Ekonomika a Manažment Podniku

Časopis pre ekonomickú teóriu a prax

Economics and Business Management

Journal for economic theory and practice

VÚSI
ISSN 1336-4103

15 Special Issue 2017

EDITOR´S OFFICE ADRESS
Výskumný ústav stavebnej informatiky, s.r.o. , Garbiarska 5, 040 01 Košice, SR
Tel./Fax : + 421 55 633 98 02
e-mail: redaktor@vusi.sk
URL: http://casopis.vusi.sk

ECONOMICS AND BUSINESS MANAGEMENT

Special Issue on Destination Data Management

VÝSKUMNÝ ÚSTAV
STAVEBNEJ INFORMATIKY
V KOŠICIACH

Special Issue/2017

vol.15

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DATA MODEL DESIGN FOR APPLICATIONS IN TOURISM

NÁVRH DÁTOVÉHO MODELU PRE APLIKÁCIU V CESTOVNOM RUCHU

ŽOFIA KUZEVIČOVÁ – MARCELA BINDZÁROVÁ – ŠTEFAN KUZEVIČ

INTRODUCTION

At present, the tourism sector requires constant access to data and information, which is, in most cases, stored and managed in the computer systems as well as in information systems. Database systems are an integral part of every information system (IS). The requirements in terms of data management are directed to easy manipulation of information and strong enough and powerful features that these systems provide. The basic technology, which should ensure the quality of the entire system (not excluding the GIS system), is a database technology. Given the amount of spatial data used in the field of tourism for the purpose of managing data using geographic information system. The Geographic Information System (GIS) comes with new possibilities in creating, managing and sharing spatial data via a geodatabase that can be implemented for different areas of interest. GIS has become part of the development of information systems in recent years as a result of the irreplaceable task of locating objects and phenomena processed by these systems. (Gergeľová et al., 2012) Within Geographic Information Systems, the term geodatabase is used.

METHODS AND MATERIALS

The basis of most of the ISs being operated, they are the essential and essential part of the database. The ISs in their deployment areas serve not only to collect, manage, and control the data they create but also to transform the data into information (graphic or descriptive format) (Connolly a kol. 2008). There are a number of definitions and explanations of the terms the database. A database is a collection of data relating to a particular area of interest or purpose.The database can also be understood as a set of data describing a part of objective reality managed by the database system. The database does not just mean software data processing.

Very important are also the methods of database design that enable database building in the first place in a systematic manner and meet predefined criteria. As databases are usually part of information systems, database design methods need to be in line with methods of creating information systems (Šimonová and Panuš, 2007). Depending on the method of organizing data in databases, we can divide them into the following basic groups (Pokorný, 1992), (Pokorný and Halaška, 2003):

- Hierarchical model,
- Network model,
- Relational model,
- Object model,

- Object - relational model.

In most of the GIS systems used, data storage is applied in a relational database. Object - oriented database management is the offer of the best GIS options (Gergeľová et al., 2012). The advantage of deploying an object-oriented model is that this model works directly with individual geographic features - objects. Geographical features are the basic organizational units of the data model, and each object contains all components of the description of the represented geo features at one location.

GEODATABASE

Geodatabase is a basic model for representing real world objects in GIS and for organizing spatial data into layers. It is a comprehensive set of tools and application logic for editing and managing spatial data. Application logic is available from ArcGIS Desktop client applications, through servers or specialized applications created using ArcGIS Engine. This is a method of storing spatial data based on GIS standards and database systems.

The data structure is implemented on relative database systems and uses XML. The geodatabase was designed as an open and simple model for spatial data storage. (ArcGIS 9) The term geodatabase is often associated with ESRI ArcGIS. It allows the creation of a central data warehouse for inserting and managing spatial data of various types (raster, vector, table, etc.). Geodatabase is a basic data structure and is the data format used to manage ArcGIS data. Data is stored and organized into so-called data sets.

ArcGIS Desktop offers several options for storing spatial data in the geodatabase:

- Personal Geodatabase – designed for working with a smaller data set, can work with only one user, max. size 2 GB, MS Access is used for working with attribute data,
- File Geodatabase – since version 9.2, individual data sets can reach up to 1TB, allow for more efficient vector data storage,
- SDE geodatabase – multi-user geodatabase allows you to work with different models of data storage IBM DB2, Informix, Oracle and SQL Server, is used as a central database for workgroups, it allows to realize extremely large continuous GIS databases, current work of several users, versioning database.

