

GIS based interactive ecotourism and environmental information system in Internet

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Abstract

Internet is one of the most democratic and objective information technologies, but precise spatial characteristics of a certain territory can be shown on the map.

Data geolocalization and digital cartography is developed in the Internet environment, and it is the most suitable and universal communication tool, which can well substitute the textual information.

The main aims of this research are:

- evaluation of existing and potencial natural basement territories in Latvia according to ecological, culture-historical, designing, recreation organization and tourism development significance*
- creation of universal ecotourism and environmental data in the GIS environment by connecting it to the digital maps of Latvia for interactive information exchange*

This system foresees integration of data from different users, compatibility of different scales, as well as integrated territorial and historic information, thus supporting the spatial data infrastructure, as well as allowing different analyses of spatial data.

Those resources must be coordinated and updated in order to promote the activities of each unit and each category of users receive the data according to its needs, the most suitable conditions.

During the project geo-referenced data basis were created in the field of ecotourism and environmental protection. Tourism has become one of the world's biggest industries. Studies of different tourism organizations show that the biggest demand in the 21st Century will be for untouched nature, culture heritage and attractive landscape.

These requirements were the main prerequisites during creation of databases. Research territory was defined the potential territory of NATURA 2000 nature park.

The system will include several layers with the attached information attributes. They will include the environmental data and its monitoring, historical development of the territory, infrastructure, information on ecotourism possibilities, i.e. ecological routes, biking routes, nature and historical objects, etc. as well as will display the photographs and video. The created Digital Surface Models (DSM), Digital Elevation Models (DEM) and Digital Terrain Models (DTM) can be used for different kind of spatial analyses.

Creation of information system on the basis of GIS will ensure monitoring of the park, as well as will help to carry out its monitoring, which, in its turn, will promote the research, system modelling for regulation of current tourism flow on the territory of the nature park and its closest vicinity. In the research project there are many specialists representing different fields and local farms involved in order to study and promote the preservation of culture values, their sustainable management and elaboration of nature protection plans.

Data basis and digital maps in Internet will provide opportunity not only for publicity, but also for attraction of new visitors and finances.

Keywords: data geolocalization, ecotourism and environmental data, information technologies, navigation device, GIS environment, GPS.

Introduction

Recently the new technologies are getting more and more well-known. It means that also the national economy of Latvia has to make use of advantages offered by these technologies adjusting them to the local needs and circumstances.

Tourism is one of the most important industries in the world. When analysing the tourism resources of Latvia, one can come to the conclusion that they are quite similar to other less urbanized and assimilated countries, where the main subjects of attraction are unaffected nature, culture heritage, landscapes. Unfortunately due to the unbalanced development and not sufficient regional tourism marketing the investments are mainly attracted to the capital. In the rural territories the main problem is lack of information. Though there are quite many offers in the field of eco-tourism, still the businesses in this field face quite many hardships. When increasing the level of information provided to the tourists also the contributions into the economic and financial development of the local municipalities and also of the country as such. The European Union has always stressed the role of information technologies, as it is helping to promote the tourism products of each country and image of the country itself.

The other problem is the preservation of variety of landscapes, evaluation and protection of the environment. This is the reason for necessity and topicality of environmental data and eco-tourism information in the potential NATURA 2000 territories.

People and nature are interacting constantly, this interactivity has been multiform and changing, and the historical development shows that the relation between the man and the nature has grown closer and more intensive. The 20th century has often been called the time of urbanization and development of engineering, as well as urban revolution (Jain, 2000; Lāčauniece, 2000), as most of the population in the world are living in the cities, and the speed of urbanization is very high. Rapid development of the cities and high density of population causes irreversible changes not only in the closest neighbourhood, but also in the landscapes at the global scale.

The landscape presents the objective reality; it is the combination of the nature conditions and resources. Being the material evidence and reflection of nature and society, the landscape is serving people and the community (Melluma, 1992). Actually the landscape is presenting the total sum of the objects and processes in the limited space and limited time.

This Project stresses not only the understanding and acquaintance, preservation and sustainable management of nature and historical values, but also their monitoring. Though the landscapes have their specific qualities, they are not stable and are the subject to the constant change. Landscape as a dynamic system, which is changing both, in time, space and its functionality, has been mentioned in the publications of several authors, e.g. Forman, 1995, Melluma, 1992.

Our research is based on the Project supported by the Structural Funds of the European Union „Preservation of environment and creation of infrastructure for eco-tourism in the nature park „Embute hillocks”. This nature park is not only a protected area in Latvia, but also a part of the protected territories’ of Europe network NATURA 2000. In this park there are unique values of the European importance, and their preservation is vital.

During the project the existing data basis on the environmental protection and eco-tourism will be developed and new data basis will be created. These are the topics having the high value added already at the moment and creating even bigger value in the future for the development of local society and economy, finances, culture of the local communities.

