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*Odessa National Academy
of Food Technologies*



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BLACK SEA SCIENCE 2020

Information Technology, Automation and Robotics

Proceedings

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DEVELOPMENT OF A MONITORING SYSTEM SEYSMOAKTYVNOSTI
CONSTRUCTION WORKS

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Abstract. Objective is to increase the efficiency of monitoring and analysis of seismic activity rise buildings by automating the process. The system consists of a database and web applications, all of which allow you to achieve this goal. The results can be used by engineers, seismologists during construction and operation of multi-storey buildings.

Keywords: Monitoring, seismology, earthquake, magnitude, seismic seismological observation LAN, seismological instrumentation channel frequency response of seismic, tectonic faults, information technology, database, web application.

I. Introduction

The negative social consequences and losses from natural disasters, including from earthquakes and accompanying dangerous secondary effects can be significantly reduced with proper training to them. Results of monitoring seismic regions of Ukraine used to address important fundamental objectives of the study geodynamics, tectonics, seismic risk of settlements, buildings, environmentally and technologically dangerous objects and to solve applied problems of public safety and the economy.

Given the high potential seismic hazard the southern regions of Ukraine, developing them fairly dense network of seismic and engineering-seismological stations is a priority needed to address problems with cheap but highly effective, seismic protection, environmentally dangerous and economically important object ' objects.

Information technology allows much faster to analyze the results of the ongoing seismic monitoring south-western regions of Ukraine and neighboring areas to identify ways of further development of the observation network of seismic and engineering-seismological stations as the most important components of seismic monitoring, providing reliable empirical data to solve not only the problems of seismic protection but the important fundamental objectives of geodynamics and tectonics.

Monitoring and analysis of seismic activity rise buildings is one of the urgent and needs new, modern software development. It is clear that using only standard, mechanical ways to solve this problem is impossible and ineffective. So now it was necessary reorganization process monitoring during construction and subsequent operation based on modern information and communication technologies.

II. Analytical review of the literature

In Ukraine, according to the Institute of Geophysics of the National Academy of Sciences, the seismic danger may soon worsen. However, to prevent seismic disasters should regularly verify that the design values of seismic vibrations from the actual values of land and conduct dynamic testing.

In Transcarpathia the magnitude of the disaster may reach 8 points. The most dangerous areas of the country is considered to district Vrancea Zone - Carpathian Mountains - and west Odessa region

In zone 6 points entering the following cities and strategically important objects: Chernovtsy, Odessa, Nikolaev, Zaporozhye and the Zaporozhye NPP Yuzhnoukrainsk. When 6 balls pictures falling from the walls, break off pieces of plaster, minor damage to buildings.

In the area get 5 points: Kherson, Dnepr, Krivoy Rog, Poltava, Cherkassy, Vinnitsa, Zhitomir, Khmelnytsky, Ivano-Frankivsk, Ternopil, Lviv and Kyiv and Kyiv region. At 5-magnitude earthquake observed cracks in walls and plaster.

In zone 4 points would be: Uzhgorod, Lutsk, Rivne, Chernihiv, Sumy, Kharkiv, Lugansk, Donetsk, Simferopol and Sevastopol. 4-magnitude earthquake felt only by people indoors but does not cause damage. [3]

During the construction of buildings to ensure the structural safety problem becomes especially high priority. One of the new elements of the safety of buildings is the development and implementation of automated systems for monitoring the technical condition of building structures. Monitoring buildings - a long time observing the shift of one or more buildings with complex research, engineering and geological methods in construction in cramped urban conditions. According to DBN V.1.2-14-2009 "General principles of reliability and structural safety of buildings, structures and foundations" objects of class effects (liability) SS3, the destruction of which could lead to catastrophic consequences, must be equipped with automated monitoring systems and control (ASMU).

- primary devices for information on repositioning (moving) and class (strain, temperature, etc.) of the observation;
- Secondary devices for processing information received (eg, computer system analysis of the object that contains the control standards and rules of decision-making)
- signaling devices;
- link between the devices and devices.

