UDC 621.3

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RATIONALE FOR NECESSITY OF IMPROVING THE PROTECTION OF OPERATIONAL VIDEOINFORMATION IN WIRELESS INFOCOMMUNICATION SYSTEMS

An analysis of the current state of information applications regarding the demand for video information resources is carried out. It is shown that, as a result of the development of infocommunication technologies, there are also dangerous risks regarding interaction with an open and uncontrolled external information environment. It is substantiated that wireless infocommunication technologies have become widely used as information delivery systems.

Keywords: *operational videoinformation, wireless infocommunication technologies, infocommunication systems.*

Introduction

The shortcomings of wireless infocommunication systems are revealed. It is justified that for the image processing variant the probability of reliable interpretation is directly proportional to the value of the peak signal-to-noise ratio in case of unauthorized access. The shortcomings of existing cryptosystems are identified.

It is proved that in order to reduce the time of encryption and data transmission via communication channels, it is necessary to use preliminary image compression. The rationale is that sequential execution of compression processes and cryptographic encryption leads to a decrease in the stealth of video information and an increase in the time it is delivered [1]. A choice is made of the direction of the formulated task's solution based on the information's protection at the coding level of image sources on the basis's development of image-resistant image transformation's method. An analysis is made of existing compression technologies for the possibility of using transformations that are resistant to decoding.

The research of the video information support's role for the information systems effective functioning

State's modern development in various spheres of activity (political, social, economic, administrative) is inextricably linked with ensuring the informatization's proper level. An important place is occupied by such processes as collection, storage, transfer, processing of information, information analysis and decision making in the management process. In order to organize the above processes, information systems (IS) are formed. Information systems include a complex of information and computing and telecommunication technologies, analytical and administrative centers, the decision-making levels' set. Examples of IS' different types are automated control systems (ACS), information and telecommunication systems (ITS), distributed data processing systems, measuring systems, intelligent information systems (support and decision-making systems, expert systems).

The most complex and large-scale IS should include:

1. ACS for transport (air and rail), ACS of ministries and departments.

2. Geoinformation systems, including:

– earth remote sensing systems (ERS). Created to provide support for decision-making by government agencies both in established and in crisis situations. This includes providing satellite information for environmental safety, nature management, farming, weather forecasting, geological exploration, monitoring of large-scale processes on dry land and sea surface.

It is supposed to obtain information on the basis of renting existing satellites and launching domestic spacecraft (the "Sich-2", "Sich-3-O" and "Sich-3-R" programs);

– space telecommunication systems. The main purpose of their creation is to meet the users' needs in modern digital communication, television and radio broadcasting services, including interactive and multimedia communication services through the integrated use of space segment resources: existing foreign geostationary communication systems (Intersputnik, Inmarsat, Eutelsat, Amos, Thuraya) And low-orbit communication systems (Orbcomm, Globalstar, GLONASS) [2].

3. Systems for collecting information using unmanned aerial vehicles (UAVs).

4. Corporate and local information and communication systems and networks.

5. Television systems and video conferencing systems.

6. Mobile radio communication systems.

In accordance with the intended purpose of IS in the course of their operation, the following information's

types are used: digital data, audio data, voice signals, text, static and dynamic images.

The last decade is characterized by a sharp increase in demand for video information products (photo-video materials obtained by means of aerospace monitoring, television programs, videoconferencing, video sites, commercials, computer graphics). For what the corresponding video applications are formed. Video applications are applications related to the provision of video information services and the use of video information, including its formation, storage, processing, transmission, analysis and delivery of video information products.

According to Cisko, the volume of global video traffic in 2017 has reached 64 % of all transmitted data (tabl. 1).

Table 1

The proportion of the transmitted data by traffic's type, %

Traffic's type	2012	2013	2014	2015	2016	2017
Video	39,5	45,5	51,9	57,1	60,4	63,7
Data	29,3	26,5	23,6	21,2	20,2	19,1
P2P	20,3	18,6	16,3	14,5	12,5	10,1
Audio	10,9	9,4	8,2	7,4	6,9	7,1

The need for such a development trend is enshrined in relevant State regulations in the field of information, communication and aerospace development, which is dictated on the one hand by the following reasons:

– integration of Ukraine into the world community;

– globalization of transcontinental corporations' production and creation, increasing the level of automation and remoteness of control and management facilities and increasing structural and functional complexity, increasing the interdependence between automated control systems' components;

– the importance of solving global problems related to ecology, energy conservation, resources' lack, development of deep space;

– ensuring national security and defense of the state, protecting sovereignty and territorial integrity;

– growth of the state's economic potential;

– prevention and elimination of technogenic and natural disasters;

– carrying out anti-terrorist measures, and combating drug trafficking;

– electronization and digitization of archives, backup copies and documentation.

