Development of the geoinformation system for monitoring the air ecology on an example of an agroindustrial enterprise on the example of a limited liability company "Dekoplant"

Qualification work
(educational qualification level - master's degree)
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Topicality

- The real-time monitoring information system will provide an adequate assessment of the pollutants in the air and become an excellent tool for application.

- Videostreaming can help ensure the uninterrupted operation of agricultural enterprises, guaranteeing their safety, equipment from harm and misuse. With the growth of image and video quality, the issue of their lossless compression is all the more

Aim of the work

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- The goal is to expand the functionality of geoinformation system by introducing optoelectronic devices for monitoring the environment and developing a data set visualization system

- To improve the compression efficiency of the video stream, by improving the already existing method, which takes into account the qualitative

Object and subject of research

- The object of research is the process of creating an environmental monitoring system.
- Subject of research – methods and means of developing an environmental monitoring system.

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- The object of research is the process of compressing video streams, various modifications to it.
- The subject of research is algorithms and methods of fragmentary compression of video streams.

Tasks of the research

- Analyze geoinformation systems and build the architecture of an information monitoring system
- Practical implementation and analysis of the results

- Analyze existing methods of fragmentation compression video stream;
- Improve the existing fragmentary compression method by applying Gray codes;
- Conduct an experimental study of this

Scientific and technical level

- Geoinformation system of ecological monitoring in real time was developed and presented.

- The existing lossless video stream compression method has been improved, which is to present video streams as components of a compressed image chain.

Scientific novelty of the results

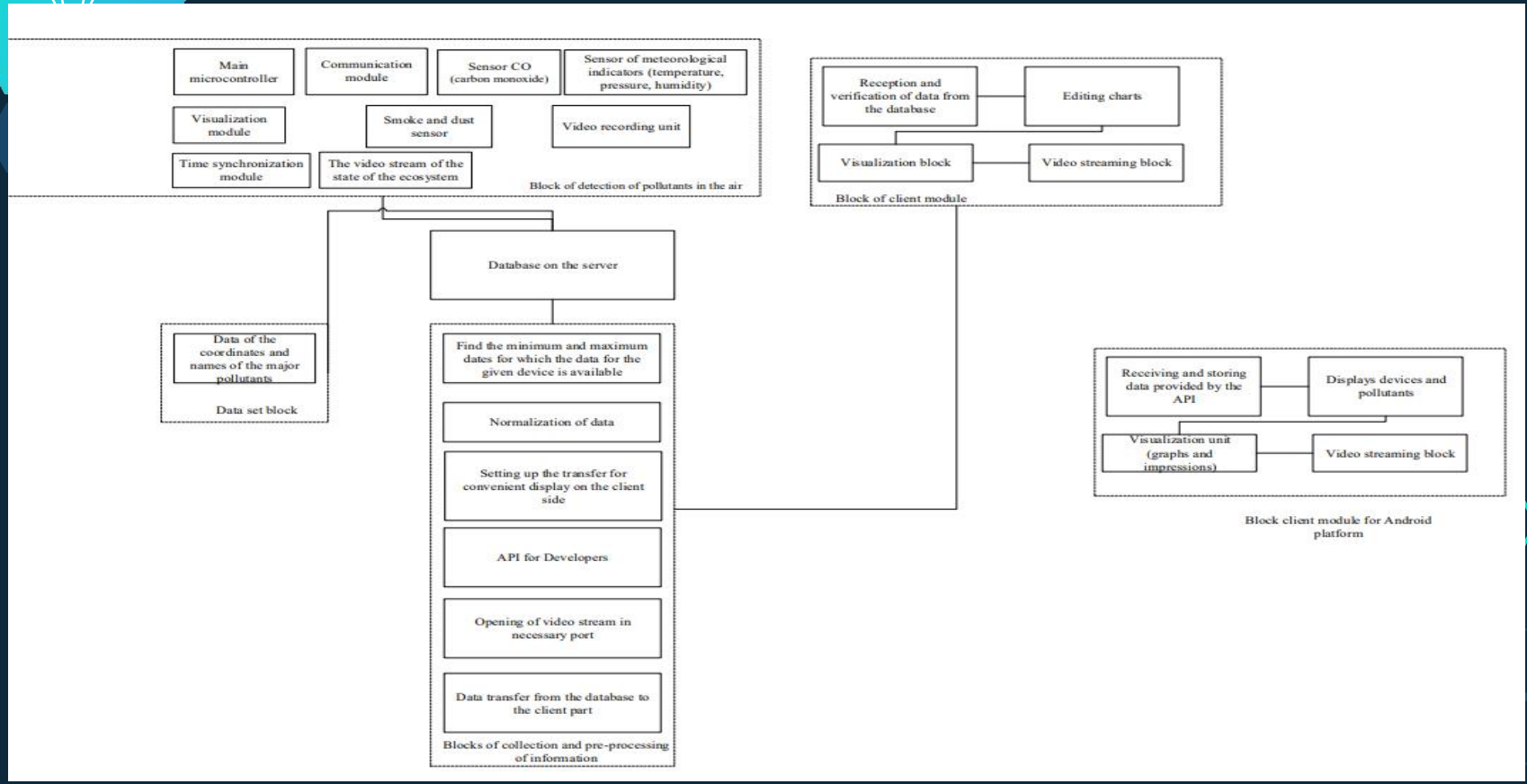
- Ecological monitoring systems, which will operate in real time, were developed.
- Improved interface and functionality of web app on mobile devices and widescreens.
- Developing mobile client app for Android with full functionally and beautiful design.