Modern information technology is defined as continuous processing, storage, transmission and display of information for the effective use of information resources, computer technology and data management systems in the different classes. Information technology affect all areas studied seismology, significantly increasing the degree of automation that can accelerate the study of the subject area. Computer modeling of seismic waves allows us to study the structure and dynamics of the Earth with unprecedented accuracy. A few minutes later the computer makes many calculations, no matter how many people had to do over a hundred million years. Also, information technologies enhance the quality and efficiency of research using computational experiments

The main task performed IT:

- Transmission of information to any distance in limited time.
- The flexibility of the process of changing data and setting objectives
- The ability to store large amounts of data on storage media.
- Reducing development time, complexity and cost of scientific research.

In the developing world seismic systems of different sizes. For example, a consortium of research institutions in the field of seismology has developed the most seismological monitoring system in the world - GSN. This network, which interacts with most of the international and national seismic systems. This modern seismic observation network uses the latest information technology. One of its major achievements is the standardization of data and research results. Dozens of disparate data collection and

storage can be integrated into a single international seismological computer system using their system worked out standards and formats. [3]

The next step in the development of information technology in this subject area was the establishment and commissioning of the seismological system SeisComP in Germany. It was the first truly automatic collection and storage of seismological information that covered the whole territory of Europe.

Currently, information software tool has become a powerful factor in the intensification and deepening of seismology studies, unlike mechanical collection, processing and analysis of information, which makes it fast and accurate results. Indeed, thanks to the improvement and introduction of systems such as GSN and SeisComP there are new data available in real time, contributing to the rapid development of seismology, enable advance warning of emergencies and help engineers during construction.

In the study of seismology used massive amounts of data. Seismology makes it possible to solve such problems, earthquake prediction, choice of search strategy and mineral deposits, etc. Processing of geological and geophysical data is an important step in the analysis of experimental data. During geophysical studies usually collected a huge amount of diverse information that can be provided in the form of text, graphs, tables, maps, etc.

The human factor influences the accuracy, timeliness or completeness of information processed. At long monotonous data entry fatigue during a person begins to make mistakes, miss data rearrange their places.

When performing verification of data in order to find errors in input data, and processing to correct and adjust errors found. It was found that the majority of errors resulting from human factors.

For this reason, it becomes very important use of databases for organizing, organizing, storing and analyzing large amounts of geophysical data. [2]

Organizing data - Combining, mixing groups of similar features for some units to some kind of functional purpose on the basis of existing ties between them and the outside world is an important stage of work. It involves the organization of data in a form suitable for storage and further treatment for her. In practice, usually little time given to training and systematization of data, while training is an important step for efficiency. Incorrect data preparation can make analysis difficult and impossible. In that case, when you have to work with huge amounts of data, preparation of data becomes an independent task which can take considerable time and effort.

Information technology can organize the available geological and geophysical information and on the basis of existing data to reveal the relationship between the studied parameters.

When the information is a lot of her hard work, even if it is well systematized. Much more difficult to find the right and highlight important to see relationships and trends and making decisions, it is impossible to consider every fact. At this point helps to cope with the problem of data visualization. Modern data visualization with high functionality and rapidly evolving from conventional reporting tools to the decision support systems. This enables us to analyze real-time large amounts of data with the possibility of deep study and prepare a structured reporting in a visual form. Through visualization users more convenient and easier to understand what is happening, to find the necessary information, correlation and dependency, draw conclusions,

When considering the visual images one sees not simply a group of individual, unconnected dots and lines, he sees a well organized group of objects. In order to accurately determine the specific numerical values necessary to include symbols or text in the image. As part of data visualization uses standard imaging techniques quantitative indicators in schematic form (pie charts, diagrams of regions, line graphs). Similar methods are universal and apply to the view of systematization, comparison and analysis focused on the issues, ideas, plans, concepts.

Information technologies allow for visualization and interactive analysis of seismic data. Developed software that make it possible to display subduction zones, separation zones bulk tectonic earthquakes typical characteristics boundaries of tectonic plates. There is also a tool for data visualization with testing seysmotomohrafiyi group of volcanoes using volume rendering. Displaying different types of seismic data in the same context, on the basis of the globe can analyze dependencies between data. [3]

III. The object, subject and research methods

The object of study - earthquakes associated with modern active tectonic structures of the platform in Ukraine

Subject of research - geological and geophysical data requiring processing.

