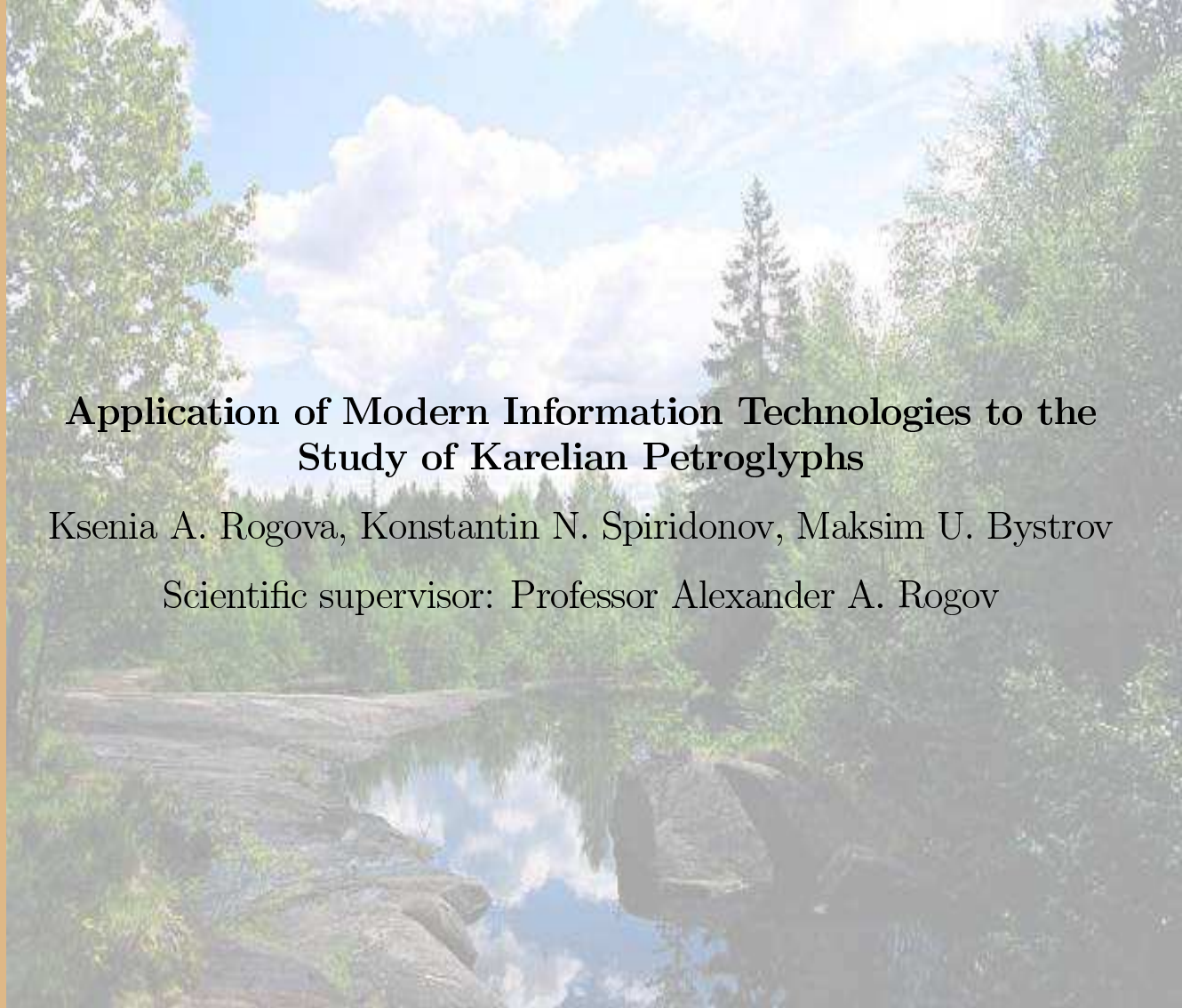
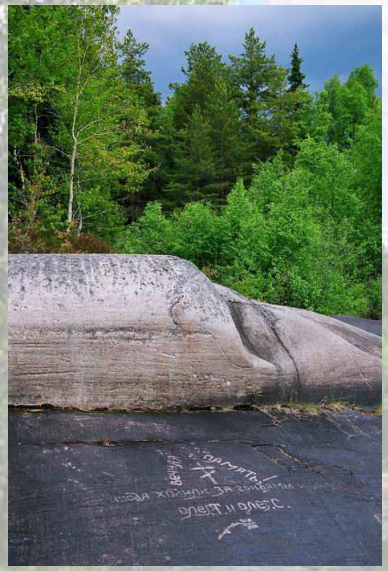


Application of Modern Information Technologies to the Study of Karelian Petroglyphs

Ksenia A. Rogova, Konstantin N. Spiridonov, Maksim U. Bystrov

Scientific supervisor: Professor Alexander A. Rogov

Vandalism



The aim of the research:
The investigation and reservation the information about Karelian petroglyphs – cultural heritage of universal importance with the usage of modern computer and mathematical methods.

