

# Use of Internet – Technologies in Cadastral Works in Russia

**Prof. Vladimir GOLUBEV and Irina FARTUKOVA, Russian Federation**

**Key words:** Geodesy, Cadastre, Internet-technologies.

## SUMMARY

In Russia development of the Internet-technologies began only from 1996. Up to this time there were not any websites in the field of a cadastre.

It is necessary to investigate existing resources of the Internet in the field of a cadastre, to systematize them, to try to predict their further development and influence on development of technologies in the field of a cadastre. As is known, occurrence of personal computers has resulted in occurrence of new technologies in the field of a cadastre. First of all it is connected with GIS. It is possible to expect, that development of the Internet, also will result in updating existing technologies in the field of a cadastre.

Already now it is shown in creation of the distributed databases. In this report other possible changes of technologies are researched also. In particular, if to integrate the satellite receiver and the mobile phone for communication with a base site it is possible to determine a route of movement of the surveyor and to correct field works through the Internet with the help of such equipment. It will allow saving time for search of lost points, especially in wintertime, under snow.

Creation of information sites by countries is offered also in the field of a geodesy and a cadastre. These sites should concentrate the information about modern technologies, normative and legal documents, education, and scientific development and ect..

We recommend to unit resources of the given sites, by links, chats, electronic conferences etc.

Thus, it could be created some information space, uniting cadastral resources of many countries allowing making special searches in the field of geodesy and cadastre.

# **Use of Internet – Technologies in Cadastral Works in Russia**

**Prof. Vladimir GOLUBEV and Irina FARTUKOVA, Russian Federation**

## **1. BACKGROUND**

It is admitted fact that the development of information technologies is a carried out very fast in comparison with other branches of science and manufacture. Besides it is difficult to find any field of science, manufacture that could exist without information technologies nowadays. Therefore the development of computer science influences perfection and rates of development of technologies in other branches.

Obviously cadastre and geodesy is close connected to information technologies. Thus achievements in the field of computer technologies significantly changed technological process of surveying and cadastral works as a whole. We can see the development of geoinformation systems, which for the short period have passed the period of development from the elementary viewers up to modern GIS. The development became possible in the period when personal computers have appeared.

It is necessary to notice, that computer technologies are continuously developed. One of the advanced directions of these technologies - development of network Internet.

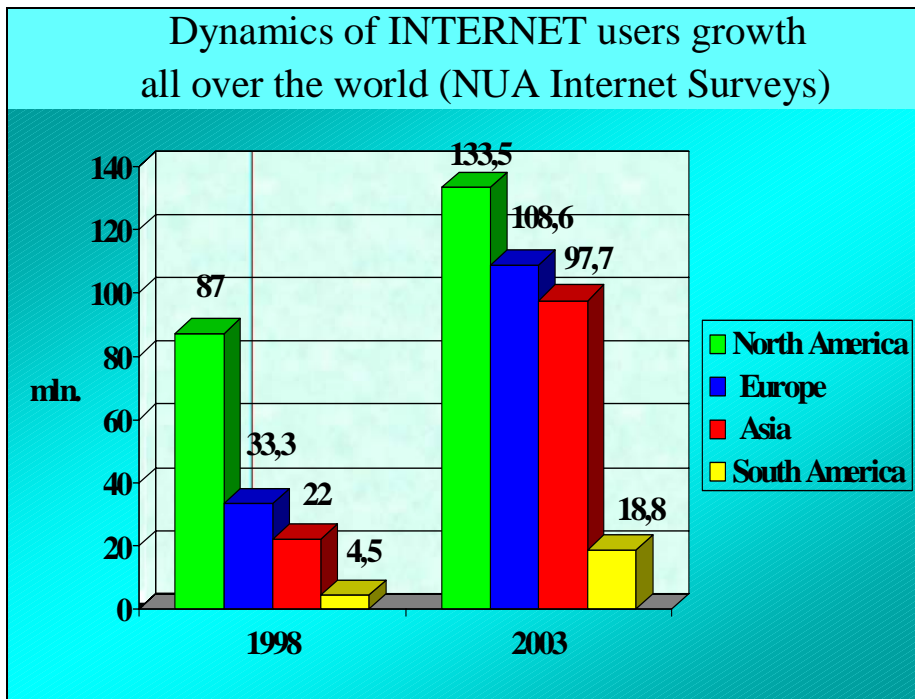
It is possible to predict, that the new stage of development of technologies for surveying will be connected to quick development of the INTERNET. In fact, we can see this process approximately during seven years. But it is only the initial stage of development the technologies based on using the Internet. Opportunities for use of this network in the given branch still are far from being exhausted.