Research methods. Method cascade development. Conduct seismological observations with the software solution. Modern methods of obtaining, collecting and processing digital seismological information. Methods of pattern recognition to identify local earthquakes. Analysis of the current active tectonic structures. Methods of analysis and comparison.

IV. The results

Information model, shown in Figure 1, shows how the system interacts with the user and receives data. User System - Engineer seismologist. It is via web application will prompt the system. Web application displays the database required user data (with the ability to export in format Excel), arriving every minute of sensors that were previously connected.

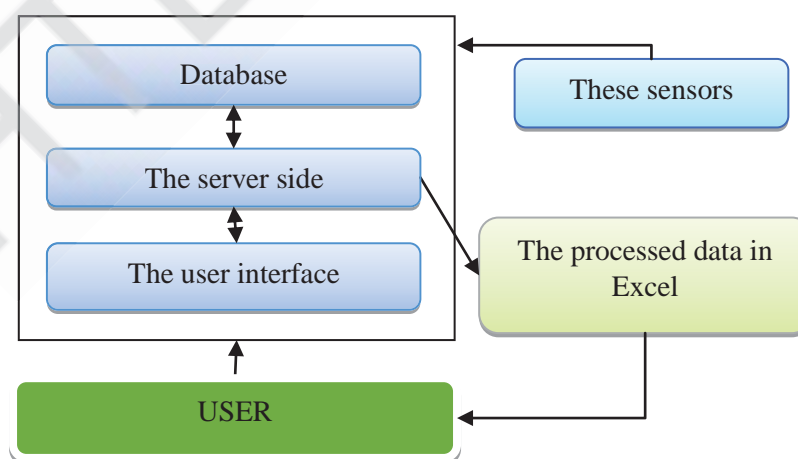


Figure 1 - Information system model

The database stores all the information necessary to complete the system. It consists of 6 tables, 4 of which are related. The base is given to the third normal form, subject specialization system requirements as evidenced by bonds, which are indicated in Figure 2.

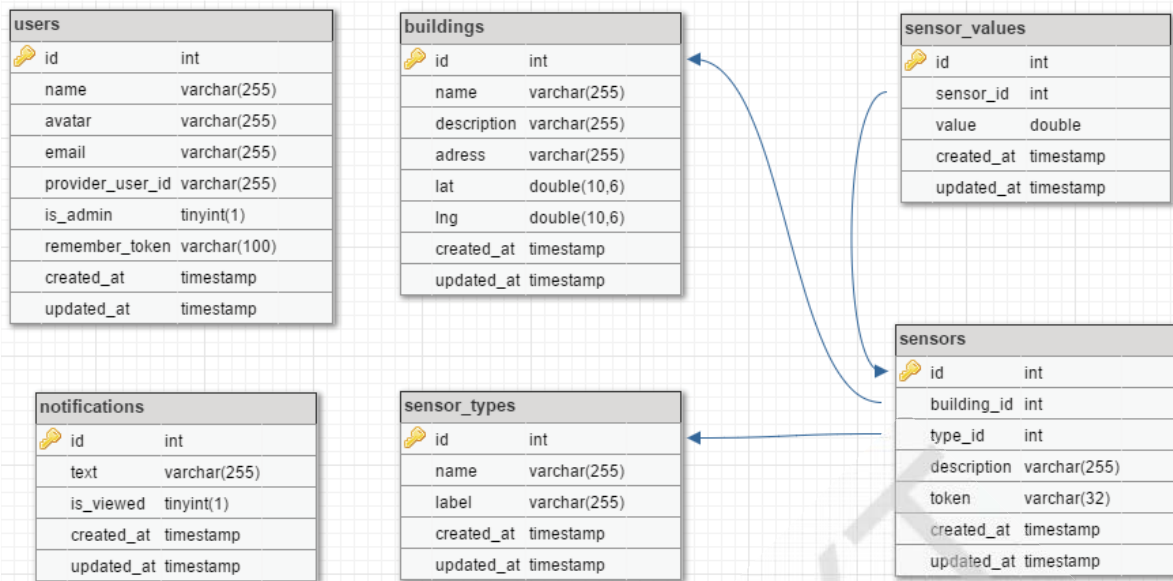


Figure 2 - Scheme database

System requirements for the database server: RAM - 1GB, free disk space - 4.76 GB, OS - Windows 7, Windows 8.1, Windows 10, Linux. System requirements for the software: poeratyvna memory (RAM) - 256 Mbytes, free disk space - 150 Mbytes, the operating system - Windows 7, Windows 8.1, Windows 10, Linux.

