THE CREATION ALGORITHM OF THE INFORMATION SYSTEMS OF CITY PLANNING

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ABSTRACT

Structural-functional model of city planning information system is developed, and special algorithm is also proposed, that make it possible to create the information systems for the needs of user, which satisfy all requirements, with the retention of compatibility with other program products, built according to this model and algorithm, and also a number of the already existing systems.

Keywords: seismicity, seismic risk, information system

1. INTRODUCTION

At present the considerable development obtain different information systems. Special position in this row occupy the geo-information systems, developed for the collection, storage, analysis and the graphic visualization of three-dimensional data and of the connected with them information about the represented in GIS objects [1]. The information systems can be classified as follows according to the degree of automation:

- Manual information systems are characterized by the absence of contemporary technical equipment for information processing and by the fulfillment of all operations by man. For example, about the activity of manager in the firm, where there are no computers, it is possible to indicate that it works with manual IS.
- Automated information systems (AIS) - the most popular class of IS. Participation in the process of accumulation, processing of the databases information, software, people and technical equipment is assumed.
- Automatic information systems carry out all operations on information processing without the participation of man or different robots. An example of automatic information systems is some search machines of the Internet, for example Google, where the collection of information about the sites is executed by an automatically search robot and human factor does not influence the ranking of the results of search.

Control of physical infrastructure requires the organization of the connections of different systems and, correspondingly, information infrastructure. Infrastructures of three-dimensional data (Spatial Data Infrastructures (SDI)) play important role, because information about the position of one or other object or another plays the key value in control of all systems, which are controlled and are governed by public authority, for example, such as roads, utility networks, systems of public health and others. Like the majority of the forms of infrastructure, SDI also ensure platform for the economic development of the country or region.

According to city planning code of RF the information systems of the city planning (ISOCP) are the systematized set of the documented information about the development of territories, about their building, about the land sections, about the objects of capital construction and other necessary for the realization of city planning information [2]. In this definition the information system can be both the manual and automated.

In the wide understanding ISOCP - meta-system (system of systems) [3], which ensures the information support of the set of the diverse processes of subsistence and development of city.
Such integrated system includes several classes of software:

- GIS (geographical information system),
- SED (system of electronic document turnover),
- DBMS (Data Base Management System),
- EAR (control system of electronic administrative regulations),
- CSCI (classification system and coding information), web-portal,
- and also organize access to SIEI (system of interdepartmental electronic interaction).

2. REALIZATION

At present the general principles and standards in the region of developing software, which offers the services of geo-information systems, are developed and are proclaimed by the international noncommercial organization of open GIS consortium (OGC) [4]. Specifically, on the basis of OGC specifications is created the large part of special software for developing the cartographic web-services in the network of Internet. The number of applications, which make it possible to create this type of services, grows with each year, and, furthermore, together with the paid program software, grows the number of developments with the open code, which give the possibility not less to easily and qualitatively create fully functional cartographic web-services on the free basis.

By the purpose of conducting the information systems of city planning is the guarantee of government and local authority, physical and legal persons the reliable information, necessary for the realization of city planning, investment and other economic activity, conducting land exploitation.

Special position, in our opinion, occupies the information about the seismic danger of territory, which are basic with the building in the seismically dangerous regions.

The existing automated systems of city planning, cadaster system, and also other information resources were examined.

As a result of conducted investigations we have developed structural-functional model ISOCP, which makes it possible to create information system for the needs of user, with the retention of compatibility with other products, built according to this model, and also with a number of the already existing systems (fig 1). Using an information model ISOCP, we can create the algorithm, to rapidly and simply build the information system, which will satisfy the requirements presented to it. Furthermore, this algorithm can prove useful during the modernization of the already existing systems.

According to cascade strategy of the information systems design, the creation algorithm of IS can be represented by the following stages (Fig. 2):
Since we develop the creation algorithm of the information systems of narrower class, then the stages of analysis and design can be defined concretely, in accordance with the developed structural-functional model:

- Stage 1. Selection of hardware of the server.
- Stage 2. Selection of operating system.
- Stage 3. Assembling hardware of the server.
- Stage 4. Creation (selection) of the control system and visualization of spatial data.
- Stage 5. Installation and tuning control system by spatial data.
- Stage 6. Installation and tuning wms of the service of access to the data.
- Stage 7. Installation of the system of the visualization of three-dimensional data.
- Stage 8. Preparation of additional data in DBMS (Data Base Management System).
- Stage 9. Creation and the installation of the administration Web-service of ISOCP.
- Stage 10. Development and the installation of safety system.

