

CHAPTER 1

Introduction

1.1 INTRODUCTION

From the Greek *photo* (light writing) *gram* (graphic) *metry* (measure) comes the root of the science of photogrammetry. The American Society for Photogrammetry and Remote Sensing (ASPRS) defines this methodology as “the art, science, and technology of obtaining reliable information about physical objects and the environment, through processes of recording, measuring, and interpreting images and patterns of electromagnetic radiant energy and other phenomena.”

Photogrammetrists, individuals skilled in the application of photomapping procedures, produce maps directly from photographic images by identifying, symbolizing, and compiling elevational, cultural, and natural features that are visible on the imagery. Contours are created in their true terrain character, while planimetric features are located in their true horizontal positions. Image analysis is the art/science of interpreting specific criteria from a remotely sensed image.

ASPRS states that, “Remote sensing techniques are used to gather and process information about an object without direct physical contact.” Remote sensors capture information from a source object that is significantly distant from the data collector.

In recent decades the advancement of image analysis, photogrammetry, and Geographic Information Systems has been due, in great measure, to progress in electronic data processing and remote sensing. Many aspects of these disciplines that were executed manually or mechanically a decade or two ago are now accomplished by analytical methods.

1.1.1 History of Photomapping

The birth of aerial photography was preceded by a lengthy development period.* Most maps that were produced in the past served a singular purpose, that of providing a visual planning tool to be utilized in a one-time design effort. During the 1980s

* For an in-depth discussion of the history of photomapping refer to Chapter 1 in *Aerial Mapping: Methods and Application*, Lewis Publishers, Boca Raton, FL, 1995.

and into the 1990s the progression of computers, stereoplotters, and map production systems moved at a hectic pace.

Currently, the field of photogrammetry is in the digital era, and today's photogrammetrist is more scientifically oriented than his yesteryear counterparts. Maps and data tabulations have become spatial data products in this age of increasing technological sophistication.

1.1.2 Photogrammetrists and Image Analysts

Both photogrammetrists and image analysts make extensive use of aerial photographs to prepare maps.

1.1.2.1 Photogrammetrists

Photogrammetrists must develop the capability to interpret photo image features, relate them to ground equivalents, and orient them to a prescribed spatial datum. They must learn to identify cultural features on a photo image so that feature details can be correctly symbolized into recognizable map features. They must also have some recognition of landforms so that the elevation data correctly depict the terrain. Most of these individuals gain proficiency by translating the photo image into what they have previously observed on the ground during their daily routine pursuits.

1.1.2.2 Image Analysts

Image analysts do much the same as photogrammetrists, but from a different point of view. They must apply the knowledge gained from a technically oriented background in specific disciplines. A few examples may clarify this concept:

- A soils specialist may be looking for erodible soils on a proposed highway route.
- A forester may be estimating the volume on a timber tract.
- An entomologist may be attempting to discern the prevalence of corn blight in a specific township.
- A hydrologist may be comparing the degree of suspended matter in several adjacent lakes.
- A wetland specialist may be monitoring the decline of wetland areas within a state.
- A wildlife biologist may be inventorying migratory geese on a wildfowl refuge.
- A glaciologist may be charting the movement of a glacier.

1.1.3 Utilization of Aerial Photos

The photogrammetrist uses photographs to directly create an end product such as a planimetric and/or a topographic map, while the analyst uses the photographic image only as one implement in a variable toolbox to arrive at a product.

1.1.3.1 End Products

A photogrammetrist generates an end product, graphic or digital, directly from the photographs by identifying, symbolizing, and compiling cultural and terrain

features that are visible on the imagery. Usually, a limited effort is directed toward field verification of the product. In other cases, an image analyst proceeds through various phases, combining image analysis with ground truth sampling to produce an end product.

1.1.3.2 Effort

Major portions of a photogrammetrist's efforts are by direct use of the photos. Conversely, the analyst's use of images may not be a major effort in the project scheme.

1.1.4 Photogrammetry

Several types of photogrammetry exist: aerial, terrestrial, and close range. Each serves the needs of a distinct category of users. Throughout the mapping community, terrestrial and close range photogrammetry have limited use. Aerial photogrammetry uses near-vertical photographic images that are exposed from a moving platform at a distant point in the sky. This procedure is employed to develop planimetric detail and/or topographic configuration. Aerial photogrammetry is also employed for numerous aerial photo analysis purposes.

1.1.4.1 Digital Mapping

Digital planimetric and/or topographic mapping projects require at least several basic operations that include acquisition of:

- Aerial photography
- Field control surveys
- Digital data collection and attribution

1.1.4.2 Supplemental Functions

Aerial mapping projects often necessitate supplemental functions such as:

- Aerotriangulation
- Photographic reproduction products
- Orthophoto mapping
- Accessory field surveys such as outboundaries, cross-sections, drill hole locations, or utilities information

1.1.4.3 Commercial Mapping

The web site <http://www.aeromap.com/> provides insight on the equipment, services, applications, and representative projects of a commercial aerial mapping firm.

1.1.5 Mapper vs. User

Most map users contract with mapping firms to accomplish the actual production procedures. Mapping requires the use of expensive equipment, and map production

is labor intensive. Hence, mapping can be a costly venture. Similarly, users are often confined to a strict budget that may or may not be sufficient to cover the cost of suitable mapping. There are times when the user might wish, but cannot expect, to obtain a map fulfilling all of the project needs for the amount of funding available. These situations could provoke a somewhat adversarial situation. The mapper must exercise professional integrity to produce a quality product in keeping with the needs of the user, but the user must be willing to pay a realistic price for that credible product.