To gain access to further work with the system must authorize and have the right of access provided during implementation. After passing the authentication menu appears with new features (Figure 3), namely:

- add new buildings to the system;
- adding new sensors;
- message window.

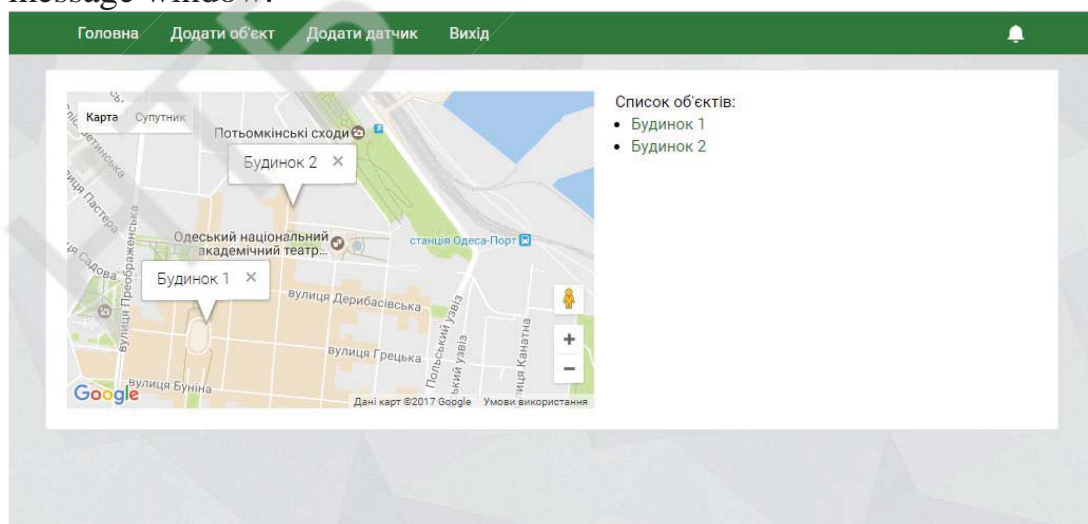


Figure 3 - Starting window

To add a home in need click "Add item". A window in which to specify a title, description and address of the building (Figure 4). To specify the address drag the marker to the place where the house on a map and web application form for himself by using coordinates. Formed address can be edited. After clicking "Add" building will be added to the system.

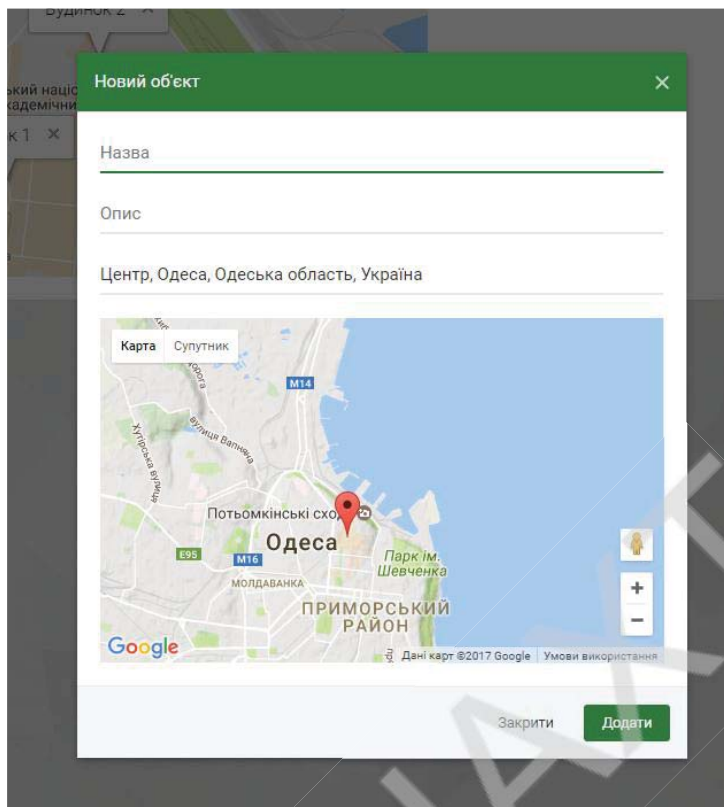


Figure 4 - Window "new facility"

To add a new sensor must click "Add Sensor". A window (Figure 5), which must choose a house where it is installed, the sensor type and if necessary to conduct some description. House type sensor is selected using the lists reflect all the options in the system. After clicking "Add" sensor is added to the system.

