Turn in both planes has a general tendency of errors for the transverse component and horizontal directions, and for vertical component and zenith distances.

The results of the experiment with membrane reflector contains the following laws:

1. The maximum reversal membrane reflector from the normal to the line of sight is 60 °. Growth of the angle of rotation of the membrane reflector is accompanied by a linear tendency to increase the measured distance.

2. The maximum reversal membrane reflector from the normal to the line of sight does not introduce errors in the results of measurement of a horizontal direction and a transverse component of ΔU.

On the basis of the experiments the following conclusions:

1.The maximum range of the angles of rotation prism is 40 ° ... 50 °, which is slightly smaller than the membrane reflector 60 °. This difference is due to the design of the prism body. The maximum rotation angle of the prism depends on the measured distance.

2. the measurements on film reflector, an increase of the measured distance with the increase of the angle of rotation of the reflector.

3. Work reversal prism in the horizontal and vertical planes is 20°. After turning 20° in the measurement results include significant errors. Acceptable reversal film reflector, in which the measured distance changes slightly, 40 ° -50 °.

4. Turn the prism in the horizontal plane showed a tendency to increase measurement errors horizontal directions. Turn the prism in the vertical plane showed a tendency to increase measurement error zenith distances. Turn the membrane reflector in the horizontal plane does not introduce errors in the measurement of the horizontal direction.

5. Based on these results it can be argued that the use of the prism when performing high-precision engineering and surveying, as well as the use of film for fixing reflectors geodetic networks for works of high precision is possible only when the strict orientation of the reflecting surface in the rangefinder.

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APPLICATION OF GIS-TECHNOLOGIES FOR INFORMATION SUPPORT OF DECISION-MAKING MANAGEMENT AT THE LOCAL LEVEL

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The article presents an example of creation and possibility to use geographic information system for the management of urban areas. The structure and data organization in a municipal GIS are presented. The possibility of a comprehensive approach to municipal management with application of remote sensing (RS) that allows providing government institutions, profit organizations and urban population with current information is reflected.

To meet the challenges of the UN programme "Goals of sustainable development" from 2015, that has underlined the importance of geospatial information, as well as in connection with the concept of informatization of the Republic of Belarus, work package for information and analytical support of all areas of national economy activities are planned to be carried out in the country.

To improve the management functions at the global and regional levels, it is necessary to start with changes in local territorial units. Geographic information systems are systems of collection, storage, analysis and graphical visualization of spatial data. [1] Municipal service management is one of the largest application field of

GIS in the world. It is necessary to create such systems in view of the gradual increase and complexity of urban infrastructure. Thus, a number of tasks is generated, among them: collection of reliable and current data, effective storage and retrieval of data about objects and processes of urban area; and implementation of analytical operations with them.

These systems are databases with a unifying cartographic basis and may include inventory and land, cadastral, engineering and communication, architectural, complex evaluation, demographic and environmental health, forecasting, advisory and other data.

A special feature of the municipal GIS is a multi-level and multi-user access to information within the administration and departments, as well as the possibility of Web-based access of the civil society to the public information. The latter is implemented through the creation of Internet-services. The latest GIS allow the direct participation of citizens in the filling with attribute information with the help of mobile technologies. In general, a GIS is a depository of diverse data:

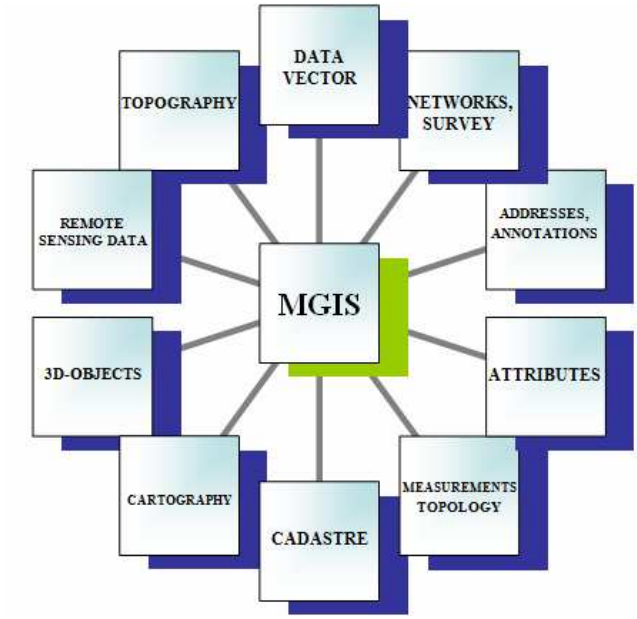

Fig. 1. Diverse data storage in GIS

As a rule, work on a similar project even for small urban areas takes a lot of time. However, after one-time establishment, these technologies make it possible to update and correct the data in real time. The possibility to edit allows us to obtain materials that reflect the current state of the objects and the situation in the city. The city administration with the help of the department of architecture, land surveying service can monitor territorial development.

In this article the basis of municipal GIS of Novopolotsk with the help of the software package ArcGIS has been created.