The purpose of the given work is the analysis of present situation in the field of information technologies for geodesy and cadastre and the forecast of the future changes of information technologies in the field of a surveying on a basis the Internet. Certainly, we realize, that computer technologies continue to develop; both technologies of adjacent sciences develop. Consequently it is impossible to make the exact and full forecast of development of technologies even for some years forward. But, nevertheless, such analysis is useful, because it allows seeing possibilities more clearly, more precisely to put the purposes in development of technologies and by that to approach the period of their realization.

## **2. THE ANALYSIS OF DEVELOPMENT THE INTERNET IN RUSSIA (RUNET)**

In Russia Internet has appeared quite recently. In 1994-95 Internet was absolutely not used for fields of geodesy and cadastre. The majority of users only could receive electronic letters, but could not be connected to Internet and use all its possibilities. Since 1996 the rough growth of Internet users in Russia has began.

Firstly, for comparison we intend to present diagrams which show growth of Internet users in the world from 1998 till 2003. (the Figure 1)

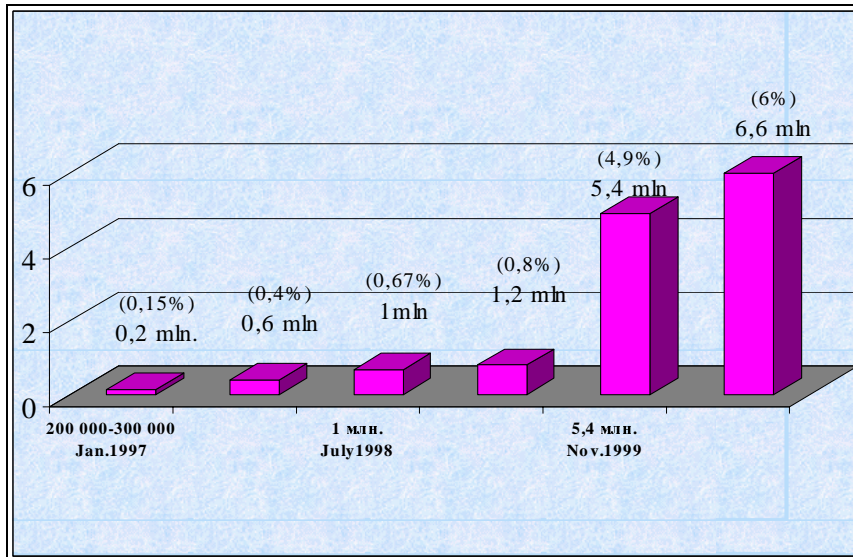


**Figure 1**

As could be seen, number of Internet users, on data NUA Internet Surveys, is increased up to 361,9 million all over the world. From the diagram it is visible, that in 1998 the share of active users from USA was 59,2 %. By 2003 the share of USA among all active users will decrease almost up to third (36,9 %).