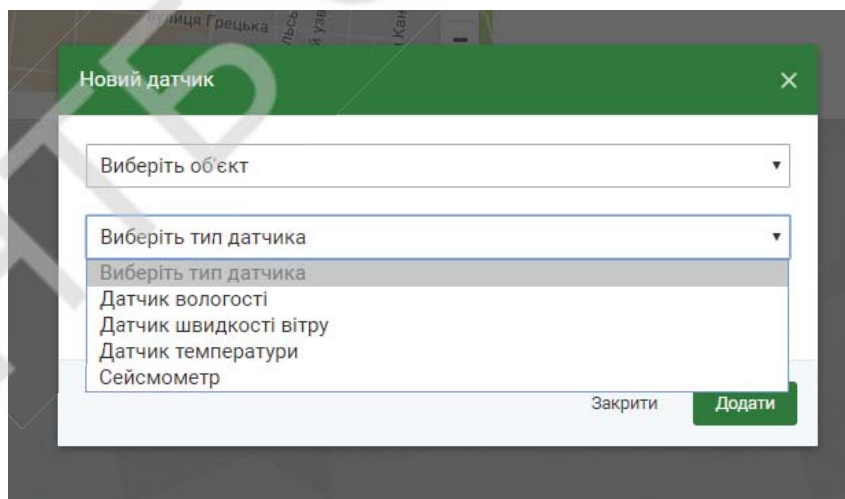


Figure 5 - List of available types of sensors

Each house has its own page that displays all the related information (Figure 6):

- name;
- location;
- description;
- sensors installed in the house.

