

A CONTRIBUTION TO THE CREATION OF THE TERMINOLOGY OF GEOGRAPHICAL INFORMATION SYSTEMS

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SUMMARY

The authors of the article deal with terminology of geographical information systems. The geographical information system is a system of people and technological and organizational means carrying out the acquisition, transfer, storage and processing of data for the purpose of generating information suitable for further utilization in geography and in practice. The development tends to the creation of automated GIS's which can be defined as: a part of the information system carried out on a set of people and automation means providing the acquisition, transfer, storage and processing of data to create information suitable for further utilization in geography and in practice.

The authors respecting the recommendation of the IGU, the geographical information system can be decomposed into six principal subsystems: the management, the acquisition, the data input and storage, the data retrieval and analysis, the information output and the information use.

In decomposing a system is necessary to observe certain principles, the most important of them being: the principle of completeness and the principle of disjunctivity.

The authors suggest the following classification of data sources: — obtained by research in the field, — from statistical censuses, — from cartographical works, — from materials of the remote sensing of the Earth, — obtained from archives and literary sources.

From the viewpoint of the user of the information system and the content of the databank the authors of the article divide data into several groups: identification, descriptive, standardized, and basic.

1. INTRODUCTION

The scientific and technological revolution is reflected in the development of the individual branches of science also by the development of new methods based on the utilization of computer technology. The new trends affect also some of the oldest branches of science, geography and cartography. It is possible to state that it was the traditional combination of the two branches that has brought about a relatively quick penetration of methods and procedures based on the utilization of computer technology. The space-time character of geographical and cartographical branches based on the accumulation and processing of large amounts of data motivated a relatively fast acquirement of the principles of utilizing geographical information systems and instrumental databanks which are their parts. A regular culmination above operations is the creation of computer maps (cartograms) which, thanks to the ever improving technology, approach more and more classical maps in their appearance.

2. THE GEOGRAPHICAL INFORMATION SYSTEM: DEFINITIONS OF BASIC CONCEPTS

In literature there are no uniform definitions of the geographical information system so far. A very polite is the definition by Langefors (1966) describing the information system in general, but from the geographic point of view relatively exactly:

An information system is such a system as contains components for acquiring, transferring, storing, processing and retrieving information about a territory. Taking into consideration the IGU committee concept Data Sensing and Processing we recommend the following definition of the geographical information system:

The geographical information system is a system of people and technological and organizational means carrying out the acquisition, transfer, storage and processing of data for the purpose of generating information suitable for further utilization in geography and in practice.

The basic elements of a GIS are different kinds of information. The determination of their contents and definition is therefore an important assumption for determining the content and function of an information system. By information we understand a set of data having sense and being at the user's disposal for further geographic processing. The development tends to the creation of automated GIS's which can be defined as:

a part of the information system carried out on a set of people and automation means providing the acquisition, transfer, storage and processing of data to create information suitable for further utilization in geography and in practice.

An assumption of utilizing such a system in geography and cartography is its integral incorporation into the whole system of utilizing geographical information, respecting fully their space-time character.

The fundamental content element of the GIS is thus information, the degree of information aggregation depending on the level of resolution. The information for a certain level of resolution appears as a datum from the point of view of a higher level of resolution, as a component of input data for generating information (more aggregated) of a higher order.

Usually non-contradictory are the considerations concerning the concept of a datum, though the respective explicit definition is rarely to be found. By data we should understand isolated facts which are assigned (by the operation of data processing) a certain sense from which certain conclusions can be drawn. Data can thus be understood as a raw material which can be changed to information by processing. They are the basic building elements in the process of generating information, when on the one hand they are objects of processing, on the other hand they constitute the basis for analysis and decision.

3. THE DECOMPOSITION OF THE GIS

Respecting the recommendation of the IGU (Tomlinson R. F. et al. 1976) the geographical information system can be decomposed into six principal subsystems:

1. The management subsystem.
2. The data acquisition subsystem.
3. The data input and storage subsystem.

4. The data retrieval and analysis subsystem.
5. The information output subsystem.
6. The information use subsystem.

The decomposition of any system is necessary for overcoming the complexity of the system and for recognizing its structure. In decomposing a system, it is however, necessary to observe certain principles, the most important of them being:

a) the principle of completeness

In subsystems originating by the decomposition of a system all activities must be contained which are recognizable on an arbitrary further level of resolution.

b) the principle of disjunctivity

The decomposition must be such as to delimit each subsystem from the same point of view as the other subsystems on the given level of resolution, thus preventing the overlapping of activities among some subsystems. It is evident that one can have certain reserves to the above decomposition of the GIS (respecting the above principles, mainly the principle of disjunctivity).

4. SOURCES AND TYPES OF GEOGRAPHICAL DATA

In connection with the creation and utilization of information systems about a territory in geographical and cartographical papers the attention paid to the sources and types of geographical data increases. These data can be the same as those used in other branches. Thus both geography and geology utilize materials from the remote sensing of the Earth, economic sciences and economic geography utilize statistical materials, etc.

We suggest the following classification of data sources:

- data obtained by research in the field,
- data from statistical censuses,
- data from cartographical works,
- data from materials of the remote sensing of the Earth,
- data obtained from archives and literary sources.

For the needs of the research data are recorded in different ways. Two ways of records are distinguished: those by classical means, including tables, written records, maps, cartograms and graphs, and those by non-traditional means, where we include punch cards and punch tapes, magnetic tapes, floppy discs, computer maps (cartograms), cartodiagrams and graphs.

The types of geographical data can be delimited according to a number of viewpoints. According to the form of expression they are graphical (photographs from the remote sensing of the Earth, cartographical works) and numerical (statistical data, digitalized photographs from the remote sensing of the Earth, etc.).

From the point of view of the basic aspects of geographical research we divided data into space data (such as coordinates, data about the dimensions of an object) and time data i.e. those related to a certain moment or period of time (amount of precipitation or its intensity, the course of (amount of precipitation or its intensity, the course of the flood wave, relative and absolute ages of relief forms).

From the viewpoint of the user of the information system and the content of the databank we divide data into several groups:

— identification data, which unambiguously determine the coordinates of the territorial unit to be investigated, but which can determine a number of further indications

— descriptive data describing quantitatively a phenomenon which occurred or which we follow. This category is, as a rule, the most widely spread and includes all thematic data related e.g. to territorial units of geographical information systems about a territory.

— standardized data, which are data determined ahead, by which we judge or limit certain phenomena (planned yields of cereals, planned increment or decrease of the forest cover in the territory studied for one year, etc.).

— basic data, represented by relatively stable data, as a rule developing identification data. They are e.g. the name of the area studied, data about the average height above sea level of the region, etc.

The above inclusion of the data into categories is not always simple, since the borderlines between them are not exactly defined. Identification and descriptive data are obligatory and must always be included. Without them the record of data about the given object or phenomenon would be impossible. The proper bearer of the information datum ascribes it to a certain object or phenomenon.

5. CONCLUSION

The problems of utilizing geographical information systems develop dynamically. Few papers are devoted to problems of terminology which are of great importance for further international research and application of the geographical information systems in practice. The authors of the present paper suggest some definitions concerning the geographical information systems. At the same time they discuss the decomposition of the geographical information systems, suggesting a classification of sources and types of geographical data.

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