The tasks of the research:

- to work out the universal system of the petroglyphs coding;
- to work out the database structure;
- to implement the local and online access to the database;
- to solve the problem of petroglyphs classification and to develop algorithms for definition similar petroglyphs according to their features;
- to analyze existent methods of segmentation petroglyphs from a photo and to modify them for the universe of discourse or to work out new ones;

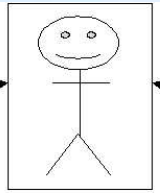
The tasks of the research(continue):

- to analyze existent methods of record retrieval in graphic database and to modify them for the universe of discourse or to work out new ones;
- to automatize the preparation of pictures for adding them into database;
- to make a module for retrieval petroglyphs in the database using developed algorithms.
- to implement methods, described earlier, for their usage in the

The module for online access to the database (section “Catalogue” of the website “Karelian Petroglyphs”)

The search by the feature “the petroglyph’s location”

smalt.karelia.ru/~petroglyphs



The database of Karelian petroglyphs

The module for local access for the database

The description of the petroglyph

The search by features

The search by the feature “the petroglyph’s location”

The search by the usage of skeletons

The search by the usage of neural networks

The search by the usage of fractal characteristics

…

The module for pictures preparation for database

The detachment single depictions from the group

The depiction’s segmentation

The reduction petroglyph’s depictions to common standart

Marking photos for protection copyright

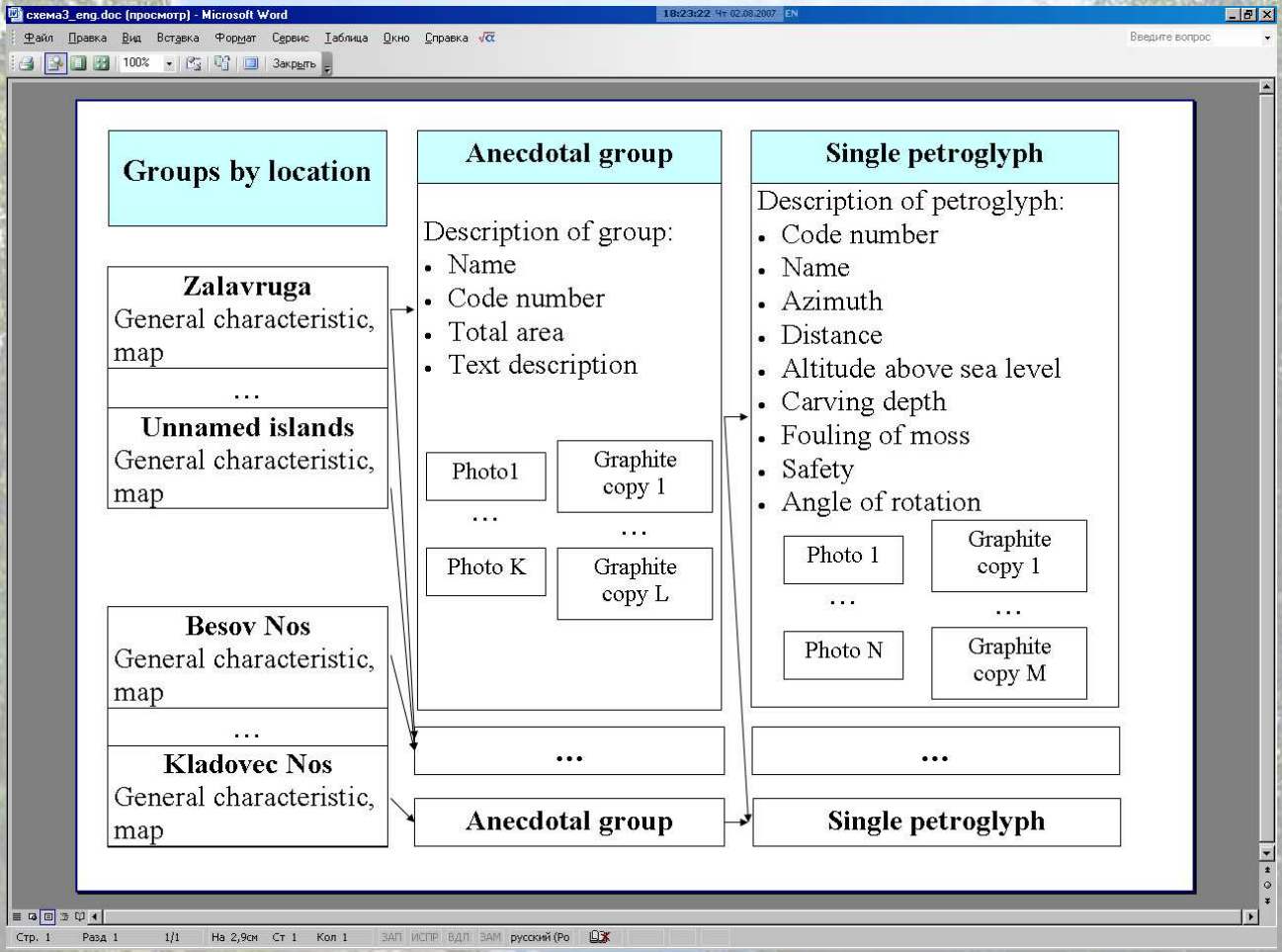


схема3_eng.doc (просмотр) - Microsoft Word
Файл Правка Вид Вставка Формат Сервис Таблица Окно Справка
Закрыть
Groups by location
Zalavruga
General characteristic, map
…
Unnamed islands
General characteristic, map
Besov Nos
General characteristic, map
…
Kladovec Nos
General characteristic, map
Anecdotal group
Description of group:
Name
Code number
Total area
Text description
Photo1
…
Photo K
Graphite copy 1
…
Graphite copy L
…
Anecdotal group
Single petroglyph
Description of petroglyph:
Code number
Name
Azimuth
Distance
Altitude above sea level
Carving depth
Fouling of moss
Safety
Angle of rotation
Photo 1
…
Photo N
Graphite copy 1
…
Graphite copy M
…
Single petroglyph

МИНИСТЕРСТВО ИНФОРМАЦИОННЫХ ТЕХНОЛОГИЙ И СВЯЗИ РОССИЙСКОЙ ФЕДЕРАЦИИ

ФЕДЕРАЛЬНОЕ АГЕНТСТВО ПО ИНФОРМАЦИОННЫМ ТЕХНОЛОГИЯМ

ФГУП Научно-технический центр "Информрегистр"

ГОСУДАРСТВЕННЫЙ РЕГИСТР БАЗ ДАННЫХ

РЕГИСТРАЦИОННОЕ СВИДЕТЕЛЬСТВО

№ 10542

от "07" сентября 2006 г.

Настоящее свидетельство выдано организации: **Институт языка, литературы и истории Карельского научного центра РАН**

в том, что представленная в Государственный регистр база данных

Петроглифы Карелии

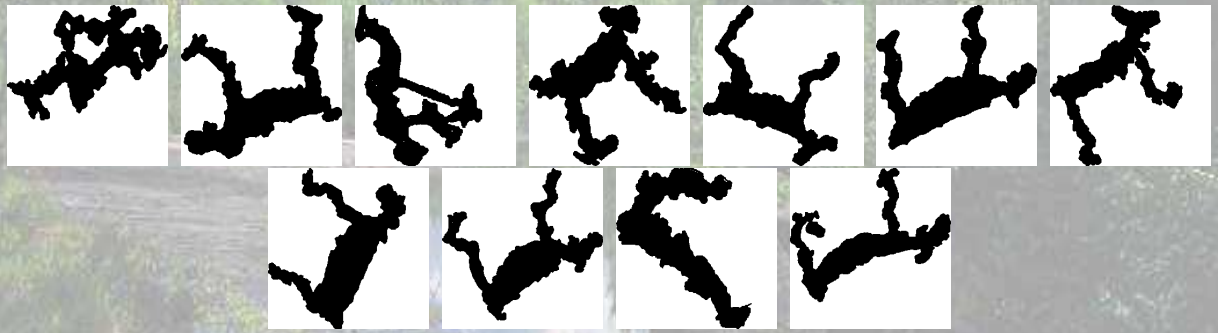
зарегистрирована за **№ 0220611248**

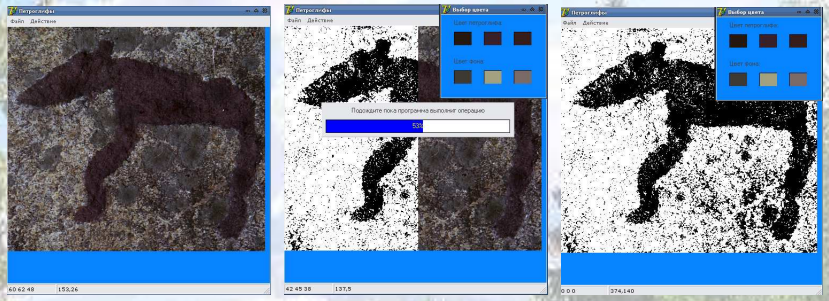
М.П. Научно-технический центр "Информрегистр" г. Москва

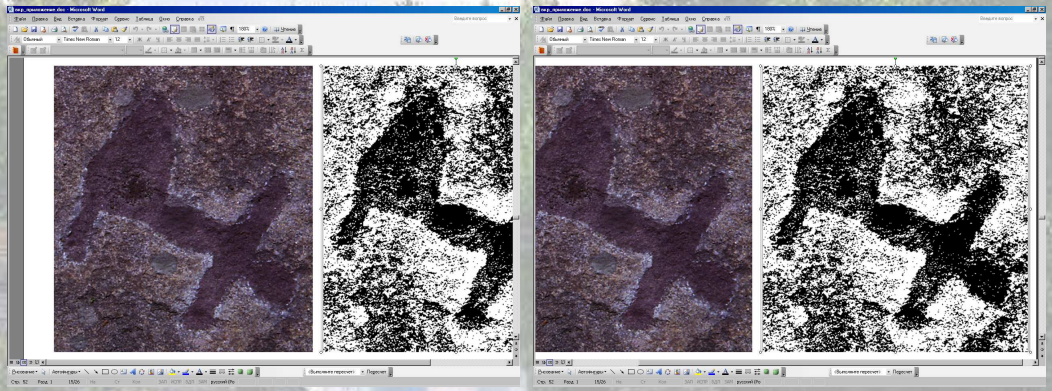
Директор ФГУП НТЦ "Информрегистр"

Е.И. Козлова

"07" сентября 2006 г.