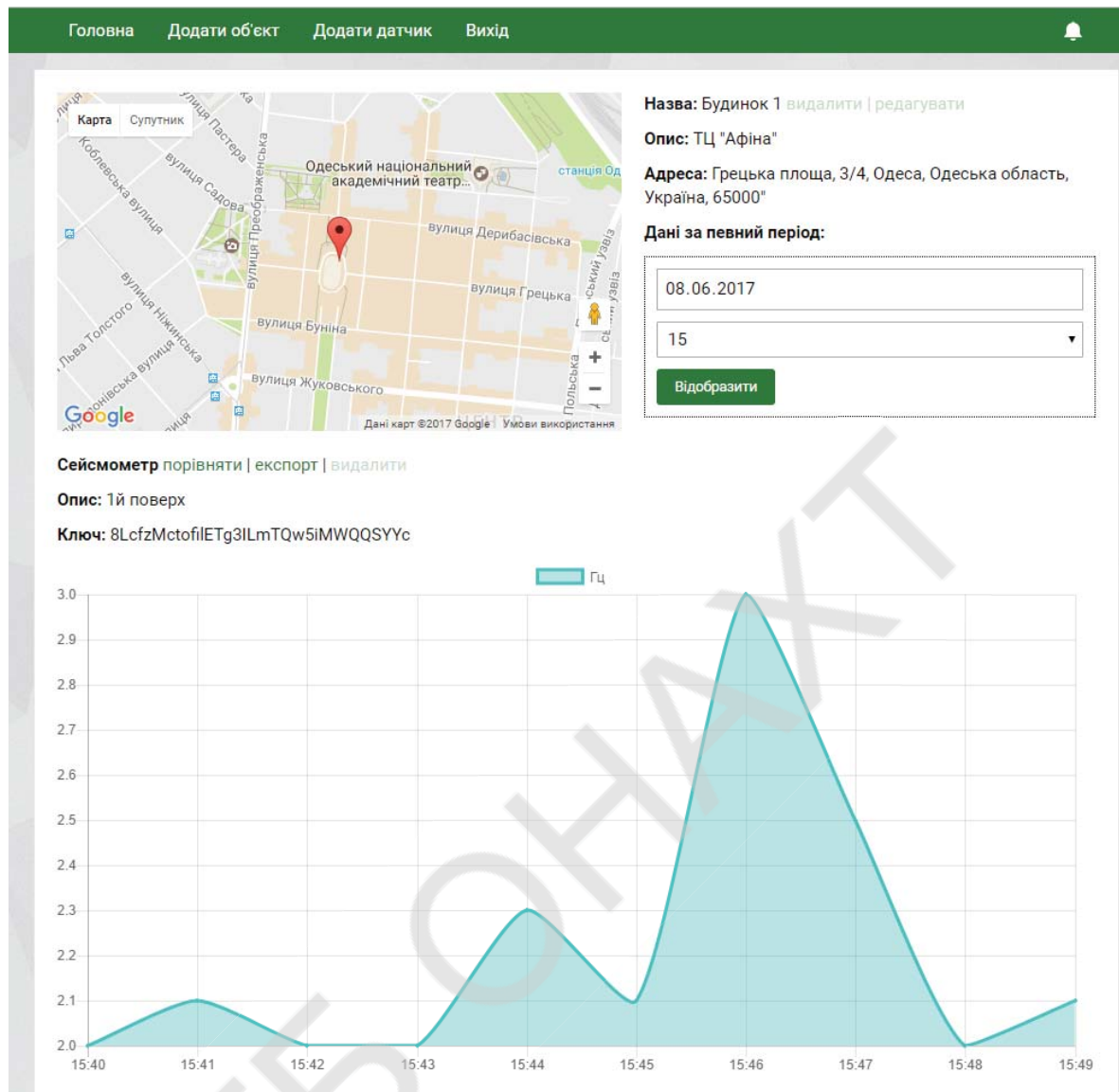


Figure 6 - Home Page Favorites

On the home can edit the required information about it or completely removed. Editing takes place similar to adding a new home in, but the field is automatically substituted the existing data and to prevent accidental deletion when you click "Delete" window appears in which you must confirm.

To view a detailed text message should open messages

To view all messages created a system should click "Show all" in the message window. After you open the system page with all the messages and the date they were created (Figure 7).

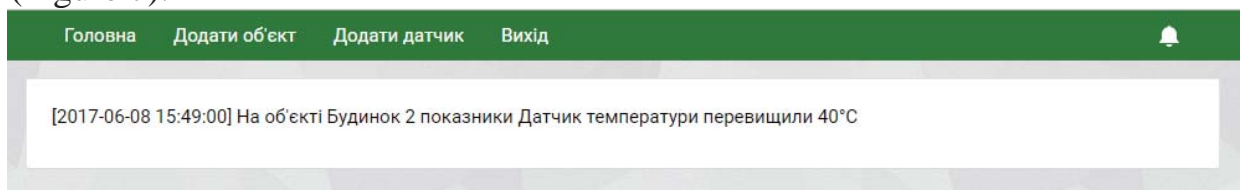


Figure 7 - Page Posts

One of the important features web application is the ability to compare similar sensors installed in different buildings. Often it helps to make the picture complete seismicity of the region, which monitored. For comparison, you must select the first sensor

and press next to his name the "compare". A window appears where you must select the building and its sensor (Figure 8) with which to compare.

