Cuadro de contenidos

1. Introducción
2. Términos geográficos
3. Modelos de datos
   3.1. Modelo vectorial
   3.2. Modelo de Raster
4. Sistemas de coordinación
5. Primeros pasos en ArcGIS Pro
   5.1. Crea un "nuevo proyecto"
   5.2. Unidades de configuración
   5.3. Creando un nuevo mapa
   5.4. La cinta y los paneles
6. Georreferenciar una imagen
   6.1. Añadiendo una imagen no-georeferenced o cualquier capa 18
   6.2. Seleccionar el Sistema de Coordinación de una imagen no referenciada.
   6.3. Georreferenciar una imagen con puntos de control 23
   6.4. Georreferenciar una imagen sin puntos de control
7. Creando y editando Entidades Vector
   7.1. Creación de Clase de Característica
   7.2. Edición de capas vectoriales
   7.3. Editando puntos
   7.4. Editar líneas
   7.5. Edición de los polígonos
8. Gestión de mesa
   8.1. Creación de nuevos campos en las tablas 46
   8.2. Introducir información en los campos de mesa 48
   8.3. Calculando Área, Perímetro y
   8.4. Calculando coordenadas XY
   8.5. Operaciones
9. Diseño y Publicación
   9.1. Punto, Línea y Símbolo de Polígono 57
   9.2. Las etiquetas
      9.2.1. Las etiquetas simples
      9.2.2. Las etiquetas combinadas
      9.2.3. Etiquetas de una categoría específica
   9.3. Dar un efecto 3D al mapa (Opcional)
   9.4. Estructura general de un mapa
   9.5. Diseño de "Layout"
      9.5.1. Título
      9.5.2. Mapa (2)
      9.5.3. Graticules (3)
      9.5.4. Norte (4)
      9.5.5. Mapa de ubicación (5)
      9.5.6. Leyenda (6)
      9.5.7. Escala gráfica (7)
      9.5.8. Escala gráfica (8)
      9.5.9. Parámetros de geodésica (9)
      9.5.10. Área de cartas o cajas (10)
   9.6. Exportar e imprimir un mapa
10. Herramientas de geoprocesamiento

10.1. Areas of influence (Buffer) 80
10.2. Intersections (Intersect) 82
10.3. Clippings (Clip) 82
10.4. Merge 84
10.5. Dissolve 85
10.6. Define Projection to a Layer 86
10.7. Project a Layer to Another Coordinate System 88
11. Spatial Analysis 90
11.1. Interpolations 91
11.1.1. Importing a Table of XY Coordinates (Taken with a GPS) 92
11.1.2. Interpolating Data from a Table with Kriging (IDW, Spline) 93
11.2. Digital Elevation Models (DEM) 96
11.3. Creation of slope maps slope maps 97
11.4. Reclassifications 99
11.5. Generation of Contours (Contour Lines) 101
11.6. Hillshade Map 103
11.7. Viewshed 104
11.8. Map Algebra 106
11.9. Delineation of a Watershed 108
11.10. Geoprocessing Automation with "ModelBuilder" 118
11.11. Topographic Profiles 122
12. Image Analysis 124
12.1. Adding a Satellite Image from "Basemap" 124
12.2. Downloading Landsat Images 125
12.3. Download images Sentinel 2 127
12.4. Combining Satellite Image Bands 128
12.5. Adding a Multispectral Image 131
12.6. Calculating NDVI 133
13. Graphics 135
13.1. Creating a Histogram 135
13.2. Charts from Tables 136
13.3. Spectral Signature Charts 137
14. 3D View 139
15. Geodatabases 140
15.1. Creating a Geodatabase 140
15.2. Creating and Configuring Domains 141
15.3. Create and Manage a "Feature Dataset" 143
15.4. Creating and Managing "Feature Class" (Points, Lines, and Polygons) 144
15.5. Importing Information from a "Shapefile" to a "Feature Class" 146
15.6. Configuring Tables Based on Domains 147
16. Topology 149
16.1. Defining Topological Rules 150
16.2. Identification and Correction of Errors 152
16.3. Validation 155
17. Frequently Asked Questions 156
18. References 162

Get a printed copy: https://amzn.to/3EIaReY

1. Introduction

The use of geographic information in decision-making is a fundamental for everyday life that often goes unnoticed. From selecting the most efficient route to work, to finding the address of a store via a smartphone, people constantly make decisions based on the analysis of geographic information, often without realizing it.

Geographic Information Systems (GIS) are valuable tools that allow for analyzing spatial data more efficiently and accurately. Using GIS, it is possible to visualize geographic data, identify patterns and trends, and make informed decisions in various contexts, including urban planning, natural resource management, traffic management, and much more. In summary, GIS is an essential tool for improving the efficiency and accuracy of decision-making based on geographic information.

According to López Trigal (2015), a GIS is an integrated system composed of hardware, software, data, and users that allows for capture, storage, manage and analyze digital information, besides the creation of graphics and maps, including the representation of alphanumeric data. Burrough (1986) defines GIS as a computerized model of geographic reality, designed to meet specific information needs, allowing for the creation, sharing, and application of useful information based on data and maps.