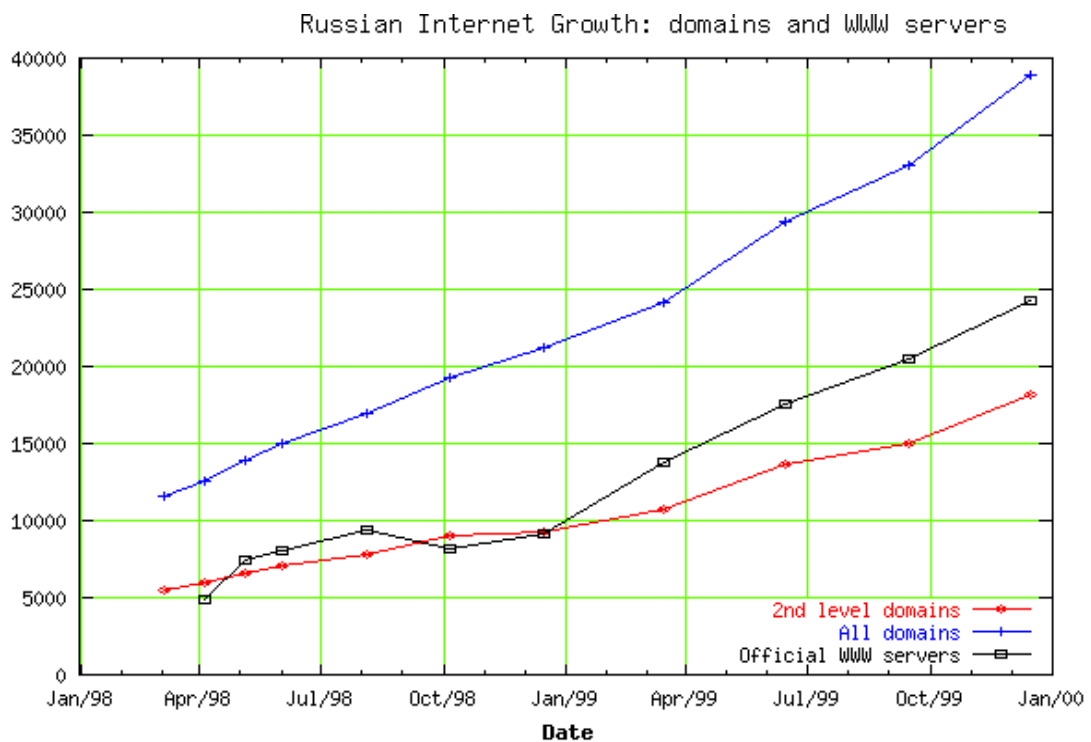
In 2003 on a share of the East Europe will have 30 % of all users, Asian - Pacific region about approximately 27 % of users whereas on a share of Latin America it is necessary 5,2 %. By 2005 the lion's share of expansion of the Internet will fall to Asian - Pacific region and the East Europe. Nevertheless, owing to the lowest launching site, Latin America will show the greatest rates of a gain.

Dynamics of Internet using in Russia is presented on the following Figure 2.



**Figure 2**

The Given analysis shows, that the Internet continues to grow and develop and, therefore, field of Internet –services is rather perspective.



**Figure 3**

One of parameters of development of the market of services in Internet is the quantity of providers. More than 300 providers operate in Russia now. In Russia, to middle of 1998, it

was totaled all 180 thousand IP hosting, in the beginning of 2000 about 360 thousand, at present time there is more than one million.

Summing up research of development the Internet in Russia, we shall result the forecast of quantity of users till July 2003 on the following figure. 4