The XML language is used to exchange information between geodatabases and other systems. XML format allows you to publish and maintain the complete content and schema of the created geodatabase, share data and update them.
The geodatabase consists of the following sections (Figure 1):

- feature dataset – vector data,
    - object classes,
    - feature classes,
    - relationship classes,
    - geometric network,
    - planar topologies,
- raster dataset – raster data,
    - rasters,
- TIN dataset,
    - locators,
    - validation rules,

- domains.

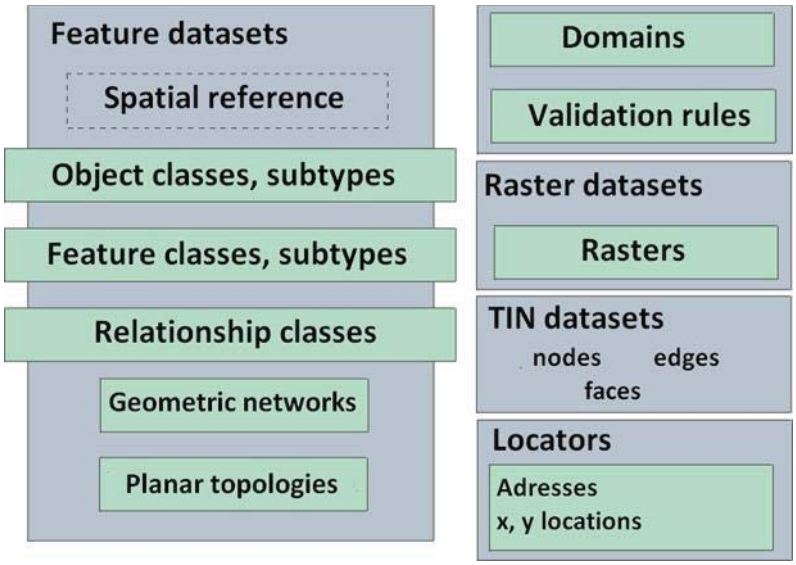

Figure 1 Geodatabase structure (processed by Zeiler, 1999)

RESULTS

The design and creation of data models has its close connection with the knowledge of the world and the systematic discovery of every round of us (Connolly et al., 2008) (Connolly et al., 2009)The term data model means a conceptual description of the space of the problem solved. These include, for example, the definition of entities, attributes and the integrity of the entity (Danek and Daneková, 2011).

The data model also includes a description of relationships between entities and any restrictions applicable to these relationships. However, the data model has no connection with the physical layout of the resulting model. Data models are a means of knowing, describing and organizing data. They have arisen in connection with the need to specify the data structure in analyzing and designing database and information systems.

The data model is a mathematical formalism allowing for a data-oriented description of the studied reality. It represents a graphical representation of the internal organization of data in DBMS through entities and relationships.

When designing a database, it is necessary to build on three levels (Arctur and Zeiler, 2004):

- Conceptual design (model) of the database,
- Logical design (model) of the database,
- Physical design (model) of the database.
-

The data model can be processed at different levels of abstraction:

- Conceptual level describes data and their relationships (conceptual model)
- The logical level of abstraction is characterized in particular by attribute specification,

- Physical level is the lowest level of abstraction - details the structure of records and how to store data on the storage media, indexing and below (physical model) (Halász, 2011).

CONCEPTUAL MODEL

The conceptual model allows for a basic solution approach for each field in the application area. It presents a basic description of the contents of the database at the conceptual level. For the "Tourism" application, the following areas and layers are proposed:

- Accommodation,
- Restaurants,
- Institutions (this area may be further subdivided into banks, health facilities, police, firemen, etc.)
- Transportation,
- Cultural heritage,
- Historical monuments,
- Cultural events
- Other attractions

Accommodation - facilities where accommodation is provided. They can be further distinguished by categories
Restaurants - facilities that provide catering services to the public. Breakdown by type e.g. restaurants, buffets, fast food,
Institutions - public and state administration that could be of interest to the visitor.
Transport - in addition to public transport, especially parking facilities with the possibility of parking and long-term.
Cultural heritage and historical monuments - located in the area, with opening hours, availability, focus.
Cultural events taking place in a given location.
Other attractions located in the selected location eg. zoo, botanical gardens.