- For the first time, a method of compression of a lossless video stream has been developed, which, unlike the present one, provides a compressed video string stream of video streams based on a compressed video stream database, which allows efficient compression without loss of video stream.
- The method of fragmentary compression of the video stream by expanding the video stream on the bitmap, the previous conversion of the pixels of the video stream into the Gray codes, the previous filtering of the incoming video stream, the exclusion of the younger bit planes, has been improved, which made it possible to increase the efficiency of the fragmentation compression method.

BIG concept

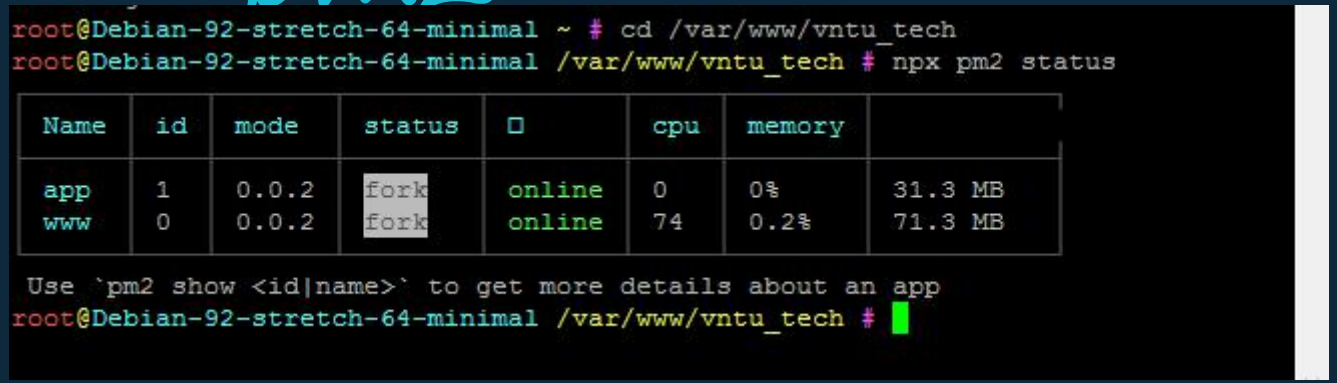
We need to develop web app which will become the central architectural component of the system and Android app

Structural functional scheme



Our process is long

The system was launched using two daemons from pm2



Google Maps API

Device parameters:

Humidity %

Temperature °C

CO ppm

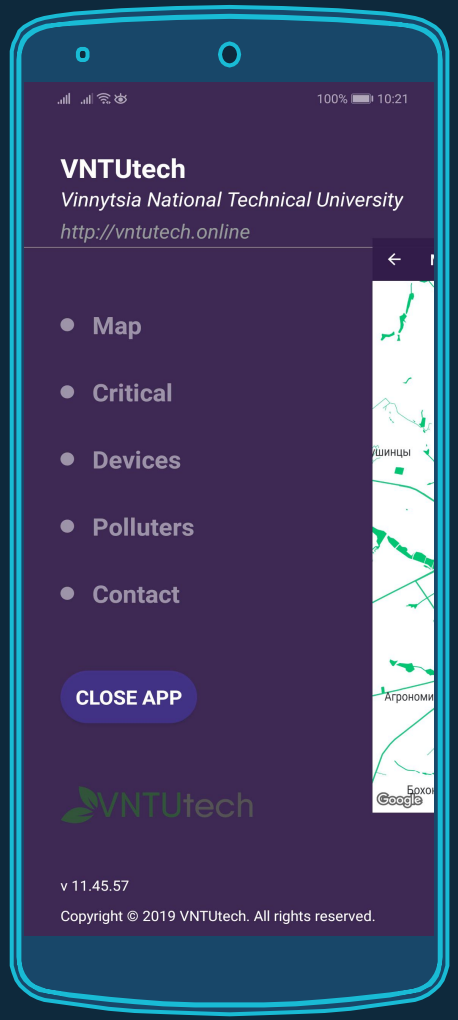
Pressure kPa

Dust level mg/m^3

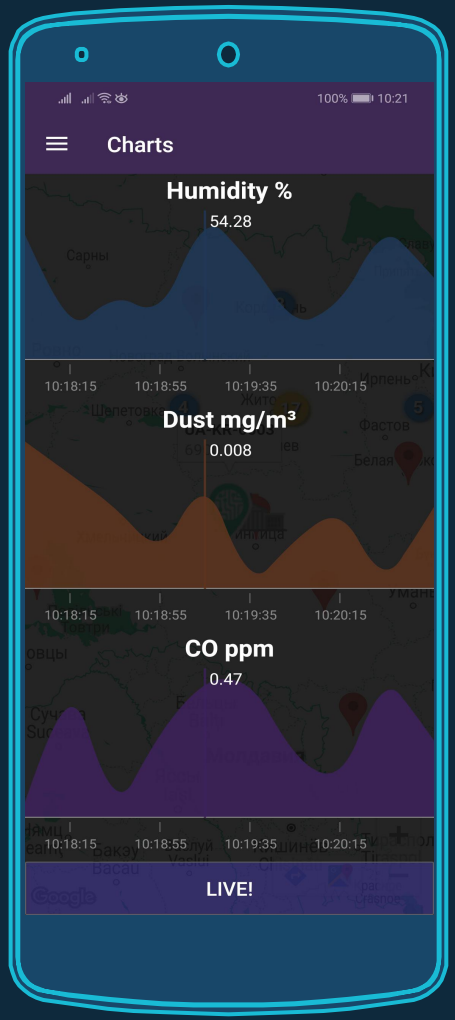
Live

Android project

We can use native application



Android project



iPhone project

If you iPhone owner, please, open the link:

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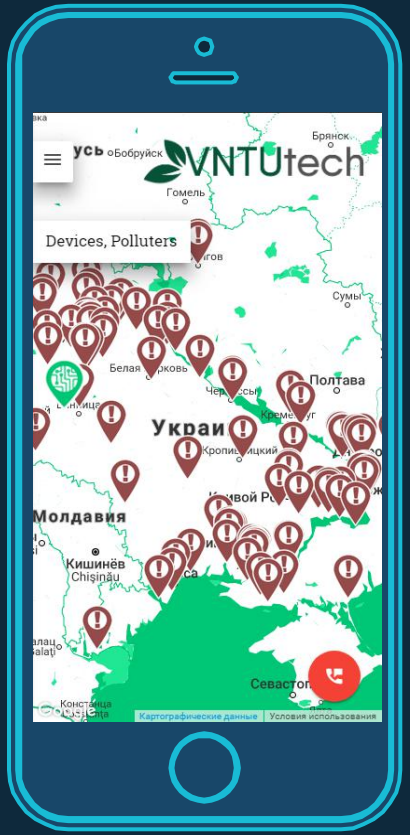

Web application

Node.js with MongoDB.

