

## INTRODUCTION

### SURE 382 - GEOGRAPHIC INFORMATION SYSTEMS II

What is a geographic information system (GIS)? In an earlier class, you were introduced to the concepts of a GIS. Let me begin by presenting a couple of definitions.

The Federal Interagency Coordinating Committee defined GIS as a

"system of computer hardware, software, and procedures designed to support the capture, management, manipulation, analysis, modularity and display of spatially referenced data for solving complex planning and management problems".<sup>1</sup>

The Environmental Systems Research Institute states that a GIS is

"An organized collection of computer hardware, software, geographic data, and personnel designed to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically referenced information. Certain complex spatial operations are possible with a GIS that would be very difficult, time consuming, or impracticable otherwise"<sup>2</sup>

Dr. Duane Marble defines a GIS in terms of components found in sophisticated software. Here, a GIS contains:

1. A data input subsystem which collects and/or processes spatial data derived from existing maps, remote sensors, etc.
2. A data storage and retrieval subsystem which organizes the spatial data in a form which permits it to be quickly retrieved by the user for subsequent analysis, as well as permitting rapid and accurate updates and corrections to be made to the spatial database.
3. A data manipulation and analysis subsystem which performs a variety of tasks such as changing the form of the data through user-defined aggregation rules or producing estimates of parameters and constraints for various space-time optimization or simulation models.
4. A data reporting subsystem which is capable of displaying all or part of the original database as well as manipulated data and the output from spatial models in tabular or map form."<sup>3</sup>

Finally, F. Hanigan states that a GIS is

"any information management system which can:

---

<sup>1</sup> See Antenucci, J., K. Brown, P. Crosswell, M. Kevany, and H. Archer, 1991. *Geographic Information Systems - A Guide to the Technology*, Chapman & Hall, New York, p. 7.

<sup>2</sup> Environmental Systems Research Institute, 1990. "Glossary of GIS and ARC/INFO Terms", Redlands, CA, p.19.

<sup>3</sup> See Marble, D., 1990. "Geographic Information Systems: An Overview", in *Introductory Readings in Geographic Information Systems*, edited by D. Peuquet and D. Marble, Taylor & Francis, London, p.10.

- Collect, store, and retrieve information based on its spatial location
- Identify locations within a targeted environment which meets specific criteria
- Explore relationships among data sets within that environment
- Analyze the related data spatially as an aid to making decisions about that environment
- Facilitate selecting and passing data to application-specific analytical models capable of assessing the impact of alternatives on the chosen environment
- Display the selected environment both graphically and numerically either before or after analysis."<sup>4</sup>

There are a number of core concepts described in all of these definitions. First, it is a computer system. Second, a GIS deals with spatially referenced data. Third, the system must be able to perform spatial analysis. One could argue that this is the most important part of a GIS. Finally, results from the manipulation must be able to be reported to the end user.

The purpose of this course is to build upon these definitions and the concepts that were introduced in SURE 282. Here we will learn about the technologies that are used in developing a GIS. These include photogrammetry, remote sensing, lidar, and mobile mapping. Since the main focus of this course will be on local government utilization of GIS, concepts of boundary surveying will also be presented and the cadastral concept expanded. Database concepts, hardware and software and system configuration will also be presented. This will culminate in the implementation strategies for local government.

This course will consist of a series of lessons and other assigned readings that will be available from the World Wide Web.

---

<sup>4</sup> See Antenucci et al, p. 7.