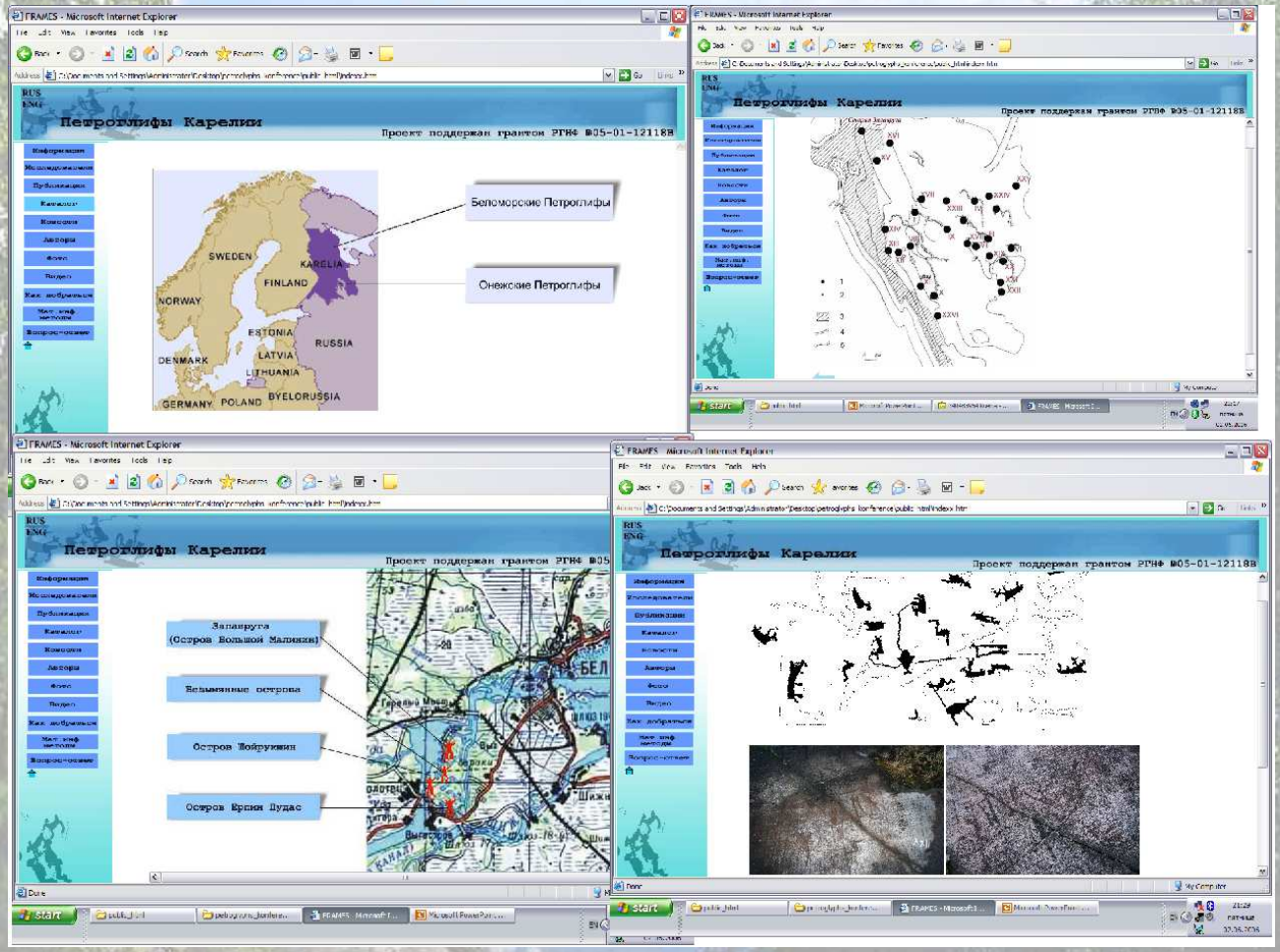




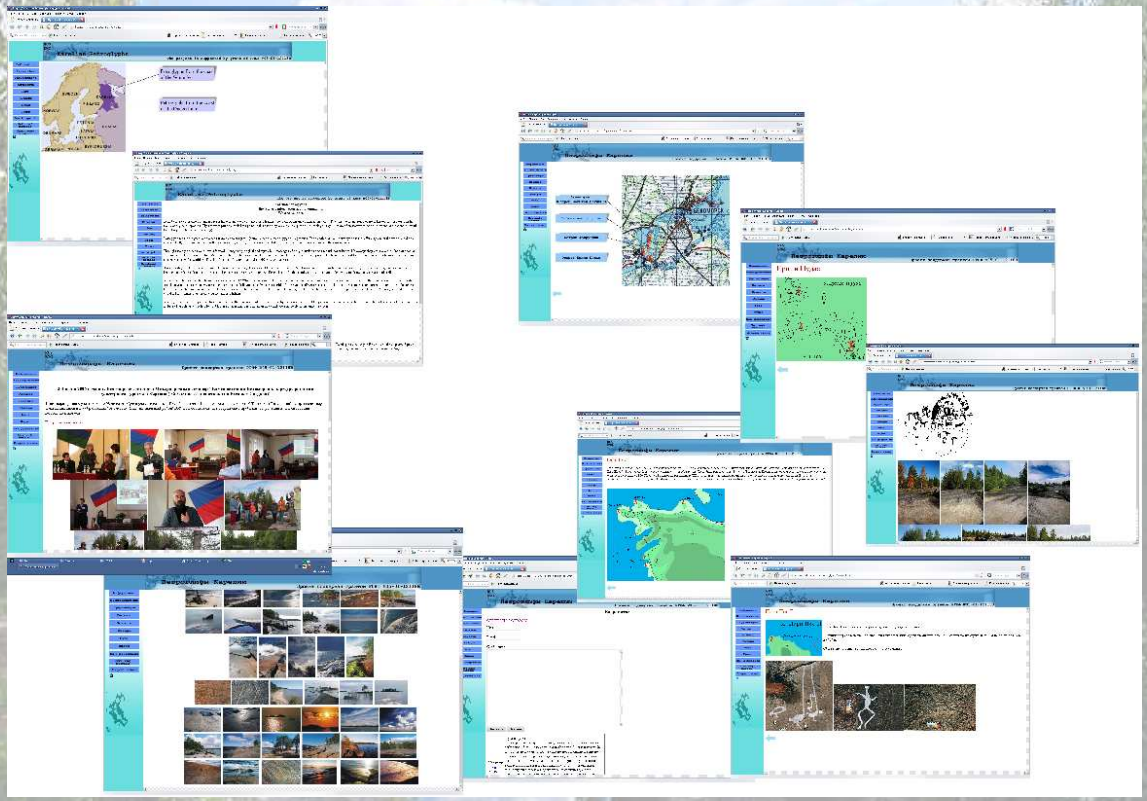


smalt.karelia.ru/~petroglyphs

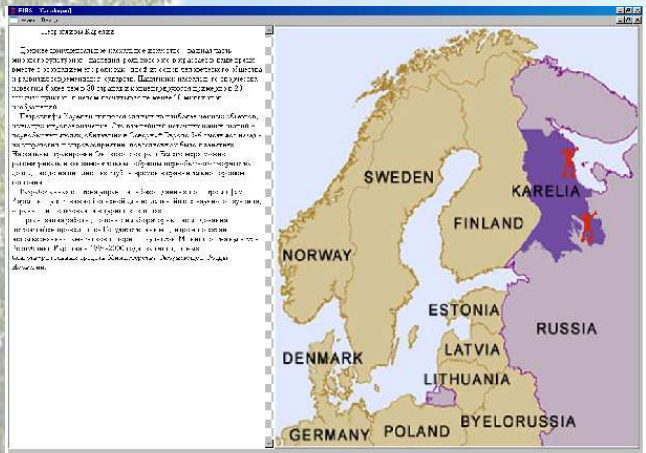
smalt.karelia.ru/~petroglyphs


FRAMES - Microsoft Internet Explorer
Петроглифы Карелии
Проект поддержан грантом РГНФ №05-01-12118в
Беломорские Петроглифы
Онежские Петроглифы
SWEDEN
FINLAND
KARELIA
NORWAY
ESTONIA
LATVIA
LITHUANIA
RUSSIA
DENMARK
GERMANY
POLAND
BYELORUSSIA
Петроглифы Карелии
Проект поддержан грантом РГНФ №05-01-12118в
Петроглифы Карелии
Проект поддержан грантом РГНФ №05-01-12118в

Website "Karelian Petroglyphs"