This information system will allow increasing the value of the finished and ongoing regional sub-projects. Elaboration of the geolocalized data basis for one particular region of Latvia will give a possibility to use this methodology in the other regions of Latvia and Europe. The value added is also created by the local partners, as specialists of different fields are participating and cooperating within the project with the common aim of recognition and promotion of the nature and historical heritage and its sustainable management. These ideas

need to be closely linked to the local and regional development plans, as the regional data geolocalization will help to improve the regional development policy and instruments.

Information system structure

Geomatics is the discipline which includes geo-sciences and information technologies in order to complete acquisition, storage, analysis, dissemination and management of data territories. Geolocalization is the universal navigation device on the Internet in the current environment of globalization.

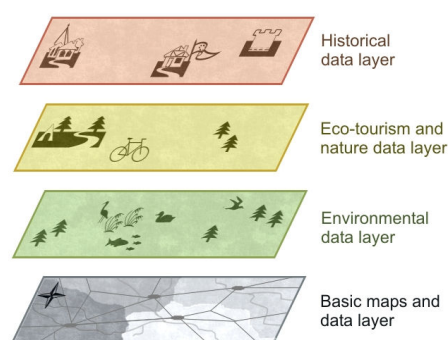
Map is the best tool for visualization of the spatial processes. Perception and reproduction of space is based on the visual, verbal, mathematical and digital methods, as well as on the individual approach of each person. Thus, to reach the perfection, all these elements have to be combined into one analytical system.

Spatial analyses is an analytical method, which is based on the analyses of the spatial location and attributive values of geographical occurrence, which makes it possible to analyze human impact on the environment in the spatial context and to create the appearance models of social, economic, demographic, etc. process' spatial classification (McGregor, 2000).

Nowadays, when the digital maps are available, there is an opportunity to describe in very detail information on the sights and regions of interest not only for the tourists, but also giving free access to the necessary information for the nature protection organizations.

This environmental and eco-tourism data system is supporting the spatial data infrastructure, which is giving possibility to make different analyses of the spatial data and is easy to use it in Internet, as the following tools of the spatial analyses are used: GIS, global position systems (GPS), distance research and spatial statistics. GIS technology can be used for adjustment of environmental data generalization and are convenient for objective evaluation. This instrument is of utmost importance for the professional environmental researchers (Chertov a.o., 1996).

Similar to the Navara territory information system (SITNA) (www.sitna.ef.navara.es), the Latvian environmental and eco-tourism spatial information structure is based on the geomatic platform, which is created in Internet, and which is based on the geographic information of Latvia and Kurzeme region: raster images (ortophotos, cartography etc.), vectorial layers (street and road map, addresses, land-use, toponymy etc.), alphanumeric information and different digital models (DEM, DTM, DSM) (fig.2.)



The basic data has compatibility of different scale cartographic layers starting with the scale of M1: 200 000 up to M 1: 10 000, M 1: 5 000 for each particular region.

The thematic layers create three thematic blocks, i.e. natural environment, eco-tourism and history (fig.1.)

Data on the natural environment and eco-tourism is displayed in the vector format with wide attribute information adjusted to it.

Fig.1. Structure of data layers

Environment data system is consisting of the following natural environment thematic layers: habitat areas of forests, protected plants and animals, water objects, topography, climate, mapping of landscapes. The following layers are used for monitoring: indicator species, different types of zoning, use of the nature park territory, etc.

Eco-tourism data system is consisting of the following thematic layers: sites of natural environment and history of culture, historical sites, tourism infrastructure objects, bicycle routes, eco-paths, etc. with the photo and video information attached (fig.3.).

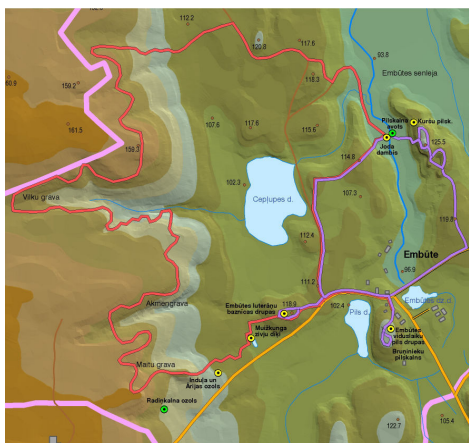


Fig.2. DTM of nature park



Fig.3. Ecotourism objects

Historical material information system includes historical information and maps in the digital format, scanning of the photo materials, etc. The historical maps from different times starting from the 13th Century are available in the digital form.

As Wang a.o., 2000 mention, the structure of landscapes is created by the spatial and temporal variations of the land use. Landscape is characterised by the groups of repeated spatial elements, i.e. terrain forms, types of soil, fauna, use of land, etc. Thus the basic data is regularly updated and new layers of the environmental data are created.

In addition to the functions available in internet, as search procedures, that allow a direct access to the graphical element from its alphanumeric identification, viewer capabilities (window definition, zoom in, drag, move, measure distance and areas, digitalize track, identify area etc.), the following additional functions are available: 3D navigation, GPS function, photo and video, as well as the virtual tour.