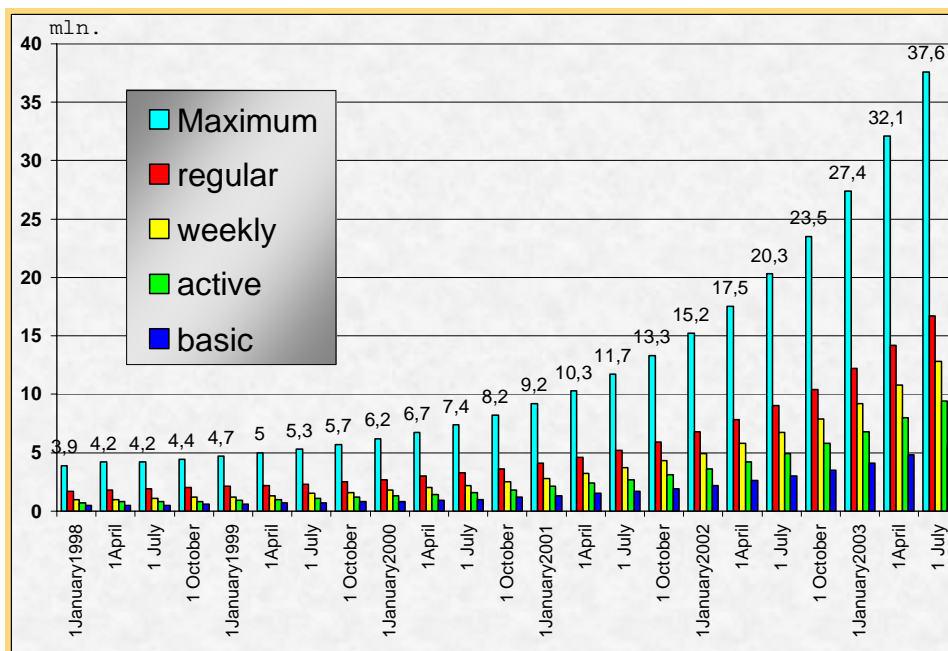


Figure 4

### 3. DYNAMICS AND PROGNOSIS OF GROWTH THE INTERNET IN RUSSIA

There are about 3 million independent information resources of the Network (web-sites, thematic pages, servers) in the Russia.

There is 0,7-1,0 terabytes of the information in Russian language in the Russian part of Internet. The estimation of a turnover of commercial services in the various data is from 6 up to 10 million \$ per one year. The estimation of a turnover from advertising reaches 1 million \$ from 10 million\$. These data shows the growth of use of marketing through the Internet.

Such dynamics corresponds to use of the Internet in the field of geodesy and cadastre.

For example, in 1995 the domestic-owned firms engaged in GIS-technologies had no sites, and only about 2 % of firms had an E-Mail. In 1998 there was 47 Russian sites on GIS subjects, by 2000 a number of them was doubled.

#### 4. THE ANALYSIS OF DEVELOPMENT THE TECHNOLOGIES IN THE FIELD OF GEODESY AND CADASTRE

The cadastre is the multy-purpose system including, of registration, the account and a real estate valuation, and also questions of legal, economic, geodetic maintenance. All these components also determine the technology of surveying works.

Let's analyse, whether the development of Internets - technologies has affected on technology of cadastral works to the present moment. It is necessary to notice, that it has affected, but in very small extent (degree). But, to our opinion, it also should be expected because you could see the Internet develops spontaneously. Nobody put the purpose to change technology of cadastral works in connection with development the Internet yet. Besides it is necessary to reveal the prospects of such development. Obviously, time is necessary for this purpose.

So, what has changed in technologies of cadastral works? First of all, the marketing technologies and possibilities of search of the necessary information have changed. The majority of the large and average enterprises, both state, and private, working in the field of a geodesy and a cadastre, own sites have developed. Sites of all three Ministries connected to works in the given branch have appeared in Russia. These are Federal Surveys of a land cadastre, geodesy and cartography, Ministry of State property.

Sites of the enterprises, as a rule, inform visitors on the services and the goods represent their characteristics, advertising.

The first online Internet-shops trading in software or geodetic equipment has appeared. On departmental sites some legal information, the information on events in branch, about structure of branch, problems and goals of the Ministries is presented.

Besides the informational sites applying for association of various informative resources in the field of a cadastre have appeared. It is possible to find there the information on the various firms, to find out where it is possible to buy software, geodetic equipment, addresses and links to the enterprises which are carrying out cadastral and geodetic works, newest scientific development, the information on conferences and symposiums and many other things.

The site developed by authors also concerns to such kind of sites. <http://www.cadastre.ru>, a site of Gis-ASSOCIATION <http://www.gisa.ru>.

But such kind of sites only facilitate search of the necessary information, not influencing on technologies of accomplishment of cadastral works. Sites, using GIS-Technologies, which have appeared recently, use technologies of interaction of databases of geoinformation systems and the web-server. Such sites, connecting to databases present the cartographical information, *aerial photographs and space photographs*, access to which, becomes possible through the Internet.

