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Chapter

Introductory Chapter: Aerospace Information Classification

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1. Introduction

1.1 Classification of space images

Classification of the aerospace image is the process of creating an environment systemizing the image pixel values into meaningful segments of the Earth features. There are a number of methods and facilities for classification of aerospace images. Aerospace image classification methods can be formed into three categories:

- Automatic
- Manual
- Hybrid

The methods indicated above can be used independently depending on task and available technological maintenance. There is no doubt that each of the methods has advantages and disadvantages. In general, automatic image classification method is the most preferable one used in spatial data classification [1].

It is obvious that aerospace image classification takes a vital place from the first stage of line of image processing up to producing final electronic or hard production. **Figure 1** demonstrates a flowchart of the processes as the required actions in the aerospace image classification.

Based on the above approach, we can describe standard approach as:

- Spatial data
- Extract information for an application
- Visual and digital image interpretation
- Field survey
- Integration spatial data into field survey
- Thematic map creation
- Decision-making

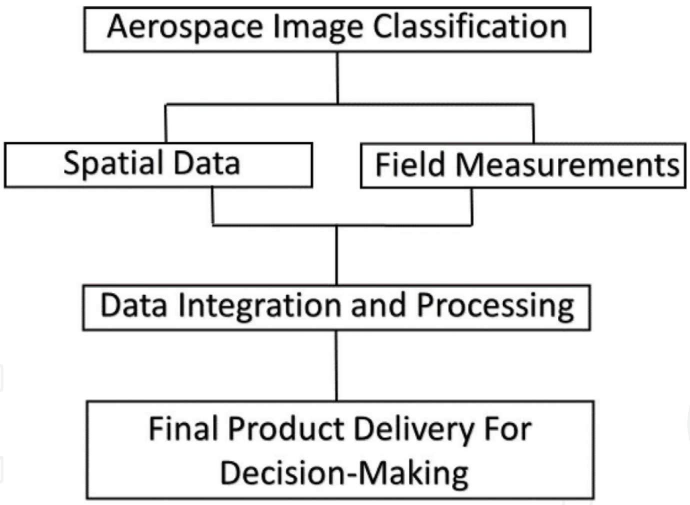

Figure 1.
Aerospace image processing classification flowchart.

1.2 Aerospace images

During the work with aerospace images, first of all, the spectral wavelength of shooting is important for researchers which defines:

- Biogeophysical characteristics of objects transferred by images and technology of achieving the image

which depend on

- Visualization, radiometric, and geometrical properties of images

These two characteristics represent a basis of the classification of aerospace images considering possibilities of their processing.

Spectral wavelength of shooting defines the first, fundamental, level of this classification considering the reflective and radiating characteristics of the objects reproduced in the image. From this point of view, three main types of aerospace images are defined:

- In visible, near and middle to the infrared wavelength
- In a thermal infrared wavelength
- In radio frequency wavelength

As the general understanding of the classification is the procedure of related to the object belonging to one of Q-classes. The relation to the object comes and defines on the basis of presence on an object of some features. Classifications are result the objects divided into the classes [2, 3].

Classification process of aerospace images in general provides the following stages:

- Identification of the main distinctive features (characteristics) reflecting from different objects with different classes
- Creation of spatial features

- Definition (calculation) at the studied object of feature(s) on which bases expected to classified of feature(s)

- Decision-making about object belonging to one of the classes with application of the decisive rule

1.3 Remote sensing data processing

Classification of remote sensing data is the process which is used for receiving aerospace images of the maps of the land surface and any other information sources which depends on task solution. Subjects of the map can be contained in a variety of segments from enough general categories, such as:

- Soil

- Vegetation

- Surface water

and up to thinner structures, for example:

- Various types of soils

- Species of vegetation

- Depth of reservoirs

The subject of classification in such tasks is the image pixel, the features of which conducts definition of the classes such as brightness of this pixel. It is necessary to indicate that in general, aerospace images consist of several layers corresponding to different spectral channels. From this point of view, brightness is the vector value. Coordinates of the vector define the provision/location of the pixel in the spatial of feature. The value of the field in the same point of coordinate is defined by the quantity of the pixels which is located into this point.

1.4 Aerospace image processing

The computer algorithm analysis realizing various procedures of classification is subdivided into two types:

- Autonomous classification

- Classification with training

Computer processing of the aerospace images presented in the digital form opens new technical capabilities for image processing. Special software packages used for the preparation of this subject, such as ERDAS Imagine, allow to display the images for monitoring, improve quality of the images (e.g., to remove influence of an atmospheric impact), synthesize color images, carry out the automated processing, and obtain quantitative data (coordinates, distances, the areas, etc.). Results of computer processing form a basis for creation of maps which can be written in a digital form or printed on the paper [4–6].

Receive the aerospace images when shooting the scanning systems from different aero- and satellite systems; for instance, the French SPOT or the American Landsat is used for processing. By means of high-precision scanners, they can be transferred to a digital format and images.

The digital images consist of the segments, pixels forming a grid of lines, and columns. Each pixel has the coordinates and characterized by brightness which is designated in conventional units. The value of brightness is connected with ability of terrestrial objects to reflect solar radiation. From this aspect it shows how significantly performed in the images of differences in brightness of objects and depends the result of processing that is:

- Objects brightness characteristics
- Use of multichannel images
- Synthesis of the color image
- The automated processing with use of appropriate software application
- Measurements according to the images

Aerospace image classification has a variety of applications such as remote sensing, image and data storage for transmission in business applications, etc. It is important to use advances of spatial data classification in wide areas, particularly in Earth studies.

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