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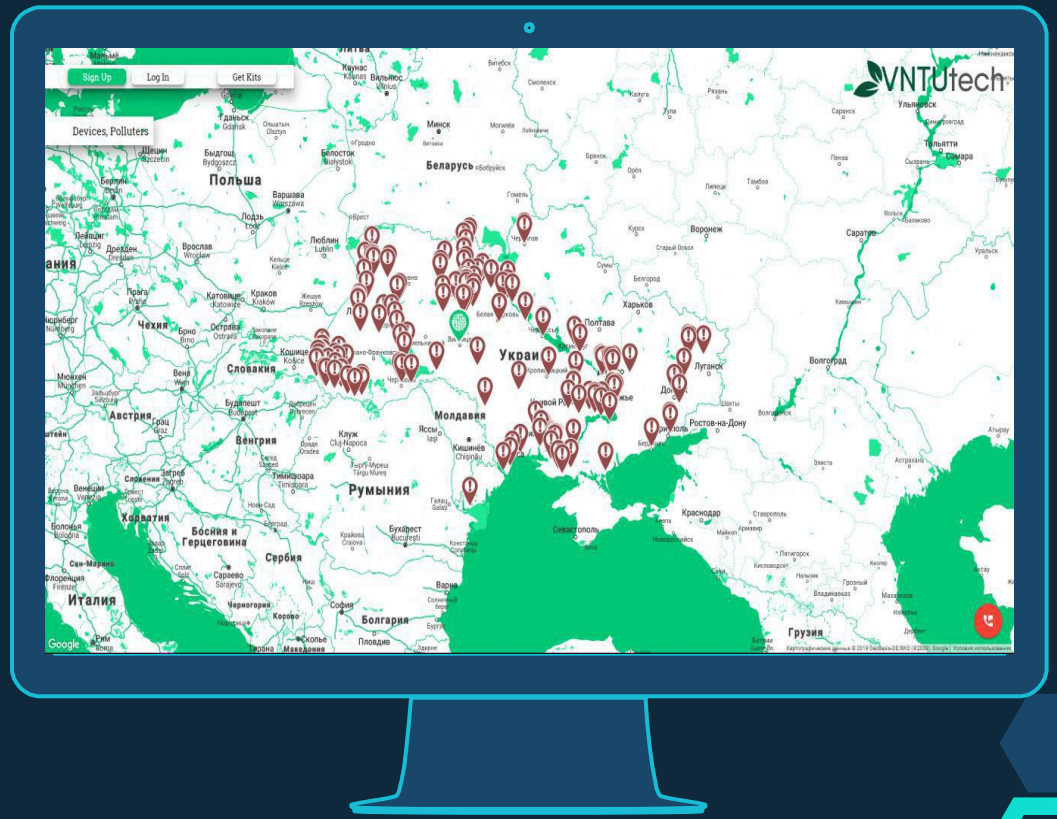

Web application

Node.js with MongoDB.

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Conclusions

- Web system and Android native application are developed;
- Improved interface and functionality of web app on mobile devices and widescreen screens;

Fragmentary method

The basic idea of a fragmentary compression method is to represent a video stream in the form of a chain of elements of length N_f. Since the video stream is a collection of meaningful images (frames), rather slowly changing in time, one should expect a significant correlation between both adjacent elements of one frame and between the corresponding elements on the adjacent frames