On the other hand, the development of video information support is facilitated by a number of factors determined by the infocommunication technologies' development, namely:

1) the development of information and computing technologies, microprocessor technology, the creation of highly effective techniques for digital signal processing, increasing the specifications' performance;

2) improvement of telecommunication technologies, data transmission systems' development using both wired and wireless networks, increasing the efficiency of mobile communications, forming the creating multiservice systems' concept within next-generation networks (NGN), including multimedia network;

3) a breakthrough in the field of technologies for the removal and video information's formation using remote aerospace segment and the ground segment, the optical-electronic systems' development for recording digital images;

4) integration of radio, computer and telecommunication technologies in the form of unified mobile and compact devices;

5) increasing the availability of information and telecommunications facilities for the user both in terms of pricing policy, in terms of choice and in terms of mobility and compactness of devices.

This makes it possible to use video applications in various fields of applied activity. Depending on the scale and importance of application areas, video applications are classified as:

a) global. World and state values, which include: geoinformation systems, aerospace monitoring, ACS transport (air, river, sea, rail, large-scale corporate management systems, crisis management and strategically important facilities (power plants, oil and gas pipeline system, oil refineries and chemical production), a system for making and supporting decisions in the monitoring of disasters;

b) local. These include television broadcasting systems, videoconferencing, management at the municipal level, video surveillance of arsenals of weapons and military equipment, chemical warehouses;

c) personal level. Here, there are such applications as telemedicine, personal information and computing and telecommunications.

So, video information becomes important as an important resource affecting national security, security of commercial structures and respect for individual rights, and determines the economic development's level of the state, the state's defense potential, and the public opinion's formation [3].

Areas of applications are expanding, for which video information becomes an information resource that is not subject to mandatory disclosure, and contains:

– information recognized in accordance with the established procedure as state secret;

– confidential information;

– information on the operative and investigative work of the prosecutor's office, the Ministry of Internal Affairs, the Security Service, the inquiry's and the court's work, in cases where its disclosure may harm operational activities, investigation or inquiry, violate a person's right to a fair and objective trial of her case, life or health of any person;

– information that relates to the personal life of citizens;

– documents that constitute internal departmental correspondence (memoranda, correspondence between subsections, etc.), if they are related to the direction's development of the institution's activities, the decision-making process and precede their adoption;

– information that is not subject to disclosure under other legislative or regulatory acts.

The regulation of video information resources is determined by the law of Ukraine "About the Concept of National Informatization Program" put into effect by the decision of the Supreme Council of Ukraine, 2008, No. 27–28, art.182. In accordance with what is being formed the Concept of the National Informatization Program, which includes a description of the current state of informatization, strategic goals and basic principles of informatization, the expected consequences of its implementation. Priority priorities are provided for the creation of a regulatory and legal framework for informatization, including:

– protection system of copyrights and personal information, national standards' development in the field of information;

– the telecommunications infrastructure's formation, especially the existing network's optimization of data transmission lines, the new modern channels construction, including fiber-optic and satellite communication systems;

– implementation of information security measures.

The main goal of the National Informatization Program is to provide citizens and the society with timely, reliable and complete information based on the extensive use of information technologies and ensuring the information security of the state.

The legal basis for ensuring the protection of information in Ukraine is the Constitution of Ukraine, the laws of Ukraine "About Information", "About Information in Automation Systems Secure", "About the State's Secret", "About Science and Technology Information", the Concept (the basis of state policy) National security of Ukraine, the concept of information's technical protection in Ukraine, as well as Ukraine's international agreements, which relate to the sphere of information relations. At this time, the protecting information problem does not have a final standard solution.

The video information resources of the state or society as a whole, as well as of individual organizations and individuals has a certain value, have a corresponding material expression and need protection from various influences that can lead to a decrease in the value of video information resources [4–7].

Loss of video information's value (violation of information security) can occur as a result of moving video information or changes in the carrier's physical properties.

The loss of video information's value can occur as a result of:

– the video information's aging, not its timely completion;

– reducing the level of video information's reliability, both as a result of inopportune timeliness, and as a result of the distortions' presence (as a result of passive or active influences);

– violation of the video information's security as a result of moving video information or changing the media's physical properties.

At the same time, due to the development of infocommunication technologies, along with the benefits, there are also dangerous risks regarding interaction with an open and uncontrolled external information environment. To reduce these risks, it is necessary to pay increasing attention to the construction, implementation and maintenance of integrated security systems, in accordance with the requirements of state and international standards [8–10].