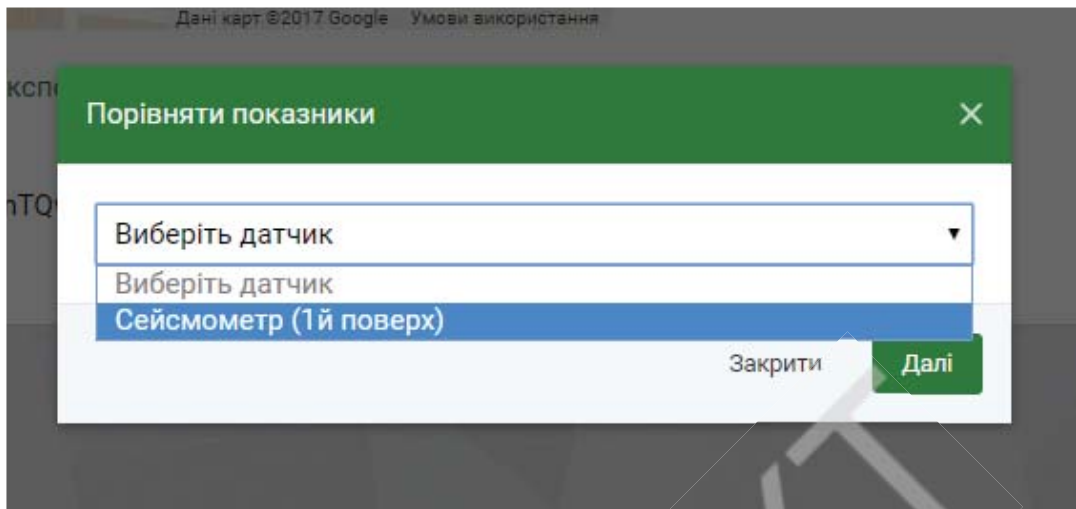


Figure 8 - Select sensor to compare

After selecting the required parameters to compare a window to the schedule, which will be selected performance sensors (Figure 9):

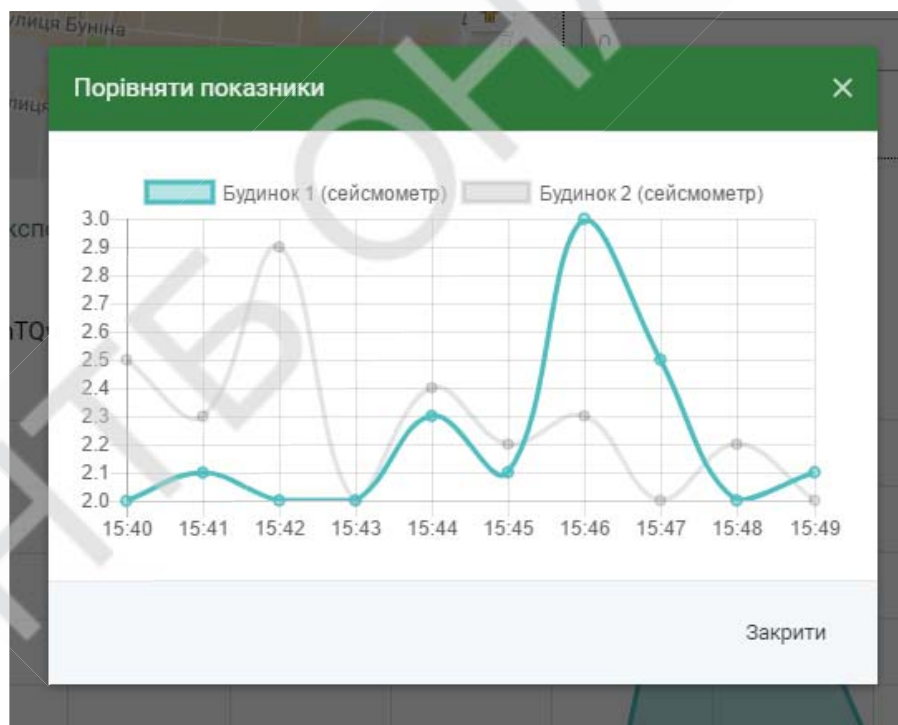


Figure 9 - Comparison of two sensors

The information obtained from the sensor for the required period can be exported into a document format excel, pressed the button "Export" which is the name of the white sensor (Figure 10).

	A	B	C	D	E	F	G	H	I	J	K	L
1		1	2	3	4	5	6	7	8	9	10	
2	Час	15:40	15:41	15:42	15:43	15:44	15:45	15:46	15:47	15:48	15:49	
3	Показники	2	2,1	2	2	2,3	2,1	3	2,5	2	2,1	
4												
5												
6												
7												

Figure 10 - The exported data in Excel document

According waves can postroyity graph that displays the chosen data. On the left panel we can select the sensor, and data that you want to show in the graph (Figure 11). It is also possible export graphics in PNG format image with the choice of its location.