http://smalt.karelia.ru/ petroglyphs


SWEDEN
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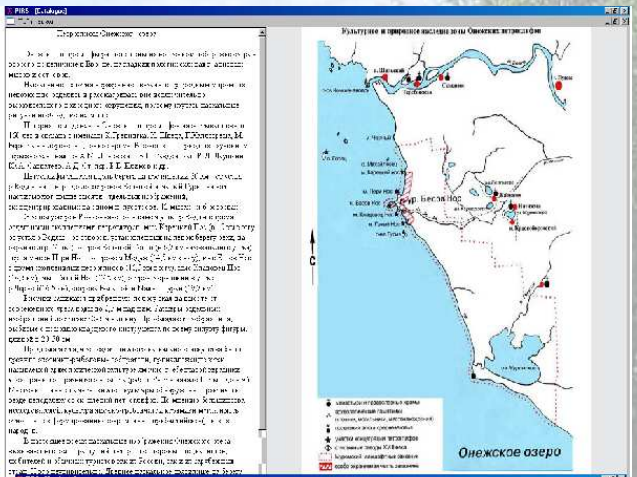
BYELORUSSIA
GERMANY
POLAND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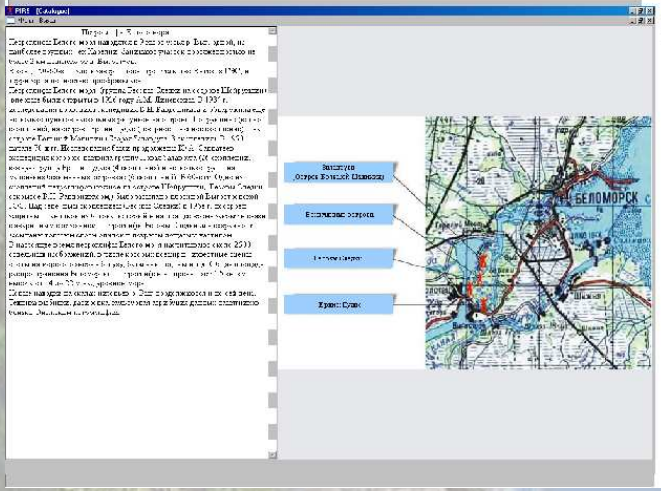
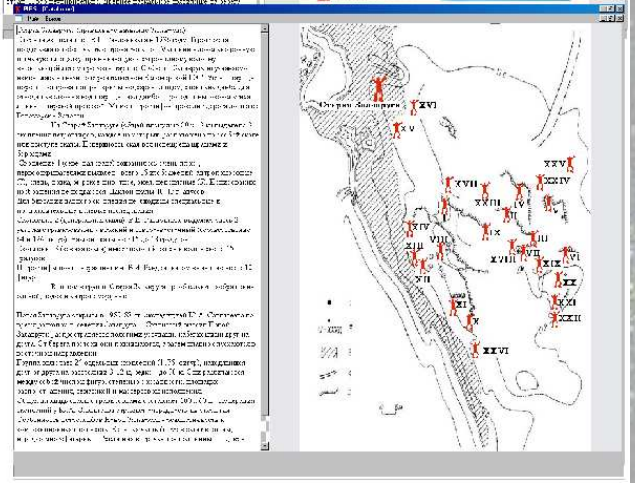
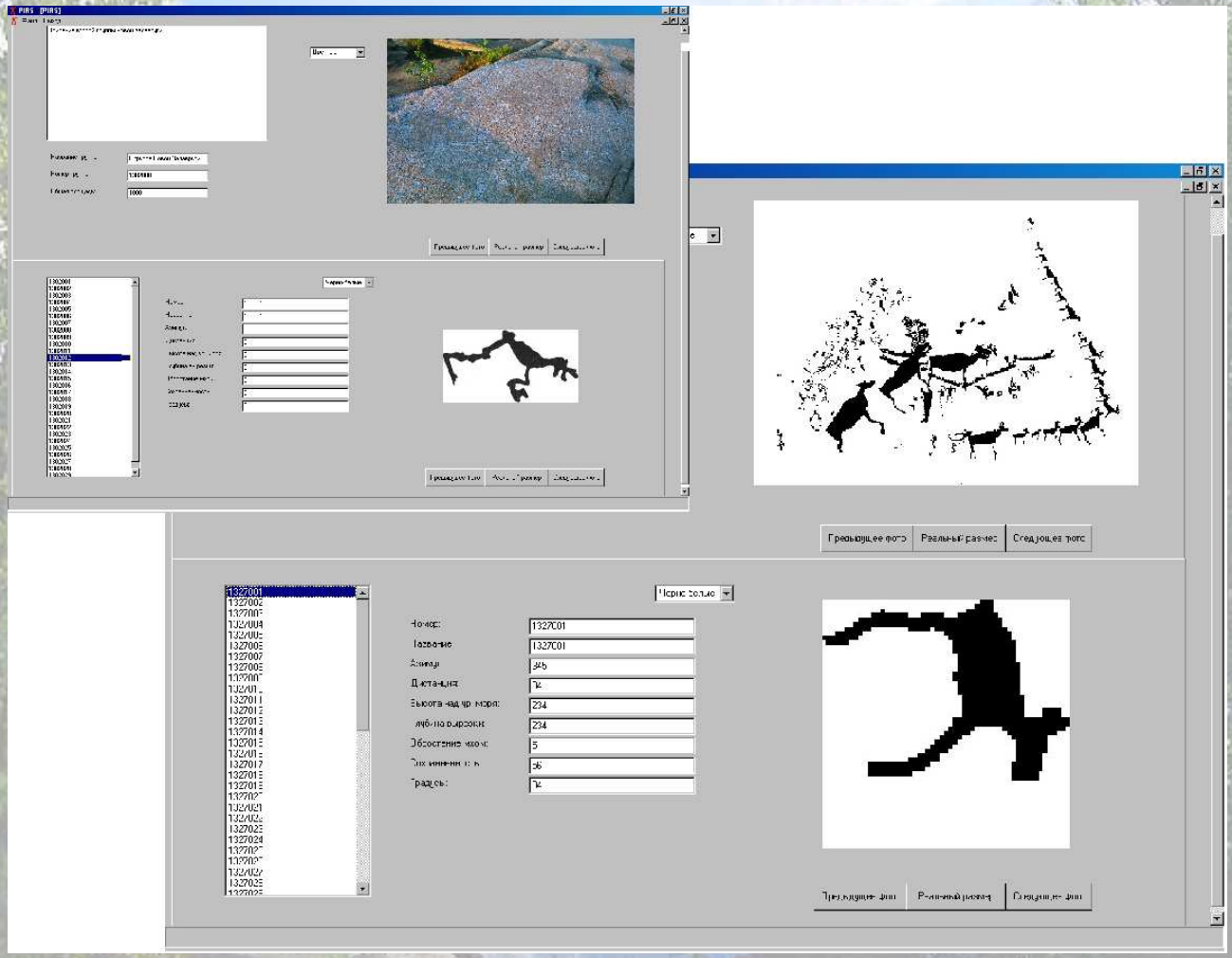

