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Engineer M.Albotă, Mathematician G.Vass, Physicist G.Ioanid,
Bucharest, Romania

TOPOGRAPHIC CONTENT INVESTIGATION OF LANDSAT CLASSIFIED MULTISPECTRAL IMAGES, DISPLAYED ON A PLOTTER

ABSTRACT

Landsat and other automated remote sensor digital multispectral data classifications are made using a medium capacity computer, when processings require a large memory. Class definitions are accomplished by unsupervised pixel classifications, using main component method, and the classified image display is obtained at the established scale, employing a plotter. Thematic plotting is analysed topographically, related to topographical maps and aerial photographs of the considered area.

INTRODUCTION

Processing of large information volume, which multispectral images can give, using a computer, and their display on ARISTOMAT plotter, at a scale we need, are very useful in thematic map compilation, employing remote sensing recordings.

Topographic themes requires special rigorous scale representations, namely, some metric plottings.

MSS Landsat images recorded on magnetic tapes over about a 200 sq.km well investigated area, were used to classify data, to display them on a plotter and to analyse topographic content.

Topographic maps at various scales, conventional and non-conventional aerial photography, taken at different times, and other topographic information are to be found for the respective area.

MULTISPECTRAL DATA CLASSIFICATION

Processing of multispectral data derived from Landsat CCT tapes is provided by our SPADAM multispectral data processing system which, firstly, makes pixel unsupervised classification of test zones. In this way, overlapping classes existed on the image are established, using radiometric data without any external information. Established class numbers are unlimited.

Unsupervised classification is an iterative process based on two dimensional histogram analyses of previously established classes; histograms are made in the first two principal component plane.

Class divisions for which histogram shows an evident nonhomogeneity are required at each iteration. Unsupervised classifi-

cation process comes to an end, when all established classes are homogeneous. As a result, two files are derived: one contains classified image and the other contains statistical established class parameters.

Classes established, using unsupervised classification process, are analysed as against data derived from other sources (aerial photography, existing maps, ground investigations, a.s.o), in order to determine their nature. SPADAM gives the possibility to modify class file, in order to delete or unify some classes, if it is required after analysing the class nature.

In case of large areas, SPADAM provides supervised classification of pixels, assigning each pixel to a class which interests the proposed theme. Some assigning criteria were included into the supervised classification programmes: maximum likelihood principle, paralelipiped algorithm, etc.

Programmes to decode Landsat CCT magnetic tapes and classifying programmes are written for Felix C-256 computer.

CLASSIFIED IMAGE PLOTTING

SPADAM gives the possibility to print classified images with Felix C-256 line printer; classes are distinguished by printing letters (Figure 1). These pictures have only an informative character; to evaluate classification for a given area. They have not the essential quality, namely, metric content required by the cartographic materials, especially by the topographic maps.

Figure 1

SPADAM provides, therefore, classified image plottings on

ARISTOMAT plotter, at the required scale.

Geometric corrections and transformations to obtain images at the needed cartographic projection can be included into the drawing programmes.

These classified images can be the basic elements for studies regarding topographic content of digital multispectral data.

SPADAM contains two main ways to represent images, using ARISTOMAT plotter.

A way consists in drawing,scanning and plotting lines centred as against each pixel line. Pixel class change is followed by automatic colour change (i.e.change of drawing active tool). Finally, a coloured image is obtained, each colour corresponding to a class (Figure 2).

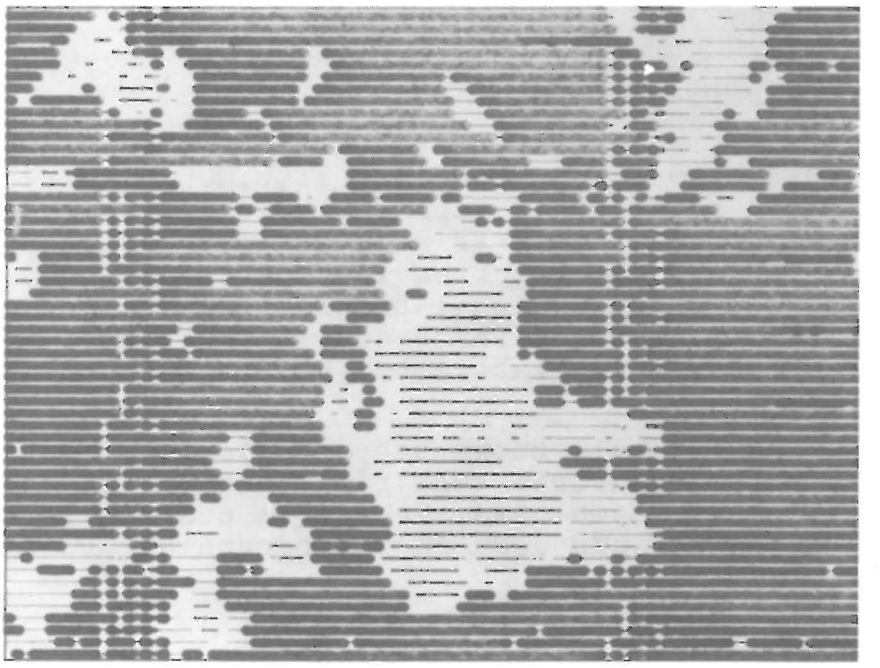

Figure 2

Although, the so-obtained image is a very expressive one, the above mentioned process takes too much time. For instance, a 1:50,000 scale picture drawing, covering a 40 sq.km area,needs about 15 minutes. Having only four installed drawing tools,plotter increases the drawing time because, usually, class number is greater than four. Indeed, repeated picture scannings are necessary, each one every four-class group.