Have appeared permanent GPS stations which data is possible to download using Internet. For example, in such project are engaged now *Federal Survey of the Land cadastre and Federal Survey of a geodesy and cartography*. At present time there are 7 stations that operate in Moscow area. In the nearest future it is planned to start 20 more. Each station will cover area up to 50 sq. km. Calculations show, that such distance will provide the necessary accuracy of determination of coordinates of measurement marks. At present time the testing of this project is carrying out.

It is possible to carry out geodetic measurements without base stations in covering area of such station. Obviously, results of supervision of satellites from permanent station are required for processing results of measurements. The data could be received through the Internet. Thus, in this case we deal with new technology of accomplishment of cadastral works using achievements of Internet of technologies.

The following example is use of the distributed database of the cadastral data. Such scheme is used by Moscow State University of the Geodesy and Cartography (which we represent), for creation of a cadastre for the real estate of state educational institutions in Russian Federation. The big volume of the information is concentrated on servers of seven regions. All these servers are connected among themselves and to the central server through the Internet, forming departmental network Intranet, with the distributed database.

There are changes in training of specialists in cadastre, based on use the Internet. Moscow State University of Geodesy and Cartography developed the site where educational materials on all disciplines of a speciality "Urban cadastre" are presented in the electronic form. Students of any forms of training have an opportunity to use resources of this site for self-preparation. As is known, FIG (The International Federation of Surveyor) has the database of educational materials on a cadastre and land management which could be used by educational institutions of many countries.

As it is possible to see from pointed above, there were some changes in technologies of realization of cadastral works in connection with appearance and development the Internet. There is a question. What changes could take place in the near future and as far as they will be essential?

## **5. THE FORECAST OF DEVELOPMENT THE TECHNOLOGIES IN THE FIELD OF CADASTRE AND GEODESY.**

First of all it is necessary to consider experience of development the Internet in other countries and other branches and also to take into account tendencies of development of other technologies, which may be used in common.

For example, it is possible to expect, that the enormous volume of the information concentrated in the Internet and increased with huge speed may result to that existing search machines will not manage with search of the necessary information. In our opinion, the solution here is in creation of search machines by directions. So the search engine should be

created in the field of a cadastre and a geodesy. That means the international information system integrating the information on all sites of the given field should be created.

It is possible to offer, for example, the system basing on informational sites of the different countries, which domain names consist of two levels. Top level is two-letter meaning the country and the second one always consists of a word cadastre or geodesy. For example, <http://www.cadastre.fr>. could be an information site of France in which presents all links to resources in the field of a cadastre of the given country.

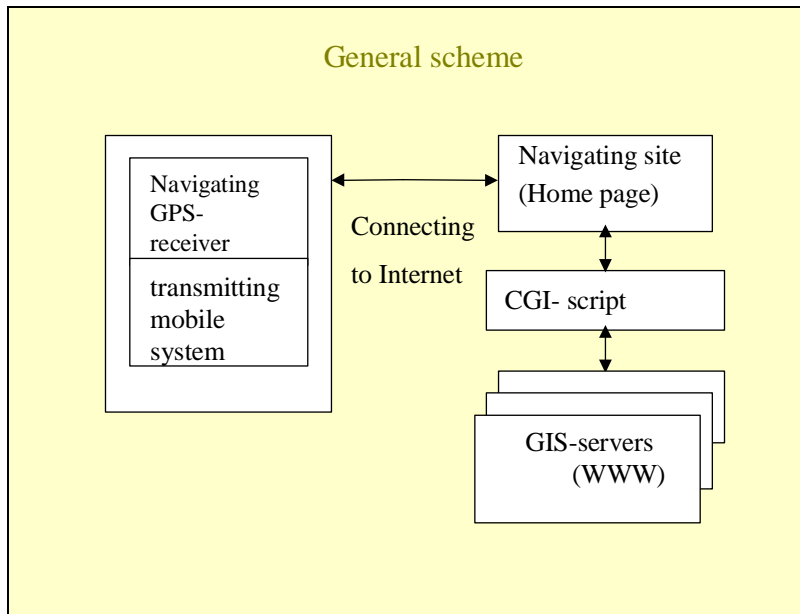
Then the specialized search machine will interrogate only informational sites of the country for the answer to search. In case of realization of such system it is necessary to ask owners of all sites of France in given branch to be registered on joined information site. Otherwise, these resources will be inaccessible to the search machine. Searches may be limited both on subjects, and on geography of search, i.e. the certain countries may be searched.

