessary to strike a balance between using this data and protecting human rights.

For more effective decision-making, it is crucial to integrate video surveillance systems with other sources of information, such as sensor systems, social media, databases, etc. As video surveillance systems become increasingly connected to networks, they become vulnerable to cyber attacks. Ensuring resilience to attacks and cybersecurity is a key task for preserving information security and preventing unwanted interference in decision-making processes.

Thus, creating an effective and reliable information technology to support decision-making in video surveillance and monitoring tasks requires a comprehensive approach that considers technical, ethical, legal, and cybersecurity aspects.

Analysis of recent research and publications. One of the key elements of information technology in video surveillance is automated video analysis. This technology utilizes artificial intelligence algorithms for object recognition, behavior analysis, and anomaly detection in video streams. For example, systems can automatically detect moving objects, recognize license plates of vehicles, or identify human behavior on the street or indoors. [3]

The ability to process large volumes of video data in real-time is an incredibly important aspect of information technology support for decision-making in video surveillance and monitoring tasks. Thanks to the rapid development of computing technologies and software, modern systems effectively analyze large streams of video data and extract useful information for decision-making. Additionally, the integration of video data with geospatial information allows for the creation of comprehensive monitoring systems that not only provide visual information but also contextualize it in space. For example, systems automatically determine the location of events on a map, aiding in the rapid response to emergencies. [1-3]

However, along with the powerful capabilities of information technology, challenges arise. One of the biggest challenges is privacy protection; the collection and analysis of large volumes of video data can violate citizens' privacy. Therefore, it is important to develop and implement effective data protection measures. Machine learning and neural networks are key components of modern video analysis systems. By training on large datasets, these algorithms become increasingly accurate and efficient in object detection and behavior analysis. [1-3]

In the modern world, where work becomes increasingly monotonous and requires constant engagement, it is important to recognize the consequences this can have on the quality and effectiveness of decisions made by humans. This issue is particularly relevant in various fields, including manufacturing, engineering, and others. Continuous workload and monotony can affect the mental state of workers

and their overall productivity. Loss of concentration and fatigue can hinder the ability to make informed decisions. Long-term monotony can lead to a loss of motivation and interest in work, further complicating the decision-making process. [1]

Moreover, constant routine can lead to the application of template approaches to decision-making, which in turn can lead to a loss of flexibility and an inability to adapt to new situations. Insufficient time for studying new issues or analyzing alternative paths can also lead to a lack of information for making informed decisions. [1] To prevent these risks, it is important to regularly optimize the workflow and seek opportunities for improvement. The development of information technologies provides the opportunity to use various algorithms and methods in such activities. One way to support decision-making is to use decision support systems (DSS), which help reduce the impact of workload and monotony on the quality of decisions.

Thus, considering the risks associated with constant workload and monotony is important for ensuring effective and informed decision-making in the modern world [1].

The methodology for developing DSS based on rapid prototyping, proposed by [2], includes the following stages:

1. Identification of goals and objectives: This stage involves carefully defining the goals of DSS development, planning the development process, determining the composition of developers, and sources of knowledge.

2. Knowledge acquisition: The process of knowledge transfer from experts to a knowledge engineer (cognitologist) is carried out, including the accumulation and systematization of expert knowledge.

3. Conceptualization (structuring) of knowledge: At this stage, the structure of the acquired knowledge about the subject area is determined, which helps to formalize these knowledge for use in the system.

4. Formalization of knowledge: The formalization stage involves constructing a formal representation of concepts about the subject area based on the selected (or developed) knowledge representation model.

5. Prototype implementation: At this stage, a DSS prototype is developed based on selected or developed software and technical means.

6. Testing the implementation results: The testing stage aims to verify and evaluate the operation of the DSS according to real requirements and user requests. [3,4]

This methodology provides a systematic and effective approach to the development of DSS, ensuring a quality and functional system that meets the needs of users.

Research Objective. The use of video data in video surveillance and monitoring systems raises a number of ethical issues that require attention and resolution to ensure the protection of privacy and other rights of citizens.

