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INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTS)

ENSURING INFORMATION PROTECTION WHEN USING INFORMATION TECHNOLOGIES  
IN AN AUTOMATED CONTROL SYSTEM OF IRRIGATION REGIMES

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**Abstract**

The issues of ensuring information protection in the implementation of the main functions of the automated control system irrigation regimes of agricultural crops when using information technologies are considered. The main stages and problems of managing irrigation regimes, the methods used, information technologies, as well as the methods and for ensuring information protection in the automated system used in drawing up irrigation regimes for agricultural crops are described.

**Conclusion.** The information protection system should ensure the integrity and confidentiality of stored, processed and transmitted information in the automated system, the implementation of the main functions and the efficiency of the automated control system irrigation regimes of agricultural crops. Solving the tasks of the information protection system will ensure the security of information in the automated control system to prevent its leakage from the system and unauthorized impact on the protected information in the automated system.

**Keywords:** Automated control system of irrigation regimes. Information technologies. Information protection.

The irrigation regime of agricultural crops must correspond to the crops' need for water in each phase of their development to obtain the planned harvest and increase the fertility of irrigated lands. For this purpose, the automated irrigation regime control system calculates crop irrigation regimes, i.e. a set of timing, norms and number of irrigations. To obtain the planned yield of agricultural crops, irrigation is carried out taking into account the biological characteristics of crops, soil and climatic conditions.

The automated control system for irrigation regimes of agricultural crops functions as follows. Before the beginning of the growing season, the corresponding normative and reference files are generated. On a daily basis, the system is updated with the following information: data on meteorological conditions; crop code, crop development phase code; soil moisture; data on the fertilizers and pesticides used for each crop; data on the irrigation performed for each crop. Every day, the total water consumption (total evaporation) and water reserves in the root zone of the soil for each crop are first calculated. Then, daily calculations are made of the irrigation dates, gross irrigation amounts (rates), gross irrigation rates per day and the number of irrigations for each crop. After this, forecasting is performed daily (up to the tenth day): water reserves, soil moisture, irrigation dates, gross irrigation amounts (rates), gross irrigation rates per day and the number of irrigations for each crop. Based on the daily data obtained, the following are generated for users (farmers, land reclamation specialists and agronomists): output files and documents (videograms) on crop irrigation regimes for the current and next ten days; stored files on irrigated crops, fertilizers and pesticides used, and so on. After all work is completed (harvesting), stored files are generated for the next planning year both for preparing irrigation plans and for preparing and carrying out agrotechnical work.

The automated control system for irrigation regimes of agricultural crops, based on the use of information technology, allows users (farmers, land reclamation specialists and agronomists) to plan, forecast and control irrigation regimes of agricultural crops, as well as make management decisions on irrigation regimes. The automated control system, based on information technology, allows users of the system to promptly draw up daily plans for irrigation regimes and organize agrotechnical and land reclamation work to obtain the planned harvest.

To implement the main functions in the automated control system for irrigation regimes, it is necessary to use information technologies:

- client-server multi-level distributed data processing in the automated system;

- multimedia technology for creating, processing, storing and visualizing information to obtain videograms and documents in interactive visual mode;
- distributed database;
- information protection system to ensure the availability, integrity and confidentiality of information in the automated system [1-3].

The automated control system operates on the basis of centralized storage of information and distributed processing of information. Client-server technology provides remote access to databases and support for multi-user mode. To organize a distributed database, it is necessary to: determine the composition, structure and connections of the information resources of the automated system; implement the tasks: description of user access to the information resources of the automated system; description of the procedures for converting the information resources of the automated system; ensure the protection of information in the distributed database of the system.

In an automated control system, when using information technologies, there is a problem of protecting Information in the automated system and it is necessary to use modern information protection technology in the system. Information security is a set of methods, tools and processes that ensure both the effective functioning of software and hardware of the automated system, and the reliability of the processed and stored information in the system. Information security is a part of information technology [2, 3].

To ensure information security, it is necessary to determine the paths of unauthorized access to the processed, transmitted and stored information, and information leakage channels. Information protection in a distributed database consists of protecting databases from unauthorized access based on the use of an information security system against accidental and deliberate interference [3-5]. The information security system must ensure:

- protection of the information security mechanisms used;
- control and protection of processed, transmitted and stored data in the automated system;
- checking anti-virus programs and searching for malware in the system;
- protection of the system of keys and access rights of system users to the information resources of the automated control system [4-8].