Preparatory work. Initial data for the creation of municipal GIS were georeferenced plates of Novopolotsk on a scale of 1: 500, General plans for the development of the urban area, cadastral maps, and other cartographic data. Cosmic images from the Belarusian spacecraft with the spatial resolution of 2.1 m [1], as well as pictures from the services Google, that are of free access and complemented with aerial photographs of the territory, formed the raster basis.

Creation of strata and database. Stratified data organization in GIS has allowed us to create and classify spatial information and link it with the data about the objects. In addition to the situation reflected in the maps, data of different services and departments of the city have been used as sources of attribute information for creation of database. The database includes the following materials: sanitary protection zones, projects of territory building and surveying, the administrative-territorial division of the city, the address register, data of cadastral valuation and value of lots, fixed property, main plan of land allotments, data about individual entrepreneurs, social infrastructure and others.

For some sites of the city in addition to the quantitative and qualitative attributive descriptions, some photos have been added for a better view of them. Such objects of public services as objects of health, education, catering, trade, services (banks, pharmacies) have links to the images. It is possible to paste hyperlinks for the link of the objects with their web sites.

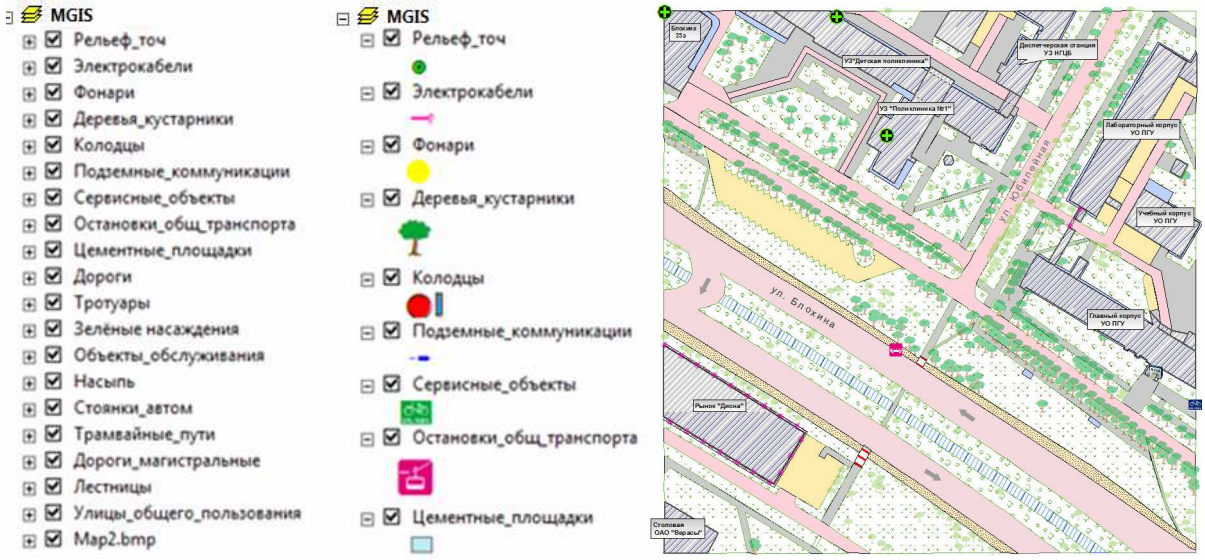

Fig. 2. Creation and displaying of municipal GIS strata

Exploitation of GIS. After the uploading of municipal GIS to the Internet, access to graphics, reference and technical information will be realized with the help of the client-server architecture and presented by two blocks of users:

- Internal users (moderators, recorders, editors).
- External users, who can only see information, often without changing the data.

Based on the above, it is possible to conclude that an important issue of GIS operation is a requirement of data integrity and security. It is especially important for multiuser databases. Strict control over all changes and restricting access to data editing should be implemented with the help of authorization function. On the one hand this measure complicates using of all system possibilities, but on the other - provides additional control. Fixation of changes or browsing as protocols allows us to control access to databases and maps of large scale. It is also important for the validity evaluation of the changes. For example, a change of boundaries or the legal status of the land must be agreed with the other materials relative to this territory, and should be done only by authorized organizations.

Conclusion. Relying on the experience of presented GIS creation for Novopolotsk it must be noted that adoption of such systems faces a set of organizational, economic, legal and other difficulties. The process of unification of the existing databases seems rather difficult to the city administrations. However, despite this, the process of creation and implementation of GIS for managing urban areas in developed countries is in progress and their experience can be applied in Belarus. Successfully integrated GIS of Moscow, St. Petersburg and other cities designed on the basis of modern earth remote sensing data, the latest map data can improve the quality of territory analysis, ensuring the making of more objective and reasonable decisions.[2] In addition, the concept of implementation with the help of the Internet not only reduces time and cost for the searching and managing of fragmented information of municipal services, but also simplifies the search of available information for citizens and commercial organizations.

Application of GIS-technologies for spatial data management in the conditions of the Republic of Belarus is based on the need to integrate departments and services. ArcGIS software package can serve as a unifying system that is not only a database management system, but also a powerful tool for spatial analytics. Geoportal of the Republic of Belarus, created and developed on the basis of ArcGIS for Server, has no analogues in the country and can become a platform for the creation and application of local GIS.

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