LOGICAL MODEL

By logical proposal we approximate conceptual design to a great extent. The basis of the successful design of a logical data model is to assign the distinctive features of the conceptual part to other characteristic features (attributes of object classes - entities). At this stage, the conceptual model was refined. Within the GIS, it is also necessary to define the layer type (vector, raster) and, in the case of a vector, whether it is a point, a line, an area, or a 3D object of the multipatch type (Table 1).

Table 1 Definition of the representations for the individual layers proposed

Accommodation	Vector layer, polygon
Restaurants	Vector layer, polygon
Institutions	Vector layer, point
Cultural heritage	Vector layer, point
Historical monuments	Vector layer, point
Cultural events	Vector layer, point
Other attractions	Vector layer, point

In the case of the proposed "Transport" layer it is appropriate to break it into other layers that will be of different types:

- Parking - Vector layer, polygon,
- Stations - Vector Layer, point,
- Routes - Vector layer, line.
- Roads - Vector Layer, line.

The basic object classes input when designing the logical form of the data model are the variables. Each variable attribute was the associated variable name based on the conceptual design. Each variable can only acquire certain types of values with the specified character range for its description. The description of the basic characteristic of the selected variable is given in Table 2.

Table 2 Example of layer processing "Accommodation (Source: own processing)

Name of attributes	**Type of field**	**Character range (Size)**	**Description (Note)**
Category	String	30	Categorization by Implementing decree No. 277/2008 Coll.
Sub category	String	30	e. g. in the case of hotel dividing on - Garni, Congress, Wellness, Spa, Boutique, Apartment
Dined at (catering)	String	30	Which kind of catering the facility provides
Internet	Boolean	Yes/No	Availability of internet
Number of beds	Integer		Total of capacity
Parking	Boolean	Yes/No	The facility has / does not have a parking place
Pets	Boolean	Yes/No	Possibility of accommodation eg. with dog

In the case of accommodation facilities, consideration should be given to accommodating hotel accommodation in a separate layer, given the possibility of other attributes.

PHYSICAL MODEL

Physical model is the final representation of the object model. It contains a complete list of classes with their full name and attributes, completing their data types. The choice of the system was tailored to GIS technology, which offers a wide range of features. The physical level of the logical design was implemented in the ArcGIS Diagrammer environment.

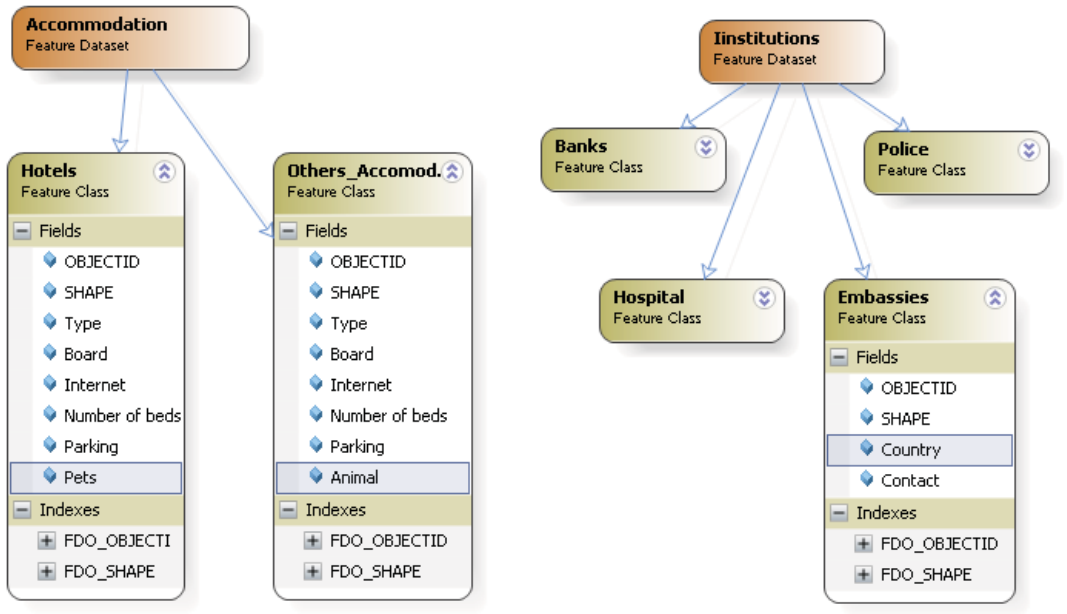

Figure 2 Preview of physical model design in ArcDiagrammer environment (Source: own processing)

ArcGIS Diagrammer allows the created model to be published in an xml. file, which actually creates a drawing for the geodatabase.

