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Tel.: +352661261668

email: bulletin@email.lu

http://cers.eu.pn/bulletin.html

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THE USE OF VIDEO ANALYTICS SYSTEMS BY LAW ENFORCEMENT AGENCIES OF UKRAINE IN ENSURING PUBLIC SAFETY AND ORDER

Oleksandr M. Zaiets

Candidate of Legal Sciences (PhD), Associate Professor,
Odessa State University of Internal Affairs, Ukraine
ORCID ID: <https://orcid.org/0000-0002-4426-5241>
Web of Science Researcher ID: AAE-1646-2020
e-mail: zaec_1985@meta.ua

Yuri S. Kononenko,

Postgraduate student of Odesa State University of Internal Affairs, Odesa, Ukraine
e-mail: kononenko_yuri@ukr.net

Abstract. In the conditions of digitalization and digitalization, the issues of search and implementation of modern mechanisms for ensuring public safety and order are especially relevant. In particular, the tasks of urban development are very important, because it is at this level that the foundations are laid for a balanced combination of different components that form a decent standard of living and effective public safety and order. Today, one of the most famous and popular concepts that determine the possibility of improving people's lives is the concept of a smart city. A significant role in increasing the importance of this concept in the modern world is played by the rapid increase in urban population, as a result, the inability of local authorities to ensure proper functioning of transport and road infrastructure, appropriate service, information protection, prevent the negative impact of cyberattacks and ensuring public safety and order.

The result of information and analytical work depends on: the reliability of primary information; quality of source information; qualifications of employees and analysts; the adequacy of measures used to combat crime; timeliness and effectiveness of management decisions. The following main types of analysis of the operational situation and the results of operational and service activities in combating crime are used in the practical activities of units: current (per day, week, month); for the reporting period (quarter, half-year, nine months, year); extraordinary; problematic. Thus, the result of the analysis and evaluation of information is to determine the possibility of making a decision, as well as important information elements that need further verification and clarification.

Keyword: video analytics systems, analysis, synthesis, analytical activity, system analysis, criminal analysis.

Formulation of the problem. In the conditions of digitalization and digitalization, the issues of search and implementation of modern mechanisms for ensuring public safety and order are especially relevant. In particular, the tasks of urban development are very important, because it is at this level that the foundations are laid for a balanced combination of different components that form a decent standard of living and effective public safety and order. Today, one of the most famous and popular concepts that determine the possibility of improving people's lives is the concept of a smart city. A significant role in increasing the importance of this concept in the modern world is played by the rapid increase in urban population, as a result, the inability of local authorities to ensure proper functioning of transport and road infrastructure, appropriate service, information protection, prevent the negative impact of cyberattacks and ensuring public safety and order.

Analysis of recent research and publications. Problems of formation of smart cities are devoted to the work of many foreign researchers, in particular the work of D. Owensby-Conte, L. Hans, L. Antopulus, P. Palma, which deals with the architecture of a smart city and its internal component. Such domestic scientists as K.Yu. Ismailov, O.E. Koristin, N.P. Sviriduk, V.A. Nekrasov devoted his work to the tactical, informational, analytical aspects of the functioning of information systems, the methodology of evaluating information on certain indicators, as well as the interpretation of the Safe City as an innovative management model.

The main presentation of the material. Video surveillance systems are widely used to provide security for banks, shopping malls, entertainment venues, industrial enterprises, and other commercial and non-commercial organizations. Video surveillance systems make it possible to respond quickly to a dangerous situation, monitor staff and visitors, have a wide application and prospects of video recording systems in the field of traffic control and more. Video analytics is a software algorithm that allows you to quickly and efficiently process video data and free the operator from the routine work of monitoring multiple cameras to detect violations. The development of intelligent video analytics is based on two main technologies - tracking and identification. On the basis of the rules laid down in the algorithm of video analysis, all the functionality of the system is built, which is essential for the construction of modern video surveillance systems. Tracking is when a video processing algorithm looks for motion in a frame, identifies and classifies a moving object, describes its characteristics (size, color, speed). Situational detectors are when the object of observation crosses imaginary lines in the frame, after which the system emits an alarm: the intersection of the object of

a straight line in a given direction; traffic in the area; exit of the object from the zone; stopping the object in the area; the subject left in a zone. At present, there is a need in Ukraine to improve video analytics materials for modern investigation, as well as to further develop the practical possibilities of using video recording in order to effectively implement the tasks of ensuring public safety and order.

Traditional video surveillance cameras, which are adapted for public use, today do not meet the needs of rapid response to possible emergencies in crowded places and large transport infrastructure. To solve modern problems requires complex intelligent systems, which are based on complex algorithms of video analytics and identification. Identification is the recognition of an image by a video image, grouping by classes or specific patterns, and comparison with a pre-prepared base of reference images. The most popular and necessary of them today are face recognition and license plate recognition.