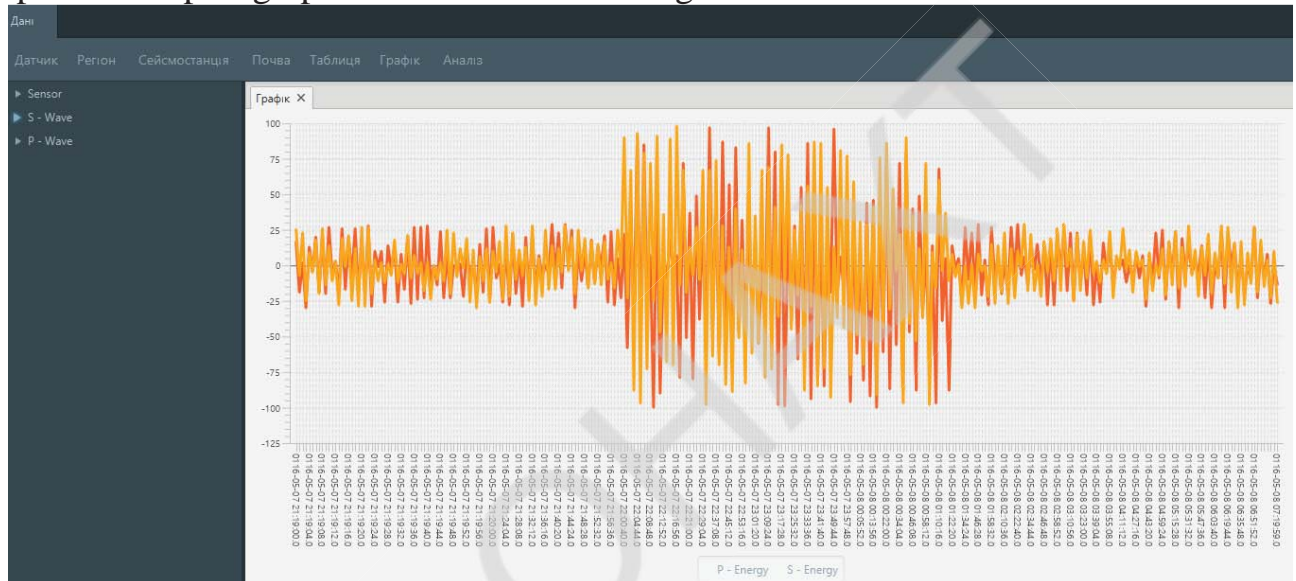


Figure 11 - "Schedule waves with multiple diagrams"

V. Conclusions

The system allows:

- monitor and adapt local seismic situation online;
- assess the potential impact of seismic waves on the stability of the controlled objects;
- timely develop measures to reduce seismic risk, improve security engineering facilities, improving the safety of controlled objects;
- build new buildings increased risk given the necessary margin of safety;
- disseminate experience in preventing man-made effects on other stations.

Automated seismic monitoring provides:

- automatic measurement and registration options fluctuations soil;
- automatic processing and evaluation of signals of seismic events;
- mapping the epicenters of earthquakes;
- automatic generation of instant notifications.

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MODELLING OF THREATS OF ECONOMY DIGITALIZATION

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***Abstract.** An analytical review of scientific research of foreign scientists on realization of the digital transformation trend is conducted, as well as on the methodological apparatus for assessing the digital economy development, a series of regulatory acts concerning digital changes in Ukraine and the experience of modelling individual risks of economy digitalization.*

An analysis of scientific literature on the specifics of the interpretation of the definition "digitalization" is carried out. It is generalized that the interpretation of "digitalization" is conditioned by the subject providing the definition, and this leads to ambiguity in the understanding of the concept under study.

It is clarified that digitalization of economy provides effective bilateral interaction of the state, society, business and person by means of digital technologies if all the participants of communication have the appropriate digital competencies.

It is substantiated that the implementation of digitalization into economy creates a number of threats, the main of which is an increase in the level of cybercrime. The main types of cybercrime are defined.

The dynamics of the main threat to the digital economy development – cybercrime – are modelled to optimize the management of economic systems. The statistics show that the growth rate of cybercrime will accelerate.

The main types of cybercrime that will carry the highest risk are foreseen. It is found that the main violations are crimes in the field of payment systems. Preventive activities are suggested.

Keywords: globalization, digital transformation, digitalization, digital economy, digital technologies, cybercrime, cybersecurity, modelling.