
APPLICATION OF REMOTE SENSING AND GIS ON DEVELOPMENT SUBJECTS

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ABSTRACT

In this paper, the possibilities of visual interpretation of a single image (Landsat and Spot) and of stereoscopic interpretation of airphotographs in small scale are being searched through. This is done from the point of «collecting» information that interest civil engineers for development subjects.

The combination of interpretation of satellite image and airphotographs seems to offer interesting information relatively to drainage, roads, faults etc. It can be considered as a starting-point and a reference base for further photogrammetric and geoinformation procedures and digital analysis.

1 INTRODUCTION

Remote Sensing gains continuously increasing number of users, because of the fast progress in methods and instrumentation. These users may concern different professions, occupations, services etc., presenting significant particularities, locally and temporally.

The civil engineer is an important division of users, because of his main scientific and professional activities (Dept of Civil Engineers, 1999).

The term «development» presents multiple considerations (Zuidam R.A. et al, 1979), that are significantly related to the activities of civil engineer.

The above describe the framework of this paper.

We mainly deal with remote sensing (satellite images and airphotographs) and particularly with visual interpretation of a single image for satellite images and stereoscopic images for airphotographs (Cracknell A.P. 1991, Meijerink A.M.J. 1987, Verstappen H.Th. 1977). The results of this visual interpretation can further support photogrammetric and geoinformation process.

Sithonia Peninsula in Northern Greece is the example area.

2 INTERPETATION OF SATELLITE IMAGES (LANDSAT - SPOT) AND AIRPHOTOGRAPHS

The data we used, concerned Sithonia Peninsula. They included
Satellite images: Landsat TM 1998-07-26 (bands 1-7), Spot PAN 1993-08-26, Spot XS 1992-08-12 (3 spectral bands)
Airphotographs in scale 1: 40,000.

Image interpretation took place with simultaneous reference to corresponding topographic, geologic and other thematic maps in various scales.

Regarding satellite images, the appearance in hardcopy enlargement of linear and areal tonal differentiations forms finally the presentation of visual features that concern subjects of relief (watersheds, drainage), geologic-geotechnical subjects (boundaries of geologic formations, faults), vegetation areas, roads etc. The place of areas that presented certain features was marked on an overlay as it is indicatively shown for Landsat Band 1 in Fig. 1.

The results of Landsat and Spot image interpretation are listed below.

Landsat images

Band 1 (Fig. 1). Particular dark tone appears at great extent with intense contrast at certain areas. We recognized: forest areas at 1-2-3-4, relief (indications for relief) at 5-6-7, drainage at 8-9, alluvial deposits at 10-11-12-13, faults at 14-15, roads (discernible at great extent in the peninsula), coast outline (slightly unclear at certain places).



Fig. 1. Sithonia Peninsula, Northern Greece. Length of the peninsula about 45 km.

- a. Landsat image band 1 overlay. 1-16: places of recognized features.
- b. Contours 300, 700 m.
- c. A, B, C: areas of stereoscopic interpretation of airphotographs.

For the following bands we refer to the most particular features, comparisons and correspondence among them.

Band 2: Lighter tone and decreased contrast appear. The features that were listed in Band 1, are recognized.

Band 3: Boundaries of geologic formations.

Band 4: Very light tone, low contrast, enhanced appearance of relief, more discernible drainage, clear coast line, clear road network.

Band 5: Darker than Band 4, relief, drainage, roads, alluvial deposits, clear coast line.

Band 6: Generally blurred appearance. Most of the previously mentioned features are not discernible.

Band 7: Relief, drainage, forest areas, road network, boundaries of geologic formations, alluvial deposits, clear coast line.

Spot Images.

Spot PAN: Significant information about relief, drainage, road network, boundaries of geologic formations, faults.

Spot XS: Colour appearance with wide gradation of colours and characteristic texture, that can offer important information for the recognition of various features.

There is a lot of literature (Erdas 1997, Lillesand et al 1987) relatively to the features that may be interpreted in each band. These are evaluated, but we also take in mind, according to the case, serious local and temporal particularities.

The interpretation of airphotograph stereopairs was done for different places in Sithonia Peninsula (Fig. 1). For such a place, we indicatively present an example (Fig. 2).