Furthermore, relying on the method of expert estimations [5], in the developed by us information system was introduced the module for determining the seismic vulnerability rating of all six blocks.

According to the developed approach, the totality of soil conditions is divided into several levels of seismic vulnerability [6]. For the present instance were used three such levels. The values of the dangerous factors correspond to each level, which form the seismic vulnerability (table 1). At the basis of this classification lies the experience of past earthquakes. In other words, the so-called expert estimation as noted above, was used. Further to each value of factor was appropriated its own weight rating, also established from the past experience.

Each factor was evaluated according to the three-point scale, where 1- corresponds to the smallest influence of this factor on worsening in rating status of site, and 3- greatest. The following relationship was used for calculating the rating of vulnerability:

$$ W_y = W \times D $$  \hspace{1cm} (1)

The used seismic danger of territory is the danger, evaluated by level SMZ (seismic microzoning), which determine forming of calculated intensity or manifestation of earthquake [7]. In other words, the worse the soil conditions of the bases of building, the higher the seismic risk. Thus, completely distinctly is outlined the connection between the soil conditions and the manifestation of seismic danger.

During the first stage the subject of a study, was selected sufficiently large region of Vladikavkaz city - the Kuybyshew street and the adjacent to it blocks.

The use of a similar procedure, in the created by us information system of city planning of republic North Ossetia-Alaniya [8], makes it possible to calculate the rating of soils and seismic risk for the entire territory of Vladikavkaz city, which makes it possible to separate most seismically vulnerable sites.

The developed structural-functional model ISOCP, and also the creation algorithm, examined above, we created the information system of city planning with the information about the seismicity and the seismic risk of the territory of republic North Ossetia-Alaniya.

### Table 1

<table>
<thead>
<tr>
<th>№</th>
<th>the designation of factors</th>
<th>measurement seismic vulnerability, D</th>
<th>weight rating, W</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>seismicity of territory</td>
<td>7 8 9</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>MSK-64,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>the spatial distribution (density) of break</td>
<td>&lt; 0,01 0,01 – 0,05 &gt; 0,05</td>
<td>1,5 3 2</td>
</tr>
<tr>
<td></td>
<td>км(\text{км}^{-1})</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>active geological processes</td>
<td>- no strong manifestation</td>
<td>2</td>
</tr>
</tbody>
</table>

**Endogenous and exogenous conditions**

**Rating indices of the special features of soils in the territory of Vladikavkaz**
We developed the Web-interface of access and visualization of service data (on the basis of OpenLayers), that possesses the necessary functional for the survey of the probabilistic maps of the seismic danger in territory RSO-A and the map of seismic city planning for the mass building of Vladikavkaz territory (Fig. 3). The use of protocol WMS of OGC specification made it possible to ensure access to the data about the seismicity and the risks in the form of information division both into its own developed program products and in software of third developers. Furthermore, the use of WMS protocol made it possible to connect to the created system the different external data, for example cadaster plans as this shown in Fig. 3.

The developed system is easily modernized and is the basis of the contemporary, constantly supplemented information database uniting the results of all directions of city planning for the investigated cities and the populated areas of North Ossetia, which makes it possible to organically include the data in the Federal All-Russian information system.

3. CONCLUSIONS

1. Geo-information systems (GIS) together with the systems of electronic document turnover (SED) are at present necessary component of state administration.

2. The adoption of town-building code led to the creation of many information systems of the city planning (ISOCP). In this case the state cannot separate or introduce its own system ISOCP. At the
same time, state can, and must regulate the protocols of the exchange of the data between the systems taking into account the requirements of safety, develop the structures metadata.

3. The developed structural-functional model of ISOCP makes it possible to create information system for the needs of user, with the retention of compatibility with other products, built according to this model, and also a number of the already existing systems.

On the basis of structural-functional model ISOCP is proposed the algorithm to rapidly and simply build the information system, which will satisfy all presented to it requirements. The assignment of the possibilities of using the cadaster map on the WMS protocol (in the form of WMS-service) makes it possible to use data in many applications both civil services and particular users, and also it makes it possible to ensure access to the data about the seismicity and the risks in the form of information division both into its own developed products and into the products of third developers.

The use of the procedure of the seismic risk assessment of territory developed by us, in the information system of city planning created by us, will allow, with the accumulation of necessary data, to calculate the rating of soils and seismic risk for the entire territory of Vladikavkaz city, which will make it possible to isolate most seismically vulnerable sites.

REFERENCES