Chapter 23
Geographic Information Systems

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ABSTRACT

The emergence of technological systems with computerized cartographic application allowed the resolution of certain military problems between the 1950s and 1960s. The first GIS was created in Canada Geographic Information Systems in 1964 for Tomlinson. At this time, GIS was in a consolidation phase in multiple areas and for various purposes. The geographical science growth with the development of GIS were in connection to the subject of the new geography, justified by the application of the methods of quantitative analysis in various spatial nature of research. In this context, the GIS feature a number of operational advantages and have allowed the proliferation of new fields of endeavor in open access systems across multiple forms of acquisition, management, interpretation, and spatial information analysis. The main goal of this chapter is to underwrite the concept of GIS, as well as distinguish the diversity of applications from the past until the present, and to identify new paths to accommodate recent scientific approaches with extensive range of application possibilities.

INTRODUCTION

One of the main challenges of the 21st century are caused by the large amount of geospatial information through a GIS. Throughout time there have been many attempts to define Geographic Information Systems (GIS). Yet there is no consensus on define it and restrict it to one definition is limited. In the acronym - Geographic Information Systems - the geographic refers to the Earth's surface and near-surface, therefore, all human production and activity, and non-human are possible spatialization in GIS.

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GIS is recognized as an analytical and decision-making tool with many uses in different fields. Likewise it is used in many industries plus commercial, education or government. It is powerful for

- Land administration,
- Statistical mapping,
- Transport,
- Network and environment management,
- Remote sensing images,
- Water/waste management,
- Maintenance and management of public lighting,
- Regional and urban planning,
- Tourism planning,
- Healthcare planning, and in
- Crime and security management.

In broad terms GIS is a special class of information systems that keep track not only of events, activities, and things, but also their location. Computerization has opened a vast new potential in the way people communicate, analyze our surroundings and take decisions. The available data represent layers of the real world that can be stored, processed and presented later to answer future needs (Bernhardsen, 2002).

In the process of acquisition, processing and spatial representation there is the involvement of a multiplicity of inputs and outputs that can be managed on databases, which invariably seek analytical and graphical spatial embodiments. In the graphical display, vector or raster elements can be chosen, depending on the degree of specificity of the database and the type of expected results.

These databases can be collected at different scales and using a plurality of data types, including population census, aerial photography or satellite imagery. It allows to address multiple operating phases of the planning management process in a multiscale perspective with the challenge to meet more effective and efficient solutions. Due to this, nowadays it is frequently used as a spatial decision support system (SDSS) (Crossland, 2005).

Well-designed GIS should be able to provide a good computer system, because traditional GIS are intended to users operating on local servers. Traditionally GIS includes hardware and software. The hardware are the physical parts of the computer itself and associated peripherals (e.g., plotters and printers); and the software is interoperable, supporting the many data formats (in the infrastructure life cycle) and implementation may be custom-designed for an organization.

Even so a GIS can have two types of groups typically called as “GIS carries” and “GIS users”, which are respectively responsible for the management and analysis. The heart of GIS technology is the ability to conduct spatial analysis, overlay data and integrate other solution and systems. Geoprocessing operations facilitate to link or merge data, spatial characteristics of data; search for particular characteristics or features in an area, update data quickly and cheaply and model data assess alternatives (maps, graphs, address lists, reports and summary statistics) tailored to meet particular needs.

Nonetheless GIS feature a number of operational advantages and have allowed the proliferation of new fields of endeavor in open access systems across multiple forms of acquisition, management, interpretation and spatial information analysis. This can be seen in the first item of the present paper where the