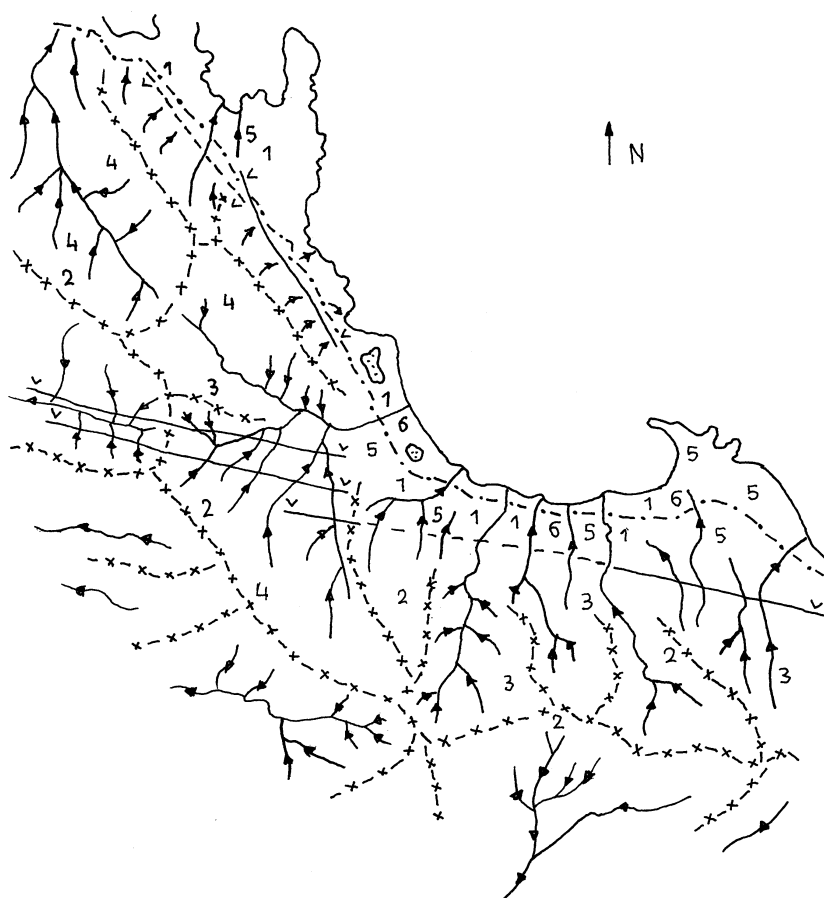


Fig. 2. Stereoscopic interpretation of airphotographs in scale 1:40,000 (reducement)

- | | | | |
|-------|----------------|---|---------------------------------|
| -x-x- | watershed | 1 | alluvial deposits |
| ↘ | drainage | 2 | metamorphic and schistose rocks |
| ⊙ | lake | 3 | forest area |
| ∨ | fault | 4 | vegetation area |
| ∨-∨ | probable fault | 5 | cultivated land |
| ⋯ | road | 6 | built-up area |

The interpretation of airphotographs in scale 1: 40,000 offers information for a lot of subjects. It presents generality without many details and provides significant understanding - familiarization of corresponding configurations in satellite images.

3 CONCLUSIONS - DISCUSSION

Remote Sensing data (satellite images and airphotographs) can offer qualitative and quantitative information if they are suitably studied and processed. The aspect of using them by various users of different knowledge-experience and instrumentation is continuously spread.

In this paper, we search through the possibility of image interpretation (satellite images, airphotographs) by the user-Civil Engineer on subjects of his activities.

The interpretation of satellite images shows that interesting information can be acquired relatively to relief, geological-geotechnical subjects and land uses. The term «recognition» in the case of interpretation of a single satellite image has not the same meaning with the case of stereoscopic interpretation of images. It is based on the effort to observe tonal characteristics, linear and areal configurations, correspondence with other data as maps and continuously increasing experience.

The interpretation of airphotographs offers multiple information relatively to watersheds, drainage, faults, rocks, alluvial deposits, forest areas, vegetation, cultivated land, roads, lakes, built-up areas.

The combination of interpreting satellite images and airphotographs in relatively small scale proves to be valuable for the acquisition and exploitation of remote sensing information. The study for every area of interest can be further extended for satellite images to various subjects of digital analysis and for airphotographs to photogrammetric process in the same or larger scale. In this way, the study of geotechnical, hydrological etc subjects and consequently the development can be effectively served.

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