In practice, outdoor video surveillance cameras are equipped with crowded places, and these are usually various parks, squares, squares, the surrounding area of markets and large shopping centers, dangerous areas of roads. With the help of video cameras, both round-the-clock real-time monitoring and retrospective search in the data archive can be performed. Signals from video surveillance cameras are sent to special transmitters designed for transmission to local computer centers of video surveillance. In these centers there is a process of processing, compression and transmission of information through the fiber-optic network to the Central video surveillance post. This post is equipped with a direct audio communication channel and a mode of video exchange with police departments, as well as a set of emergency communication "alarm button" to call the task force in case of a crime or offense. With the help of video surveillance, law enforcement officers monitor the situation and make their own decisions on how to act in the event of an emergency. But the work of traditional video surveillance has a huge disadvantage - too much depends on the human factor. Operators are forced to continuously monitor the large flow of information, risking missing something important, especially at the end of the shift, when staff attention decreases.

Law enforcement officers often use video surveillance cameras to ensure law and order during mass gatherings, when the safety of participants is protected. Also online, police find abandoned and abandoned items, bags, cars that may be dangerous. According to statistics, this is also a good preventive measure that prevents the commission of crimes or offenses. The main tasks of video surveillance systems implemented in law enforcement agencies are issues related to public safety, as well as control of the automated process of using the received information, which, as a rule, is constantly evolving and becoming more high-tech. Closed Circulation Television (CCTV), also known as security video systems, is widely used in law enforcement. The main elements of such systems are: video cameras; switching devices; display devices (monitors); documentation devices; video transmission channels (Pic. 1).



Pic. 1. Video analytics system architecture

With the help of modern video surveillance systems it is possible to find in the human stream of suspects, abandoned things that can pose a danger to others, to detect signs of crimes and offenses and to monitor the actions of law enforcement officers. With the help of modern video recording capabilities, face recognition becomes easier and simpler. It is known that a person has individuality (uniqueness) of appearance and relative stability of signs. The process of identification is to compare two (or more) sets of features with each other. Therefore, these features need to be identified for identification.

A more difficult task is face recognition, when the system is required to first identify a person in the crowd, and then uniquely identify (identify) a particular person [1], comparing the image obtained from the camera with a photo in the database. Criteria for the quality of such systems are accuracy (proportion of correctly identified and omitted persons), speed of recognition, as well as time to search and compare with persons from the database. When describing a person's appearance, forensically significant facial features are: scalp, forehead, eyebrows,

eyes, eyelids, cheeks, nose, lips, teeth, chin, ears. However, in a particular element in its in-depth study can be identified other components: in the description of the eyes - the structure of the orbit, the protrusion of the eyeballs, the type of inner corners of the eyes; when describing the nose - nose, back of the nose, base of the nose, wings of the nose. In this case, each element of appearance can be characterized by the following features: shape, size, position, color. Paired elements also have symmetry or asymmetry. Each feature has three values of severity (two extreme and one average). According to experts, the total number of people from whom each person can be identified by the combination of these features will be 950. Tracking a person's face in a crowded waiting room (at the station) is extremely difficult, so another important element of identification may be the so-called "dynamic robot» [2]. Based on this, the tasks that need to be solved in the work of police officers are always an order of magnitude more complex than just video surveillance. The second major problem with the use of video technology in the work of the National Police is usually poor lighting conditions. Illumination may be sufficient for surveillance video surveillance, but, for example, in the area where remote facial recognition systems are installed, the illuminance should be 300-400 lux. It is most convenient to recognize a person in transition, because usually people move there on certain trajectories. But there, as a rule, the illumination is about 100 lux, and this is not enough for reliable operation of the recognition system [3]. This creates big problems for video analytics systems. We have to look for a new non-standard solution to this problem in each case. Criminals also monitor the development of modern equipment and technology, and use the latest developments for their own purposes. The task of video analytics is to detect them in time, prevent emergencies and continue to act ahead. It is known that the time factor is important in the work on crime detection. Most crimes are revealed as a result of the search for criminals "in hot pursuit." Therefore, the sooner law enforcement agencies become aware of a crime, the sooner they use the information obtained, the more realistic the opportunity to quickly identify and apprehend the offender. This is due to the fact that criminals are sometimes for some time after the crime in places where CCTV cameras are installed, and can keep traces of the crime and have objects obtained by criminal means. Using the latest methods of receiving and processing video, you can continuously collect and transmit, intelligently analyze and archive video data from a large number of cameras with the ability to quickly display and access the video archive from the workstations of operators. It is recommended to install cameras protected from vandals in the city in the most criminogenic places, places of gathering of people, entrances of apartment houses, roads, lanes, parkings of transport, etc. Promising areas of application of information video analytics can be the prevention of riots in places of mass passage of people. Thus, biometric recognition can be a preventive measure that will minimize the risk of congestion and unexpected conflicts, for example, at the entrance, as it will increase the capacity in the turnstile area [4]. It should be noted that increasing the number of cameras requires increasing resources to process the information coming from these cameras. We are talking about both the hardware resources of the system and human resources, because in order to identify an emergency situation and respond to it correctly, human intervention is required. But using SMART features, which are already integrated into most modern cameras, can significantly reduce the time to detect and capture an emergency.