In the search machine it is necessary to arrange the catalogue of names by countries. Therefore, the requirement to a name for informational site mentioned above is not formal. Especially whether the given name already may be occupied with someone and this owner will not agree to cooperate and make an information site. But such name could be convenient in the case when any user has decided to take advantage of resources of an information site without the search machine, independently. Then user should know a name of an information site of the concrete country. Naturally it is better to have special system in this case that we offer.

As it was marked earlier, the cadastre is the multipurpose process. We shall consider some of its components from the point of view of possible change of technologies. Let us begin with measurements of borders between areas. As a rule, such works are carried out with the help of satellite methods. Naturally, at the first stage surveying marks is built up. After putting all surveying marks their coordinates is determined. Other people carry out surveying, some months later, and even it is more. Everything depends on financing. Therefore search of surveying marks, especially, in wintertime when marks appear under snow, becomes inconvenient. What in this case it is possible to offer?

On Moscow conference in 2000, we have offered to unit navigating GPS-receiver and the mobile phone of the third generation with G3 technologies. These technologies provide speed of an exchange between computers up to 150 kilobit/sec. For comparison GPRS - technologies provide about 50 kilobit/sec. Such instrument could be used for navigation as it is shown on the scheme showed below.





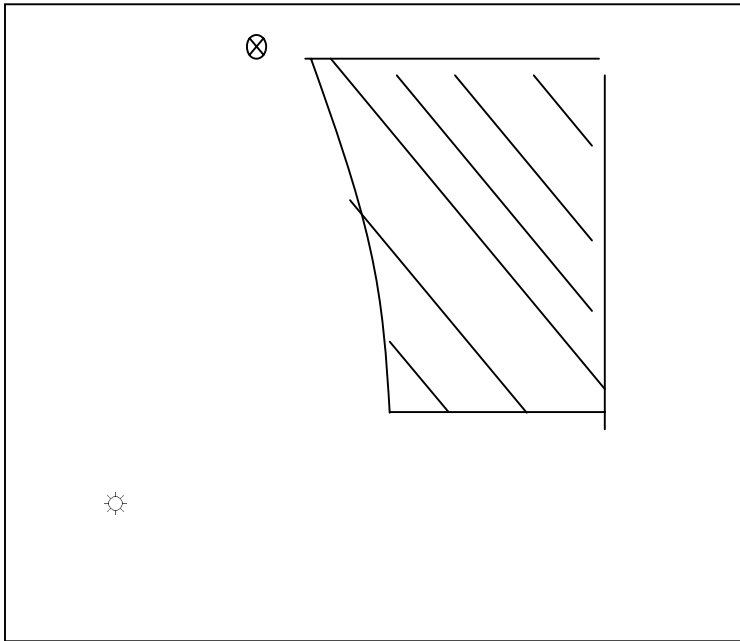
**Figure 6**

Obviously, coordinates are determined using the navigating device, which are transferred to the server with the help of the mobile phone. The server has the software created with CGI - scripts or Java -technologies allowing forming search for database of GIS-server. According to the given search in a database there is a map, which is transferred back through the mobile phone, in memory GPS-receiver. Thus, the point of district and the appropriate point of a map are identified with help CGI of scripts. Coordinates of the given point on a map also are transferred in memory GPS- receiver. Further it is possible to have orientation with the map, having determined coordinates even one more point. The transferring speed of the data in this case allows transferring significant volume of the graphic information. Thus recording and installation of the appropriate map in GPS-receiver became possible carrying out through the Internet.

With using the navigating GPS-receiver it is more efficient to determine the approached coordinates of surveying marks and to put the information in database of GIS-server, (rather than with use кроки to find them during measurements). It is possible to put into database a route of movement by surveying marks beforehand while during determination of their coordinates. In this case, it becomes much more effective use of a method «STOP AND GO».

