

## Some Technological Schemes of using the Internet in a Geodesy

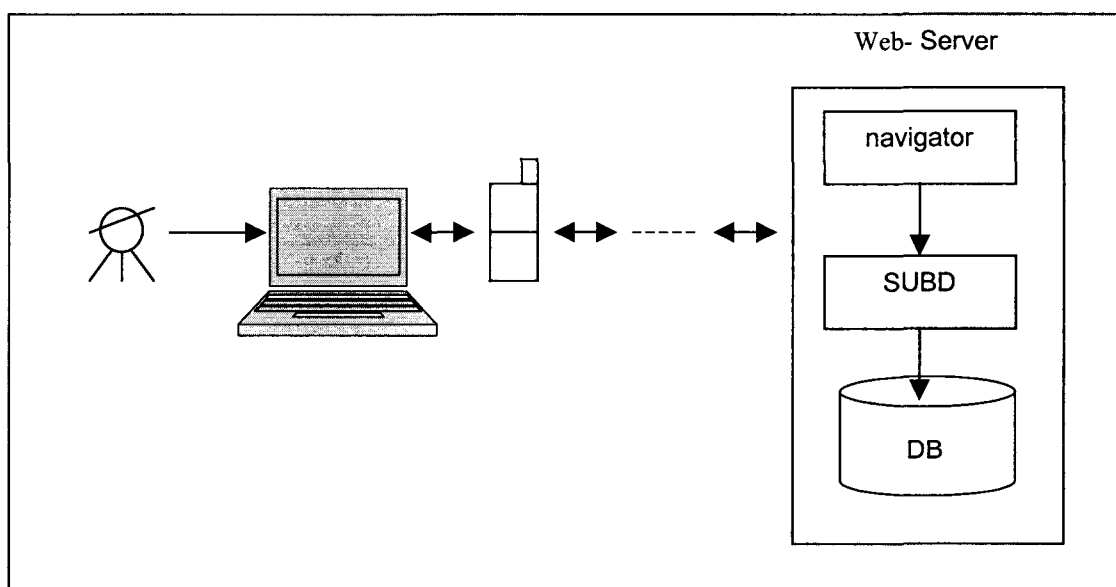
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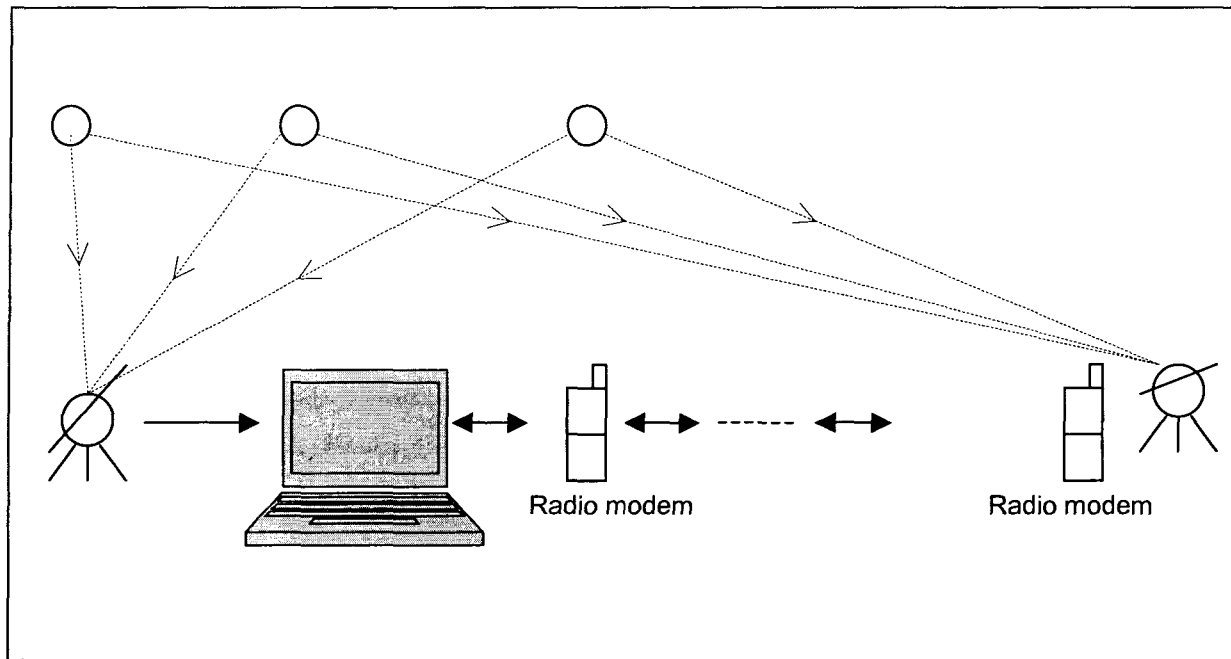
In practice use of Internets-technologies can be demanded in a case when field works are removed from the central office and are enduring. In this case there will be a necessity of transfer of results of field measurements from registrars of the information electronic taheometrov, satellite devices. Now, memory of registrars release, transferring the information in memory of field COMPUTERS, more often Notebook. Association GSM and the Internet – technologies allows today skachat the information from geodetic devices directly on a server.