БЕЛОМОРСК




Предыдущее фото
Реальный размер
Следующее фото
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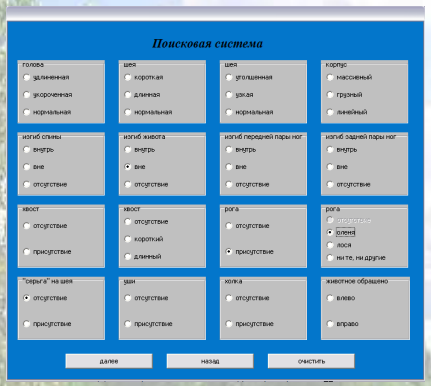
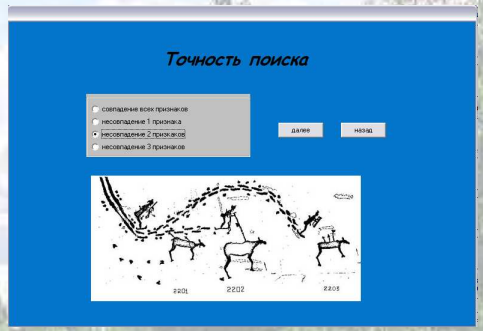
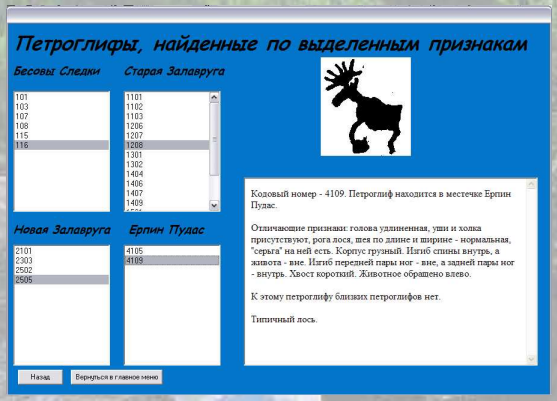
Название
1327001
Дистанция
Высота над ур. моря:
234
234
Обозначение ключ:
5
Градусь:

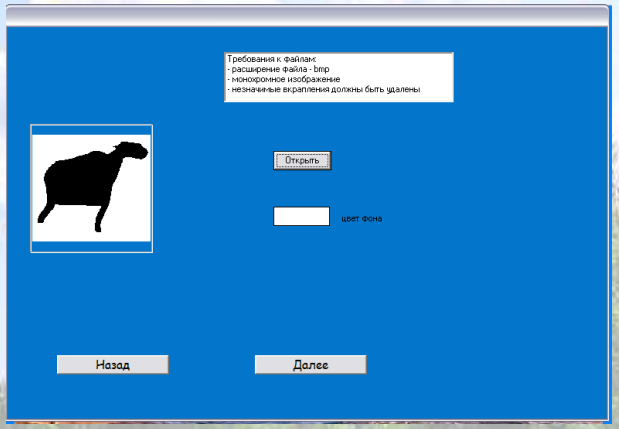
Search according to features

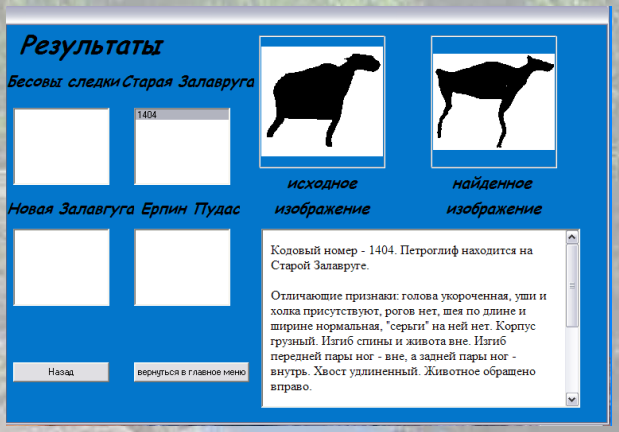




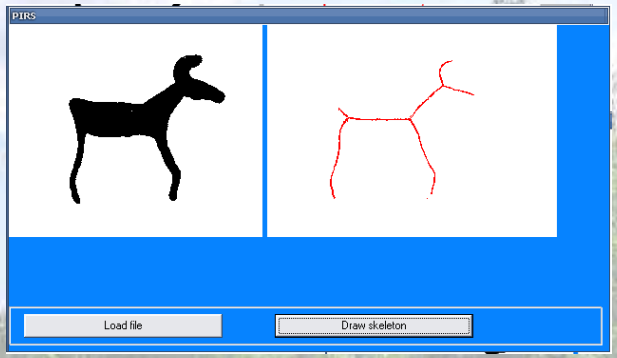


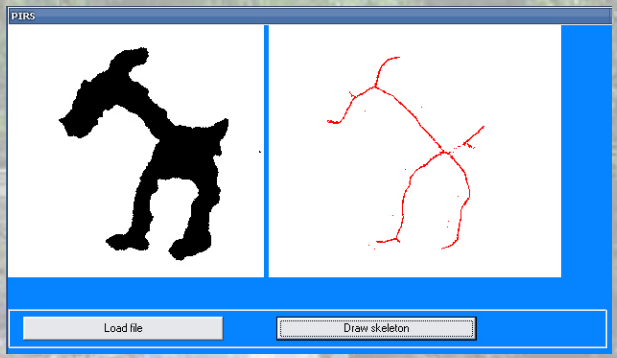
Search according to pictures similarity



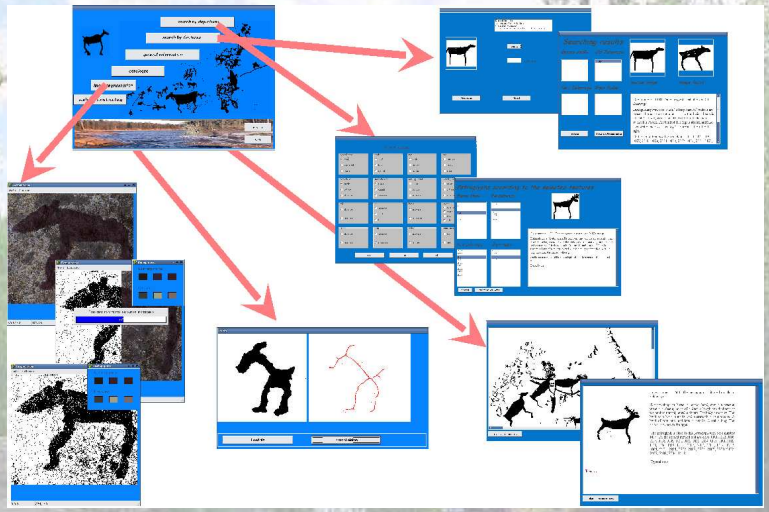


Search according to pictures similarity





The module for database search



Multifractal parameterization of petroglyphs depictions.Spectrum features 1-4.

1. Closeness of values D_q for image fragments in each area - on petroglyph and on the rock on one photo.
2. Closeness of values D_q for image fragments in each area - on petroglyph on two different photos.
3. Distinction of values D_q for image fragments in each area - on petroglyph and on the rock on one photo.
4. Distinction of values D_q for image fragments in each area - on different petroglyphs on two different photos.

Multifractal parameterization of petroglyphs depictions. Tasks.

1. Binary image segmentation.
2. The task of rock filling by petroglyphs (the task of one - hand).
3. The search of similar depictions in graphic database.

Multifractal parameterization of petroglyphs depictions. Carried research

1. spectrum of petroglyph and spectrum of the rock are different, but they both satisfy the features 1 - 4.
2. spectrum D_q is an invariant for petroglyphs depictions in regard to brightness transformation rotation and scale.

To sum it up: nowadays software for solving tasks of segmentation and search in graphic database is developing. The results of datum research are planed to use in the system "PIRS".

Total characteristics

The number of petroglyphs	3968
The number of photos and graphite copies	1854
The number of maps	29
The number of records and text information	1014
Total size (local version/online version)	319/780 Mb

The main results

- the universal system of the petroglyphs coding is worked out;
- the module for pictures preparation for database is realized;
- the database of Karelian petroglyphs is designed and filled;
- the website "Karelian Petroglyphs" is prepeared;
- the algorithm for petroglyphs analysis is worked out for the depictions of elks and deer from the coast of the White Sea. It is possible to use it for analysis of other depictions;
- the algorithms of similar petroglyphs search with the help of neural networks are realized;
- the algorithms of similar petroglyphs search with the help of skeletons are realized;
- the information retrieval system "PIRS" is worked out.

The approbation of the work on the international conferences and exhibitions

- ESE-2002 (Slovakia, Bratislava, July 2002) – the gold medal;
- 15 European Union Contest for Young Scientists (Hungary,Budapest, September 2003) – the third prize;
- ESE-2006 (Spain, Tarragona, July 2006);
- ESM-2006 (Malta, November 2006);

The approbation of the work on the international conferences and exhibitions(continue)

- IX contest of business ideas and research works "Young. Daring. Perspective." (Saint-Petersburg, December 2006) – the third diploma;
- IX international conference "Intellectual Systems and Computer Science" (Moscow, mechanics and mathematics faculty MSU, October 2006);
- VII all-Russian exhibition of scientific and technical works of youth NTTM (Moscow, June, 2007) - the medal "For Progress in Scientific and Technical Works";

All in all more than 12 scientific conferences and contests of different level (2002 – 2007). 7 articles are published on the theme of the research, 3 are printing.