The information protection system is a set of measures aimed at ensuring information security. The information protection system must be effective in identifying security threats to information technologies, information, cloud applications and services used in the automated control system.

Structurally, the information protection system consists of a sequence of protection mechanisms that prevent unauthorized access requests from penetrating the system. The information protection system will ensure the integrity and confidentiality of the processed, transmitted and stored information in the automated system.

The main software tools for information protection in an automated control system, necessary for creating a mechanism for ensuring information security, include:

- programs for identifying and regulating the work of user tasks (farmers, land reclamation workers and agronomists) and the distributed database of the system;
- antivirus programs;
- mechanisms for ensuring data integrity;
- archiving programs;
- encryption mechanism (cryptography);
- digital signature mechanism.

Software tools for information protection in the automated control system must ensure:

- authentication of users (farmers, land reclamation specialists and agronomists) of the system and data exchange in the automated system;
- delimitation of access rights of users (farmers, land reclamation specialists and agronomists) of the automated system;
- confidentiality of information in the automated system;
- protection of information from destruction, blocking and damage;
- security of information in emergency situations of the system; analysis of the possibility of loss of information in the automated system as a result of failure of technical devices of the system;
- control of the integrity of information, operability of technical means and software of the system;

- checking anti-virus software protection, search for malware;
- checking the distribution of user access rights to information and password policy in the system;
- performing the main functions of the automated control system.

The automated control system for irrigation regimes of agricultural crops, based on the use of information technology, allows planning, forecasting and monitoring of crop irrigation regimes.

The efficient functioning of the automated control system for irrigation regimes of agricultural crops, using information technology, is ensured on the basis of:

- ensuring the confidentiality and reliability of information in the automated control system;
- establishing rules for working with information and ensuring access of users (farmers, land reclamation specialists and agronomists) to the distributed database of the system for making management decisions on irrigation regimes;
- ensuring the protection of information in the distributed database, protection of processed, transmitted and stored information in the system.

#### References

1. Pochovyan S.M., Maysuradze G.R. (2009). Database design. GTU, Publishing House „Technical University“, Tbilisi, 131 p. (in Russian). ISBN 978-9941-14-553-7.
2. Gabedava O.V., Pochovyan S.M. (2012). Server technologies. GTU, Publishing House „Technical University“, Tbilisi, 254 p. (in Georgian). ISBN 978-9941-20-046-5.
3. Pochovyan S.M. (2016). The use of information technology in the management decision-making processes. GTU Transactions „Automated Control Systems“, №2(22). GTU, Publishing House „Technical University“, Tbilisi, pp. 139-142. (in Russian). ISSN 1512-3979.
4. Pochovyan S.M. (2018). Ensuring the protection of information when using modern automated information technologies. GTU Transactions „Automated Control Systems“, №2(26), Works of the International Scientific-Technical Conference "Information Society and Technologies for Intensification of Education" (ISITE '18). GTU, Publishing House „Technical University“, Tbilisi, pp. 251-255. (in Russian). ISSN 1512-3979.
5. Pochovyan S.M. (2019). Development of an automated information system using Modern information technologies. GTU, „Technical University“, Proceedings of GTU „Automated management systems“, №1(28), Tbilisi, pp. 154-158. (in Russian). ISSN 1512-3979.
6. Pochovyan S.M. (2021). Ensuring information security based on information technology. Georgian Science and Society Development Foundation „Intellecti“ periodical scientific publication, international scientific periodical „Intellecti“, №2(69), Tbilisi, pp. 41-43. (in Russian). ISSN 1512-0333.
7. Pochovyan S.M. (2021). Construction of a corporate automated information system using modern information technologies. GTU Transactions „Automated Control Systems“ №1(32), Vol. 2, Works of the International Scientific-Technical Conference „Information Society and Technologies of Education Intensification“ (ISITE '21). GTU, Publishing House „Technical University“, Tbilisi, pp. 136-139. (in Russian). ISSN 1512-3979.
8. Pochovyan S.M. (2022). The use of Information Technologies in an Automated Information System. GTU Proceedings book „Science Georgia“ International Conference on Global Practice of
9. Multidisciplinary Scientific Studies Dedicated to the 100<sup>th</sup> Anniversary of „Georgian Technical University - GTU“, June 24-26, 2022. Tbilisi, Georgia, Publishing House „Iksad Global“, pp. 984-988. (in Russian). ISBN 978-625-9323-63-4.

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