**Fig. 1.** The scheme of transfer of the information of field measurements from registrars on a server

Such scheme now is not used yet. But it is possible to tell with confidence, that she will be shortly realized. All technical decisions are already executed. It is necessary to collect only together all chain of the given technical devices. Now there are the navigating devices combining technologies GPS-GSM. However geodetic GPS – receivers for the present are not incorporated into a uniform complex. Whether has prospect in manufacture such combined device? Most likely such device can find application in case the differential amendment should be entered in a mode of real time. For example, for shooting diameters of the pipelines laid in a bottom of the rivers or the seas. In this case one of GPS stations settles down on coast, another at the bottom of a vessel. The computer, eholot and other equipment in the same place settles down.

The ground station is used for definition of the differential amendment which is transferred, now, through a radio modem on a computer. Radio transmitters allow to carry out data transmission in direct visibility.



**Fig. 2. Use of radio modems**

The distance between stations can be from 700-900 m up to 4-5 km. However, with increase in distance cost of such radio transmitter considerably increases. If in the given district there are retransmitters of the companies of cellular communication it is possible to suggest to use a mobile phone instead of a radio transmitter. It is much cheaper, will allow to work in absence of direct visibility and on the big distances. Besides the information can be transferred at once and in the Internet, to the central server. It will allow to compare the acting information to the information from a database in a mode of real time. Thus already now it is possible to use GPRS technologies. It is batch data transmission, with speed of transfer, achievable at the moment 33kbit/sek. The following generations of mobile phones, with technology G3, will allow to carry out data exchange up to 170 kbit/sek. But also technologies GPRS under forecasts in the near future will allow to reach the same speeds.

#### **Use of accompanying base stations**

In a static method of definition of coordinates of items with help GPS – receivers is used by base stations. The base station is created on starting points by each brigade. Recently as such station referents-stations are used. So, in the Moscow area, such 7 stations now operate and is planned to put into operation such 24 stations. The provisional area of Moscow and the Moscow area makes 35 000 km<sup>2</sup>. I.e. one station should cover the area equal  $35000/24 \text{ km}^2 = 1500 \text{ km}^2$ . Thus, at performance of field measurements in the Moscow area referents the station will be located not further 40 km from items determined with help GPS. Referents-stations everyone are more widely used and in the western countries. Efficiency of their use is marked in many scientific publications. But it is necessary to tell, that cost of such stations high enough. And depending on a kind, letting out firm can exceed 30 000 \$.

Taking into account the areas of the Russian Federation, it is uneasy to count up a total cost of such program on all country. During too time, amount of works on creation of geodetic maintenance now increases. Thus sometimes works are conducted by several brigades, is independent from each other in adjacent areas. Sometimes in several kilometers from each other. And field brigades do not know about it as work or in different areas, or perform

these works for different departments. In this case one base station for two, and even more brigades can be used. For this purpose it is necessary to agree upon time and a place of standing of such base station only. Clearly, that such technology can increase labour productivity of both brigades since at least one additional GPS-receiver can be allocated for definition of coordinates of points of a created geodetic substantiation. The question will be how to provide realization of such technology. We suggest to use the Internet for this purpose, in particular to use a site [http: // www.cadaastre.ru/](http://www.cadaastre.ru/), created by authors.

The site should become workers for all field brigades performing field works. Here always, on the one hand, it is possible to place the information that the concrete brigade plans to carry out works in such area, the base station will be established on such item, during such time how to contact this brigade when the information on supervision will be submitted on a site. On the other hand, beforehand to look the information on, whether are planned in the nearest area, to a place of your field works, to put base station, to take advantage and skachat the necessary information. Naturally, such technology will earn in process of acquaintance of geodesists with the given site.