For many decades, GIS has been used in issues related to land and natural resource management, environment, military coordination, and in contexts related to Earth sciences, such as geography and geology. Recently, its potential use has also been explored in unprecedented fields as in Human and Social Sciences research (Del Bosque, Fernández Freire, Martín-Forero Morente, & Pérez Asensio, 2012).

ArcGIS Pro is ESRI's flagship application, encompassing classic desktop GIS functionality. ArcGIS Pro includes a set of tools that enable the visualization and management of geographic information, and has an extensible architecture, involving new functionalities. These extensions include the Spatial Analyst, 3D Analyst, and the well-known Geostatistical Analyst.

The objective of this technical manual is to introduce basic GIS concepts through the exploration of case studies that cover the entire map creation process. Although ArcGIS Pro has a wealth of tools, it is important to note that not all of them can be covered exhaustively. Instead, the purpose of this document is to help users become familiar with

https://giscrack.com

Get a printed copy: https://amzn.to/3EIaReY

the general operation of the program and to motivate them to continue learning independently.

As the manual progresses, it is expected that users will acquire and improve skills, analyzing geographic information more efficiently to create high-quality maps. This document is a useful tool for those interested in developing their GIS skills and for those who wish to enhance their existing abilities.

The document is designed for widespread and accessible distribution. The reader is authorized to copy, remix, transform, or redistribute part or all of the material in any medium or format for **non-commercial purposes**, provided that the original source of the work is adequately cited.

Without further delay, the ArcGIS Pro Manual is presented, with the expectation that it will be highly beneficial to the reader.

This manual was developed using ArcGIS Pro 3.3/3.4. Some parts were optimized with ChatGPT. The exercises are available at https://github.com/franzpc/arcpro_en

---

2. Geographic Terms

Geographic information in digital formats needs the standardization of criteria and the inclusion of minimum parameters to ensure its quality. This standardization enables interoperability among users, optimizing the use and exchange of information. It also facilitates the reuse and democratization of this information (SENPLADES, 2013).

Below is a glossary of the most relevant geographic terms that will be utilized throughout this document:

- **Band:** Each section of the electromagnetic spectrum classifies radiation into different wavelengths, which are captured by sensors. Radiation data is typically organized as raster files and contains numerical values collected for each defined band (Moreno, 2008).
- **Cartographic projection:** This geometric operation enables the representation of the curved surface of the Earth (three-dimensional) to a flat surface (two-dimensional). This procedure transforms the real angular coordinates of geographic objects into planar

https://giscrack.com

Get a printed copy: https://amzn.to/3EIaReY

coordinates, thus enabling their cartographic representation in two dimensions (Lopez L., 2015).

- **Coordinate:** The value of a position on the Earth's surface defines the location of any point on it, allowing for the determination of the distance between any two points. Imaginary lines, perpendicular to each other and called parallels and meridians, are used to obtain these values. Their intersection defines the position of a point in the coordinate system (López L., 2015).
- **Datum:** A parameter or set of parameters that defines position (A.282). Different coordinate systems vary in their origin, scale, and orientation [ISO 19111:2007].
- **Digital Elevation Model (DEM):** A digital elevation model, or DEM, represents the height of the terrain above sea level in a particular area. It is a numerical data structure that depicts the spatial distribution of the land surface's altitude (Mancebo et al., 2008).
- **Ellipsoid:** A surface formed by rotation around a principal axis, as the movement of the Earth. Note: The international definition specifies that ellipsoids are always oblong, meaning the axis of rotation is always the minor axis [ISO 19111:2007].
- **Geopositioning**: The measurement of an object's geographic position using a Global Positioning System (GPS) [ISO/TS 19130:2010].
- **Georeferencing**: The operation of assigning geographic coordinates to any information (usually a layer) that lacks in it. It is commonly applied to represent accurately the position of Earth images or associated events [Moreno, 2008].
- **Image**: A raster-type layer, whose attribute values are distributed in grids, representing a physical parameter in numerical form [ISO 19115-2:2009].
- **Latitude**, represented by the symbol (φ): Latitude is the angle measured from the Earth´s center between the Equator and a specific point on an ellipsoid. Circles of equal latitude form complete circles around the Earth's surface. Latitude is measured from the Equator (0°) to the poles (90°), with positive values in the Northern Hemisphere (0° to 90°) and negative values in the Southern Hemisphere (0° to -90°) (Del Bosque et al., 2012).
- **Layer**: A basic unit of geographic information according to a map in raster (grids) or vector (points, lines, or polygons) format from a server [ISO 19128:2005]. Conceptually, a layer is a portion of geographic space in a specific area, equivalent to an element of the map legend, like temperature or atmospheric pressure [SENPLADES, 2013].
- **Legend**: The application of a classification to a specific area (A.52) using a defined mapping scale and a specific dataset [ISO 19144-1:2009].
- **Longitude,** represented by the symbol (λ): Longitude is the angle measured from the Earth´s center between the zero meridian and a specified point on an ellipsoid. Points

https://giscrack.com