Network technologies could be especially useful when the interactive mode of operation is necessary. Let us consider one of possible variants. With occurrence in Russia of a private property on the land, there have been arisen disputes on boundaries more often which are solved with the help of experts. The final decision is solved by court. At present time the cadastral plans of land plots exists not everywhere around Russia. It could be offered the technique of delimitation of a site with use of a digital camera for elimination of disputes.

The given technique is in the following. Borders of a site are coordinated with proprietors of nearby sites. For example, as shown in the following figure.



**Figure 7**

It is shown the site of the land, which border should to be determined. It is shaded on the figure.

With help GPS-receiver the coordinates of 2 points (if district is flat) or three points which are preliminary marked are determined. They are designated by a symbol. ⊗

The shooting of the marked border by a digital camera from a usual support is made with a point designated ☀. The given picture is sent to Land committee where the archive is stored with the help of the mobile phone and the Internet. There is a comparison of a picture, border and the area of a site to available contemporary records. It is defined, whether the border was moved whether or not. It will allow directly, on a place to solve the arisen dispute.

It is necessary to notice, that measurements may be implemented by any way. For example, with the help taheometrs. Important thing is a transfer of results of measurements on a server of Land committee in an interactive mode where these results are compared to contemporary records. Results of comparison are sent back. But this way will be less evident and convincing for the arguing sides.

It is obvious, that Cadastre includes not only the simple account of the real estate. The estimation of real property and land, fixtures etc. objects is very important aspect. It is important to notice that now in Russia the opportunities of Internet in the given area still are very poorly used. One of the basic evaluation stages of the real estate is data gathering. And it could be made, even partly, through the Internet. It will reduce a significant amount of time for the appraiser and will reduce the price of procedure of estimation. But it will demand changing of legal specifications.

Really, now practically nobody creates databases with results of bargains, characteristics of objects on which there were bargains. Whether there will be any stimulating levers from new normative documents which will result in creating such databases? Whether there will be it compulsory or economic levers? Now, it is difficult to answer these questions. It is clear that for appraisers it would be useful.

However, many general data now could be placed in the Internet by the Russian society of appraisers (ROO). For example, the normative documents concerning an estimation (the Majority of such documents already now is placed on site ROO), results of bargains which pass through ROO, the methods of estimation accepted now, changes of market values of rates of rent payments, rates on the involved capital, statistics of change of the prices in various segments of the market, the forecast of these changes from point of view ROO etc. By the way, this information may be paid.

To our opinion, the distributed databases will be used more widely in the near future. They should be formed on regions and departments and to be settled down on different servers. Such databases should allow forming information to the inquiries consisting of the data form various bases.

However, one of the basic problems which will rise in developing new technologies with use Internet will be a problem of change the legal space. New specifications should correspond to existing laws in the field of real estate and Russian legislation. At the same time new laws should create new opportunities for use the Internet. I.e. ways of an optimum combination both priorities named above should be found.

## REFERENCES

Internet sources;  
NUA Internet Surveys;

## BIOGRAPHICAL NOTES

**Vladimir Golubev** is dean of Economics and Land Management Faculty, professor. He is the lecturer on the following disciplines: Real Estate Valuation; Internets – technologies; The theory of errors of geodetic measurements. He leads the scientific researches in the programme of development the cadastre of the real estate for educational institutions in Russia.

**Irina Fartukova** is vice-dean of Economics and Land Management Faculty. She graduated Moscow State University of Geodesy and Cartography in 1999. In 2000 she has continued education and became a student of Master of Science programme in Land Management in Royal Institute of Technology in Stockholm. December 2002 Irina Fartukova has presented her thesis for Master of Science Diploma. At this time she is the post-graduate student in Moscow State University of Geodesy and Cartography.

## CONTACTS

Vladimir Golubev and Irina Fartukova  
Moscow State University of Geodesy and Cartography  
Gorokhovskiy str. 4.  
Moscow  
RUSSIAN FEDERATION  
105064  
Tel. + 7 095 262 5365  
Fax + 7 095 262 5365  
Email: golubev@miigaik.ru, fut-office@miigaik.ru  
Web site: <http://www.cadaastre.ru/>