Decision Support Information Technology (DSIT) in the field of video surveillance and monitoring is a key component for optimizing the processes of analysis, processing, and utilization of video data. This technology is used to automate and improve decision-making based on information obtained from video recordings. The main goal of this technology is to provide operators and surveillance systems with powerful tools for automatically detecting events, objects, and patterns in the video stream, which helps in making effective and well-founded decisions.

The method of using computer vision technologies based on video surveillance data in conjunction with decision support systems (DSS) is an important direction for improving management and control processes in various fields. This allows reducing the workload on personnel, optimizing the processes of analysis and event detection, and improving task performance. Computer vision technologies provide the ability to automate the analysis of video data, while DSS help make informed decisions based on this information.

A key component of using computer vision technologies is the use of video analytics systems, which detect objects, recognize faces, detect motion, and analyze abnormal events in video recordings. Before a computer can detect objects in an image, the original image undergoes preprocessing, which includes noise reduction and contrast enhancement. Then, special features such as colors, textures, or shapes are extracted, and these objects are classified based on trained models. In particular, convolutional neural networks (CNNs) are used for these purposes, which are one of the basic approaches in deep learning for object recognition in images. This approach involves applying patterns to recognize objects in images through convolution operations.

Image classification is one of the most common tasks in the field of computer vision. It is based on the classification of objects and their localization in the image, allowing to determine their coordinates and positions on the frame. There are many methods for object detection, but important characteristics are processing speed and detection quality. Thus, the use of computer vision technologies in conjunction with decision support systems in the field of video surveillance and monitoring is a prom-

ising direction for improving the efficiency and accuracy of object detection, face recognition, and event analysis.

The use of video data in surveillance and monitoring systems raises a number of ethical issues that require attention and resolution to ensure the protection of privacy and other rights of citizens.

Information technology for decision support (ITDS) in the field of video surveillance and monitoring is a key component for optimizing the processes of analysis, processing, and utilization of video data. This technology is used to automate and improve decision-making based on information obtained from video recordings. The main goal of this technology is to provide operators and surveillance systems with powerful tools for automatically detecting events, objects, and patterns in video streams, which helps in making effective and informed decisions.

Video analytics systems are a key component of information technology for decision support in surveillance and monitoring tasks. They are responsible for analyzing video data from cameras in real-time or post-processing mode, detecting events, movements, objects, and other important aspects for decision-making. Object detection is used to identify and highlight objects in the video stream (these can be people, vehicles, animals, or any other objects of interest to the surveillance system). Face recognition function is used to recognize and identify people in video recordings, used for access control, detection of suspicious individuals, or other security purposes. The technology also detects and analyzes the movement of objects in the video stream (can be used to detect abnormal movement, such as suspicious movements of people or vehicles, which may indicate potential threats).

Privacy and confidentiality of individuals depicted in videos are one of the most important ethical issues in the context of using surveillance systems. The collection and processing of video data become sources of privacy breaches, which often raise serious concerns and negative public reaction. The issue of protecting the privacy of individuals in video recordings and monitoring systems arises from the possibility of using this data for the identification of individuals, their movements, and behavior without their consent, which is very important as in the modern world, individuals cannot avoid it. This is especially relevant in cases where video surveillance is conducted in public places such as streets, parks, airports, and other public facilities.

To ensure the privacy protection of individuals in videos, several measures need to be taken. Firstly, it is important to limit the collection and storage of video data to the necessary minimum, restricting the duration of their storage and processing. Some systems already use anonymization or face masking technologies to

protect the privacy of individuals depicted in videos. Additionally, regular risk assessments of privacy breaches and improvement of data protection technologies are crucial to minimize potential threats. It is also necessary to develop and implement clear rules for the use of video data, defined according to legal requirements and ethical standards.

The direction and scale of video surveillance are key aspects that affect the ethics and effectiveness of using surveillance systems. They determine how accurately and widely monitoring of certain areas or objects takes place and which groups of people become the object of surveillance. The direction of video surveillance is determined by the goals and tasks for which the system is intended, for example, it may be aimed at ensuring the safety of public places, monitoring compliance with rules at work sites, or used to detect criminals or prevent thefts. It is important that the direction of video surveillance is clearly defined and limited according to the tasks facing the system. The scale of video surveillance, on the other hand, determines how large or limited the area under surveillance is and which objects or individuals are under observation. Therefore, the scale can vary from large public sites to narrow industrial corridors. The scale of video surveillance can also be temporary, for example, during mass events or emergencies, or permanent, for continuous monitoring of specific locations. [4]

Ethical aspects of the direction and scale of video surveillance include ensuring proportionality between the necessity of surveillance and privacy protection, as well as preventing random or systematic observation of specific groups of people or objects. For example, a large-scale video surveillance system in a public area should be aimed at overall safety and crime prevention, rather than systematic tracking of individuals without justified reasons.