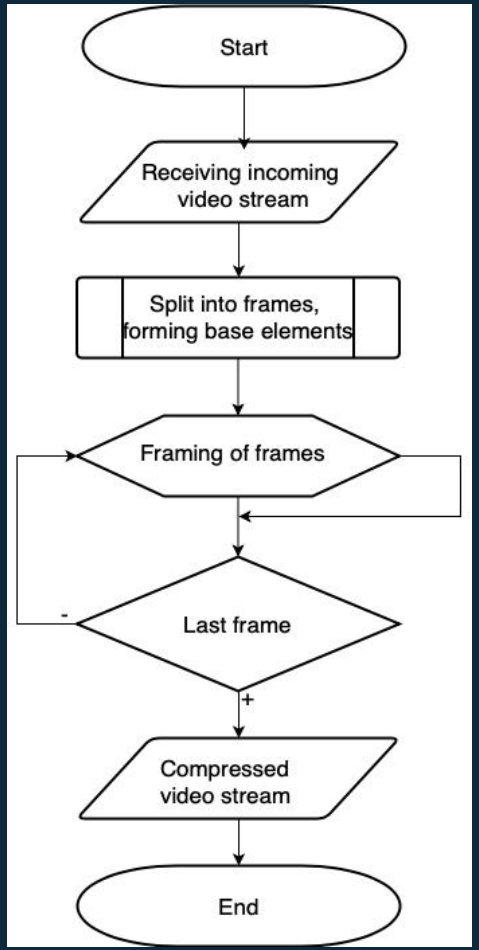
Formation of base elements

Analysis of the obtained base

Construction of short codes

A brief movie

Compressing Video Stream Program Scheme

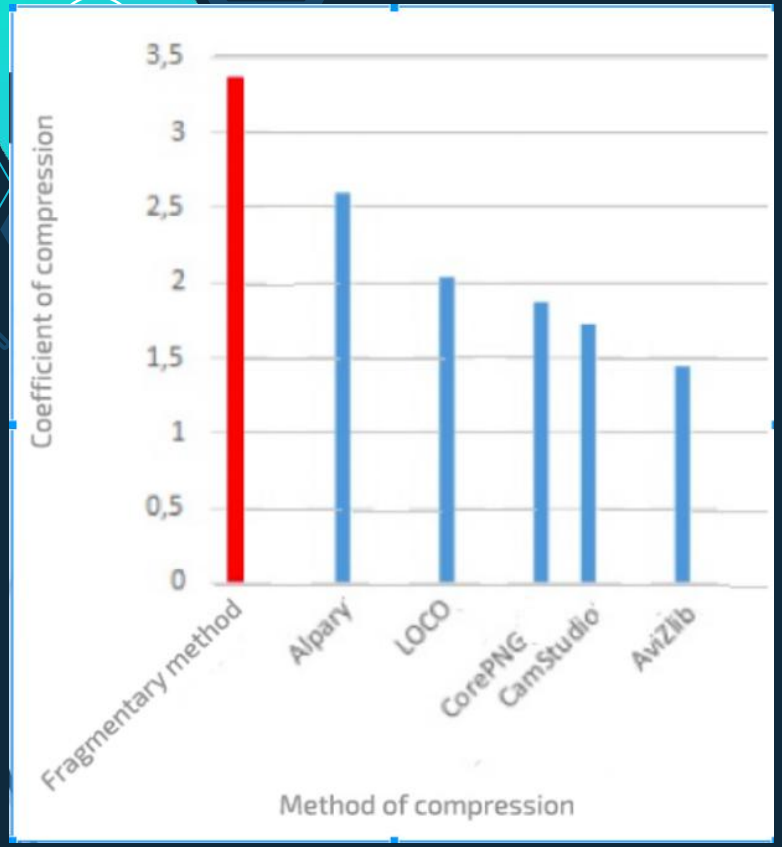


$log_2 n$

Gray's codes

The Gray code is called a system of numbering nonnegative numbers, when the codes of two adjacent numbers differ exactly in one bit.

Brightness level	Binary code	Gray's code
127	01111111	01000000
128	10000000	11000000



Results of experimental research in comparison with analogues

Experimental study

Outgoing image	Images in Gray codes
	

Program works

	Pictures
Without the use of fragmentary compression method	
With the use of fragmentary compression method	

Conclusions

- Was analysis of the existing methods of loss and lossless compression, and the fragmentary compression of the video stream was considered in more detail.
- The theoretical development of the video compression method based on Gray codes is presented. Also presented is the practical development of the method of fragmentary compression method with the help of Gray codes.

Approbations and publications

- Main provisions were reported at the VIII International Conference on Optoelectronic Information Technologies "PHOTONICS-ODS 2018" Ukraine, Vinnytsia, VNTU October 2-4, 2018, which resulted in the publication theses
- Fourth International Scientific and Practical Conference "Computing Intellect (Results, Problems, Prospects) - 2017" (ComInt-2017)
- Volodym Garmash, Olena Chernovolyk "Investigation of fragmentary compression of video stream"

Thanks for your attention!

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