All modern transport communications should be designed taking into account the equipment of video surveillance devices, but the equipment of those transport infrastructure facilities that were built at a time when video surveillance was not yet used, there are some difficulties. An example is the usual pedestrian crossings. This is the optimal place to install intelligent face recognition cameras, because it is more convenient to recognize a person just when a person is moving in a directional flow along a certain trajectory. License plate recognition is the most popular and necessary feature in modern video surveillance systems. With a properly constructed and configured system, you can achieve license plate recognition with a probability of up to 95%. But even such a high probability suggests that a fully autonomous video surveillance system with number recognition can not be built. These 5% require an operator who will make the right decisions on the passage of the car in the presence of two types of errors - erroneous access and erroneous failure. To build a recognition system with such high accuracy, you need to know and anticipate a large number of nuances. Each system consists of a radar detector, a video camera capable of recognizing the car number and an electronic data processing unit. If the driver exceeds the speed limit, drives at a stop light, travels in a public transport lane, parks where it is forbidden, it detects the detector, the camera takes a picture, the information is processed and sent to the patrol police server. Then on the basis of the cars registered in Ukraine the owner, his address of residence is automatically defined and the receipt is formed. The police have to print it out, put it in an envelope, write the address and send it to the violator to pay the fine.

Conclusions. The result of information and analytical work depends on: the reliability of primary information; quality of source information; qualifications of employees and analysts; the adequacy of measures used to combat crime; timeliness and effectiveness of management decisions. The following main types of analysis of the operational situation and the results of operational and service activities in combating crime are used in the practical activities of units: current (per day, week, month); for the reporting period (quarter, half-year, nine months, year); extraordinary; problematic. Thus, the result of the analysis and evaluation of information is to determine the possibility of making a decision, as well as important information elements that need further verification and clarification.

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Использование систем видеоаналитики правоохранительными органами Украины во время обеспечения публичной безопасности и порядка

Заец Александр Михайлович, e-mail: zaec_1985@meta.ua

Одесский государственный университет внутренних дел, г. Одесса, Украина

Кононенко Юрий Сергеевич, e-mail: kononenko_yuri@ukr.net

Одесский государственный университет внутренних дел, г. Одесса, Украина

Аннотация. В условиях осуществления цифровизации и диджитализации особенно актуальны вопросы поиска и внедрения современных механизмов обеспечения публичной безопасности и порядка. В частности, очень важны задачи развития городов, поскольку именно на этом уровне закладываются основы сбалансированного сочетания различных составляющих, формирующих достойный уровень жизни населения и эффективного обеспечения публичной безопасности и порядка. Сегодня одной из самых известных и популярных концепций, определяющих возможность улучшения жизни людей, является концепция умного города. Значительную роль в повышении значения этой концепции в современном мире играет стремительное увеличение численности населения городов, как следствие, неспособность местных органов власти обеспечивать надлежащее функционирование объектов транспортной, дорожной инфраструктуры, соответствующий уровень его обслуживания, информационной защиты, предотвращать негативное влияние кибератак, а также обеспечение публичной безопасности и порядка. Результат информационно-аналитической работы зависит от: достоверности первичной информации; качества исходной информации; квалификации работников и специалистов аналитиков; адекватности мер, применяемых для противодействия преступности; своевременности и эффективности принимаемых управленческих решений. В практической деятельности подразделений используются следующие основные виды анализа оперативной обстановки и результатов оперативно-служебной деятельности в противодействии преступности: текущий (за сутки, неделю, месяц); за отчетный период (квартал, полугодие, девять месяцев, год); внеочередной; проблемный. Следовательно, результатом анализа и оценки информации является определение возможности принятия соответствующего решения, а также важных информационных элементов, требующих дополнительной проверки и уточнения.

Ключевые слова: видеоаналитика, анализ, аналитическая деятельность, системный анализ, криминальный анализ.

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+352661261668, email: bulletin@email.lu, <http://cers.eu.pn/bulletin.html>