Considering privacy, confidentiality, direction, and scale, it is important to understand that each of these aspects should be interconnected, and it is also important to mention transparency and citizen awareness. Transparency and citizen awareness of the presence and functioning of video surveillance systems are necessary components for ensuring the ethical use of these technologies. Individuals affected by these technologies have the right to know that their surroundings may be under video surveillance and what data may be collected, stored, and used. First and foremost, it is important to ensure transparency regarding the placement of surveillance cameras and their operation. Information about the location of cameras, their orientation, and the extent of surveillance should be made available to the public. This can be achieved through visible signage at surveillance locations, as well as

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through the publication of information on municipal websites or by organizations responsible for installing cameras.

Furthermore, it is important to ensure citizens' awareness of the rules for the use and processing of video data. Citizens should be able to obtain information about how they can influence the processes of video surveillance and their own data. Additionally, it is important to provide feedback mechanisms that allow citizens to address questions and complaints regarding the use of surveillance systems.

Conclusions. Information technology for decision support in surveillance and monitoring tasks plays an important role in ensuring safety and efficiency in various areas of life. With the development of artificial intelligence, big data processing, and machine learning technologies, we can expect further improvement in the functionality and efficiency of these systems. However, it is also important to consider ethical and legal aspects, ensuring the protection of privacy and compliance with data security norms. A smart combination of technology and legal regulation will help achieve the optimal balance between ensuring security and protecting personal freedom.

To ensure the privacy protection of individuals in videos, it is important to take a series of measures. Collection and storage of video data should be limited to the necessary minimum, and the duration of their storage and processing should be restricted. Some systems already use anonymization or face masking technologies to protect individuals' privacy in videos. However, it is important to note that the development of these technologies is ongoing, and privacy protection requirements are constantly evolving.

Protecting individuals' privacy in videos requires a comprehensive approach that combines technological, organizational, and legal measures. Only in this way can a balance between security and privacy be achieved, ensuring the protection of citizens' rights and interests. It is very important to carefully consider and limit the direction and scale of video surveillance from ethical perspectives, ensuring a balance between security and the protection of citizens' rights and privacy.

To ensure the ethical use of video surveillance, it is important to ensure proportionality between the necessity of surveillance and privacy protection, as well as to ensure transparency and citizen awareness of the functioning of video surveillance systems. Only through coordinated application of these principles can effective and ethical use of video surveillance be ensured in modern society.

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Інформаційна технологія підтримки прийняття рішень в задачах відеоспостереження та моніторінгу

В сучасному світі системи відеоспостереження є невід'ємною частиною безпекових та контрольних заходів в різних сферах: від громадських місць до промислових об'єктів. Проте, разом із зростанням їхньої поширеності з'являються етичні питання, пов'язані з використанням відеоданих та впливом цих систем на приватність та права громадян. У цій статті ми детально розглянемо деякі з цих питань та запропонуємо рекомендації для їх вирішення.

Важливо визнати наслідки, які може мати відеоспостереження та моніторінгу, на якість та ефективність рішень, які приймають люди. Ця проблема виявляється досить актуальною у різних сферах, включаючи виробництво, інженерію, та інші галузі. Відеоспостереження та моніторинг стали невід'ємною частиною сучасного світу, зокрема в областях безпеки, транспорту, містобудування та екології, з допомогою передових технологій відеоаналізу та обробки даних. Сьогоднішні системи відеоспостереження забезпечують високий рівень інформаційної підтримки для прийняття рішень, саме тому ми розглянемо ключові аспекти інформаційної технології, яка забезпечує підтримку прийняття рішень у задачах відеоспостереження та моніторингу, а також перспективи та виклики її застосування.

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