The other way consists in previous selection of boundaries among various class areas and only their plottings (Figure 3).So,time required by picture drawing is reduced four-five times.

Drawing programme can plot boundaries using polygonal lines or three-degree curves, as it is required. Now, we must say that boundary plotting using curves is not essential, because image

resolution is anyhow limited by pixel sizes.

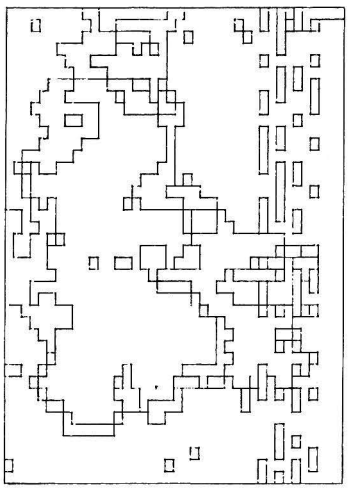

Figure 3

TOPOGRAPHICAL INTERPRETATION

Displays on a plotter, which have resulted from the unsupervised classifications, were compared with 1:50,000 and 1:25,000 scale existing basic topographic maps and partially with large scale 1:10,000 and 1:5,000 maps, as well as with aerial photographs, which scales are ranging from 1:4,000 to 1:50,000, taken at various dates, using conventional black-and-white and colour or black-and-white infrared and false colour photosensitive materials. Analysis made in the laboratory has been supplemented by ground investigations.

Test field investigated, well-known topographically, contains Albeşti national photogrammetric test field and the adjacent areas (Figure 4); at the same time, it is the central part of the remote sensing test field used in cartographic applications.

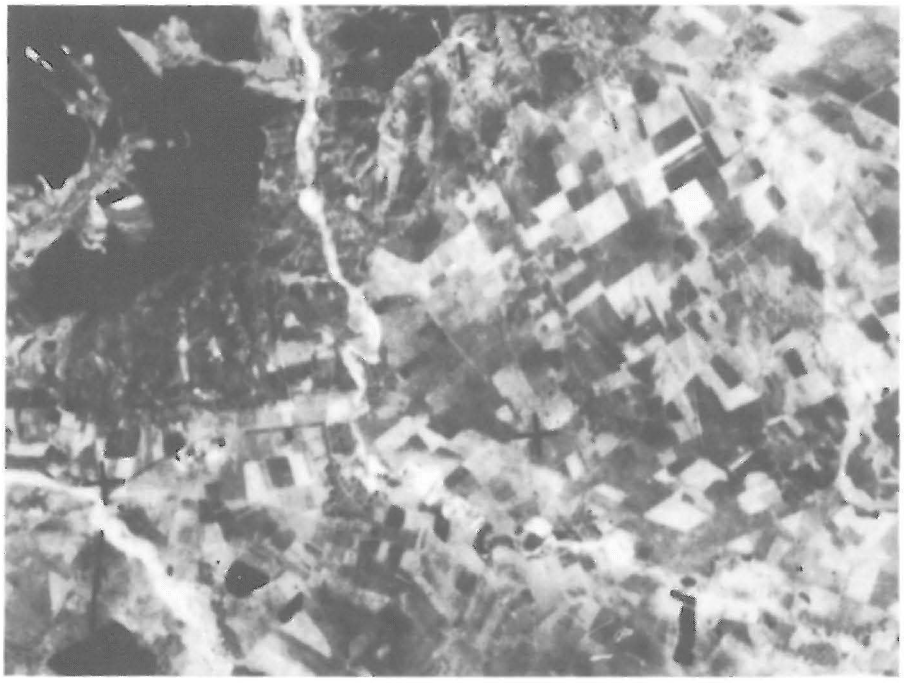

Figure 4

Pictographic image in Figure 4 has been made by Salut 4 spacecraft. Some parts of the investigated area are presented in figures 1-3.

Automated classified images have rendered positively evident: forests, hydrographic network and lakes, populated centres (towns, villages), cultivated lands, ways of communications, while vineyards and orchards are doubtly rendered.

Some topographic elements can be presented in detail; forests can be differentiated as regards species and age; populated centres can be divided into zones showing dense or scattered buildings, street networks, parks, a.s.o.

Possibility to automatically represent some topographic elements, at the required scale, is very useful in some topographic map compilation and updating.