It is necessary to tell and that if each brigade uses the base stations then they can be used for processing both brigades. I.e. to transfer through the given site the information on supervision from base station of other brigade. Thus, the number of firm points at processing increases, that will allow to increase reliability of definition of coordinates of points if on any points there will be failures, that quite often it happens. And repeatedly to count these coordinates with use of other base station, we shall name such in addition used base station of other brigade accompanying.

At performance of works on land maintenance of an establishment of borders between areas in field conditions it is necessary to carry out search of geodetic signs. First project border, then pawn geodetic points and draw them kroki. After a bookmark of all signs define their coordinates. Thus search of items, especially, during winter time when signs appear under a snow, becomes inconvenient. What in this case it is possible to offer ?

In 2000, at conference, in Moscow we have suggested to unit navigating GPS the receiver and a mobile phone of the third generation with G3 technologies. These technologies provide speed of an exchange with the removed computer up to 150 kbit/sek. For comparison GPRS – technologies about 50 kbit/sek. Now such integrated devices of firms Benefon and Carmin have appeared. Such device can be used for navigation as it is shown on the mentioned below scheme.

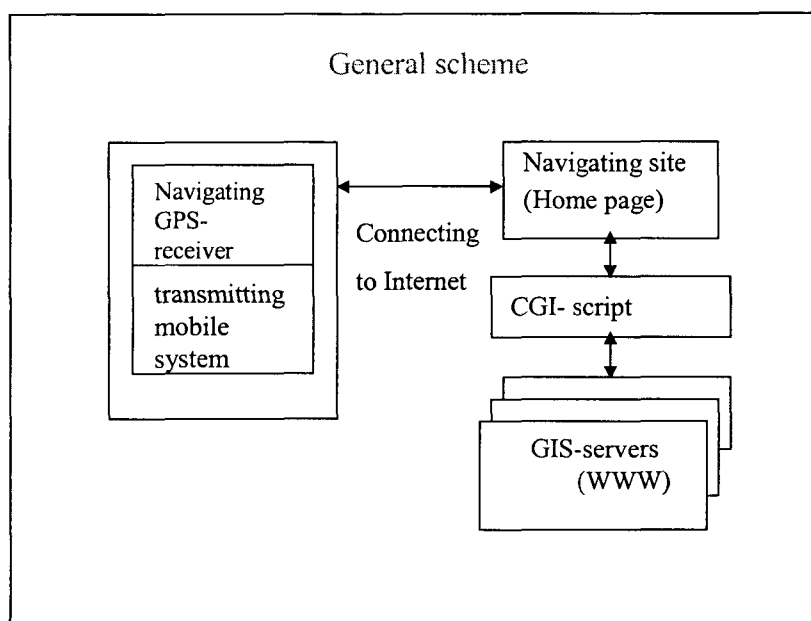


Fig. 3. Scheme of integrated receiver

As it is uneasy to understand, with the help of the navigating device coordinates of item of standing which with the help of a mobile phone are transferred to a server are defined. The server has the software written with use CGI – scripts or Java – the technologies, allowing to form inquiry for SUBD GIS-a server. By the given inquiry in a database there is a sheet of a card which is transferred back through a mobile phone, in memory GPS – the receiver. Thus, with help CGI of scripts the point of district and a corresponding point of a card are identified. Coordinates of the given point on a card also are transferred in memory GPS of the receiver. Further a card it is possible sorientirovat, having risen and having defined coordinates, even one more point. Speed of data transmission in this case allows to transfer significant volume of the graphic information. Thus, record and installation of a corresponding card of district in GPS the receiver begins possible to carry out through the Internet.

Having put in pawn in database GIS-of a server the information on the approached coordinates mezhevyh signs which can be defined during their bookmark, with the help of the same navigating receiver, it is possible much more effectively, rather than with use kroki, to find them during measurements. In a database it is possible to put in pawn beforehand a route of movement on mezhevym to signs during definition of their coordinates. Here examples of possible association of Internet-technologies, GIS and the geodetic technics, connected with appearing new opportunities are considered. And it can become a reality in the near future. It is obvious, that firms, the organizations should pay attention to use Internet. It is connected with GIS – to technologies which are already united on GIS-SERVERS, both with geodetic devices and with advertising services in sphere of a geodesy and a cadastre and other opportunities about which was spoken above.

The geodesy and cadastre will not stay in the party. Therefore the geodetic organizations engaged in cadastral works, should invest money in the Internet projects. It concerns also development of new technologies and marketing researches on the INTERNET.