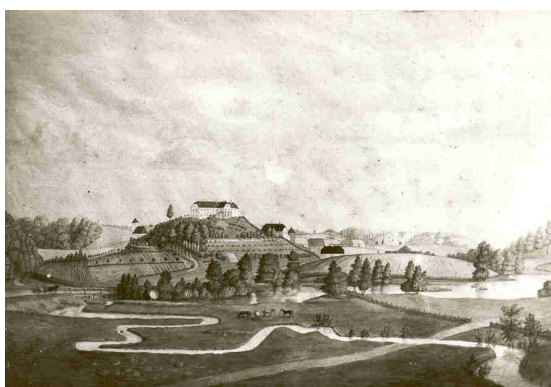


Fig.4. Historical materials of nature park (Brastins, 1923.)

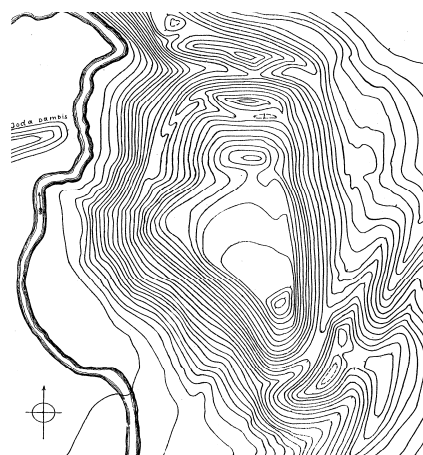


Fig.5. Survey of castle mound in 1922.

Virtual tour

There is a possibility to make a virtual tour in the nature park.

The tour is made by a virtual walker (shown on the map) who is either moved by the user or is moving on the map automatically. The basis of the route is the walkway; however, there is also a possibility to choose the path individually.

When making a virtual tour, the previous route is being analyzed, and based on its results the relevant information is being displayed. Information for the analyses is gained from the chosen route. If the tour is made along the walkway, the photographs and descriptions of the closest nature objects and their history is displayed, as well as the video/ webcam information is made available with the possibility to listen to additional audio information.

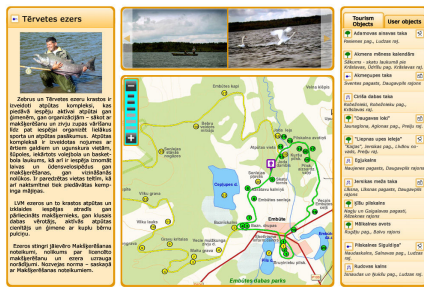


Fig.6. Virtual park screen

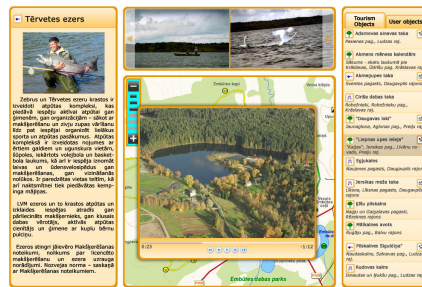


Fig.7. Video option

When analyzing the options chosen, stress is made on the information displayed previously (e.g. if the previous choice of information mainly concerned the history, this information is further on displayed as the basic information, the rest of information is secondary). If movement on the map is not following the pre-defined route, based on the previous path the new route is being generated and suggested.

The same information can be displayed also on the cellular phones, which makes them the virtual guides during the tours in the nature park. In addition use of the GPS connection enables the possibility to plan the route like it is done during the virtual tour.

There is also a possibility for every visitor to add information by adding their observations and opinions to the existing descriptions, as well as by adding their photographs and videos. Thus the newest tendencies in the creation of the social portals are observed and the additional information is collected making the information displayed on the portal of the nature park more attractive and adjusted to the needs of representatives of different social groups stressing their particular interest.



Fig.8. Cell phone environment

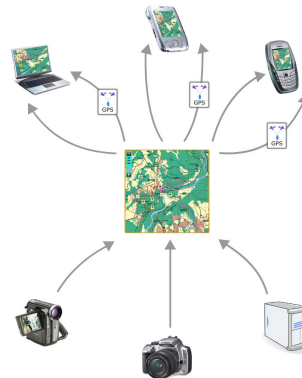


Fig.9. Virtual park network

Conclusions

The advantages of these data basis are:

- information exchange and distribution process is made faster and cheaper;
- creation of the unified eco-tourism product and environmental data base system makes the use of the data base easier, both for the tourists and for the environmental specialists;
- local historical and nature sights are promoted, the eco-tourism market is being developed in the region of Kurzeme;
- recognition and publicity of the sites not only in Latvia, but also outside it;
- number of the potential tourists and their level of information is increasing;
- easier access to the sights for the tourists;
- impact on the environment is being assessed, thus helping to preserve the environment, lead the flow of tourists in the protected areas and also allowing to implement the educational measures as well as the monitoring of the nature park;
- creation of opportunities to make similar researches, data collection and data base creation in the other protected territories with developed eco-tourism infrastructure.

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