CONCLUSION

The design of the data model and the subsequent creation of the geodatabase is a creative activity. In the design process, it is necessary to consult the proposed model with future users of the system, and to reconcile the ideas between the creator and the user. At the same time, it is a system "alive", so for new layers, it should not be a problem to modify the model and then geodatabase. The creation of a foundation input file (xml format) is advantageous for the purpose of harmonizing and wider use of data within Slovakia or within the European Union, in compliance with INSPIRE guidelines and its implementation in Slovakia Law No. 3/2010 Coll. on National Spatial Information Infrastructure (NIPI).

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ABSTRACT

ŽOFIA KUZEVIČOVÁ – MARCELA BINDZÁROVÁ – ŠTEFAN KUZEVIČ

The database is an indispensable and integral part of the information system and therefore it is extremely important to pay special attention to its design, creation and subsequent testing. The proposal itself is creative. In the beginning, we should determine what its the goal is and what our expectations are. Then, during the entire design of the data model, communicate with the assignor of the task or future users. In the contribution, we deal with the theoretical aspects of the database, in geographic information systems - geodatabase. The practical part is a demonstration of how to design a data model and a conceptual model, then a logical model to the physical model for which ArcDiagrammer was used. The physical model was then stored as XML-based documentation and could be the basis for creating a comprehensive geodatabase for tourism applications, taking into account INSPIRE.

KEYWORDS: data model, geodatabase, conceptual, logical, physical model.

ABSTRAKT

Databáza je nepostrádateľnou a neoddeliteľnou súčasťou informačného systému, a preto je mimoriadne dôležité venovať osobitnú pozornosť jej návrhu, tvorbe a následnému testovaniu. Samotný návrh je kreatívny. Na začiatku by sme mali určiť, čo je jej cieľom a aké sú naše očakávania. Následne počas celej koncepcie dátového modelu komunikujte s prekladateľom úlohy alebo s budúcimi používateľmi. V príspevku sa zaoberáme teoretickými aspektmi databázy v geografických informačných systémoch - geodatabáze. Praktická časť je ukážkou toho, ako navrhnúť dátový model a koncepčný model, potom logický model fyzického modelu, pre ktorý bol ArcDiagrammer použitý. Fyzický model bol potom uložený ako XML dokumentácia založená a mohla by byť základom pre vytvorenie komplexnej geodatabázy pre aplikácie v cestovnom ruchu s prihliadnutím na INSPIRE.

KĽÚČOVÉ SLOVÁ: dátový model, geodatabáza, konceptuálny, logický, fyzický model

AUTHORS

doc. Ing. Žofia Kuzevičová, PhD.
Technical university of Košice
Faculty of Mining, Ecology, Process Control and Geotechnology

zofia.kuzevicova@tuke.sk

Ing. Marcela Bindzárová Gergeľová, PhD
Technical university of Košice
Faculty of Mining, Ecology, Process Control and Geotechnology

marcela.gergelova@gmail.com

doc. Ing. Štefan Kuzevič, PhD.
Technical university of Košice
Faculty of Mining, Ecology, Process Control and Geotechnology

stefan.kuzevic@tuke.sk

EKONOMIKA A MANAŽMENT PODNIKU

Cieľom časopisu je prinášať originálne redakčnou radou recenzované vedecké články o ekonomike a manažmente podniku z oblasti mikroekonomiky, manažmentu, marketingu, informačných systémov, riadenia ľudských zdrojov, ako aj ďalších oblastí podnikovej praxe.

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Vydavateľ a distribútor:
Výskumný ústav stavebnej informatiky, s.r.o.,
Garbiarska 5, 040 01 Košice, Slovenská republika.

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Cena výtlačku 7,90 €

ECONOMICS AND BUSINESS MANAGEMENT

The aim of the journal is to bring original scientific papers on economics and management in the field of microeconomics, management, marketing, information systems, human resources management etc. Editorial board´s members review contributions.

Published twice a year

Editorial office:
Research Institute of Building Informatics, Ltd.,
Garbiarska 5, 040 01 Košice, Slovak Republic

Tel./fax: +421 55/ 633 98 02
e-mail: redaktor@vusi.sk
http://casopis.vusi.sk

A copy price 7,90 €

ISSN 1336-4103