The urgency and the problem's importance of ensuring the information technologies' security are due to such causes:

– increasing the modern automated systems' processing power, while simplifying their operation;

– rapid increase in the information data streams' volumes that are processed and transmitted by communication channels;

– rapid increase in the distributed databases' number of different purposes and their standardization and integration with the modern information space;

– high growth rates of information technologies in all spheres of the society;

– expansion of the information sources' number and users that have direct access to information resources and a wide range of services provided by information systems;

– distribution of modern commutative and non-commutative network technologies, including the terrestrial and space segment.

From here it can be concluded that it is required to ensure:

1. Increase the degree of confidential video information's protection. Confidential information refers to information that is owned, used or disposed of by individual or legal persons, and is distributed beyond their desire in accordance with the conditions provided by them.

2. Increase the delivering speed of video information. General recommendations regarding the delivery time of information are given in tabl. 2.

In the case of providing video information services using telecommunications networks, there are recommendations of the ITU-T G.1010 international union (tabl. 3) regarding the boundary values of the delay in packet loss and quality loss (QofS) required for acceptable performance of various applications. For data applications, the factor determining the resulting quality of service (QoE) is the loss amount, while for voice and video transmission, the delay values.

Table 2

The accordance table of the information system's response time to the operator's activity type

Response time	Restrictions on the activity type
More than 15 sec.	Usual interactive mode is not possible.
More than 4 sec.	Requires the operator to keep the dialogue going. The process of solving problems is not up to date.
From 2 to 4 sec.	Delays of more than 2 seconds slow down operations with a terminal that requires high operator concentration.
Less then 2 sec.	When a user needs to remember information during several system responses, the response time should be short. The more detailed information a user needs to remember, the stronger the need for a response time of less than 2 seconds. For scrupulous operations behind the terminal, 2 seconds represent an important threshold of response time.
Less then 1 c.	Some types of intellectual activity, especially operations with graphics applications, require a very short response time to maintain user's attention for a long time.

Table 3

Recommendation ITU-T G.1010

The type of application	Recommendation ITU-T G.1010	
	Delay time	Loss of data, in %
Real-time video	About 0.1 second.	Allow packet loss Loss of quality up to 5%
Videomessages	About 1 second.	
Video stream	About 10 seconds.	Allow packet loss Loss of quality up to 2%
Facsimile images	No more than 100 seconds.	Allow packet loss Loss of quality up to 1%
Still images	About 15 seconds.	Packet loss is not acceptable

3. Providing a given reliability level of the received video information. Here it is required to take into account the reconstructed images' quality loss that occur at the processing and transmission stages of infocommunication systems. Evaluation of infocommunication systems' possibility to ensure the real-time video information's protection is discussed in the next paragraph.

Conclusions

1. In the article was analyzed current state of information applications regarding the demand for video information resources is carried out.

2. General recommendations regarding the delivery time of information are given in tabl. 2.

3. The role of video information support for the effective functioning of information systems was analyzed.

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Надійшла до редколегії 12.07.2017

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ОБҐРУНТУВАННЯ НЕОБХІДНОСТІ ПІДВИЩЕННЯ ЗАХИСТУ ОПЕРАТИВНОЇ ВІДЕОІНФОРМАЦІЇ В БЕЗДРОТОВИХ ІНФОКОМУНІКАЦІЙНИХ СИСТЕМАХ

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Проводиться аналіз сучасного стану інформаційних програм щодо попиту на відеоінформаційні ресурси. Показано, що внаслідок розвитку інфокомунікаційних технологій виникають і небезпечні ризики щодо взаємодії з відкритим і неконтрольованим зовнішнім інформаційним середовищем. Обґрунтовано, що широке поширення в якості систем доставки інформації отримали бездротові інфокомунікаційні технології.

Ключові слова: *оперативна відеоінформація, бездротові інфокомунікаційні технології, інфокомунікаційні системи.*

ОБОСНОВАНИЕ НЕОБХОДИМОСТИ ПОВЫШЕНИЯ ЗАЩИТЫ ОПЕРАТИВНОЙ ВИДЕОИНФОРМАЦИИ В БЕСПРОВОДНЫХ ИНФОКОММУНИКАЦИОННЫХ СИСТЕМАХ

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Проводится анализ современного состояния информационных приложений относительно спроса на видеоинформационные ресурсы. Показано, что в следствии развития инфокоммуникационных технологий возникают и опасные риски относительно взаимодействия с открытой и неконтролированой внешней информационной средой. Обосновано, что широкое распространение в качестве систем доставки информации получили беспроводные инфокоммуникационные технологии.

Ключевые слова: *оперативная видеоинформация, беспроводные инфокоммуникационные технологии, инфокоммуникационные системы.*