

Chapter 3: “Image interpretation & analysis”

Part 1 out of 3

Introduction:

Image interpretation & analysis of remotely sensed imagery involves the identification &/or measurement of various targets in an image in order to extract useful information about them.

Targets must also be distinguishable; it must contrast with other features around it in the image.



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Introduction: (continue)

Image interpretation can be defined as the science & art of analyzing terrain features recorded on an image, by detective reasoning, to determine their effects upon a particular problem.

Images, usually, contain raw data, when we can identify what we can see on them & communicate this information to others, then we are actually practicing image interpretation analysis.

An interpreter systematically examines images & frequently other supporting materials, to identify the physical nature of objects & phenomena appearing on the image.

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Introduction: (continue)

Many image interpretation & identification of targets in remote sensing imagery are performed visually, although digital interpretation is more common nowadays.

Visual interpretation, analogue or digital imagery, can be displayed as black & white images, or as color images by combining different channels or bands representing different wavelengths.

Success in image interpretation depends upon;

- (a) the abilities & experiences of the interpreter,*
- (b) the quality of the image, &*
- (c) the equipment used to analyze the image.*

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Introduction: (continue)

Other factors that can effects the level of information extracted from an image are;

- (1) wavelengths &/or film filter combination,*
- (2) temporal aspects of the natural phenomena (more positive results can be achieved by obtaining images at several times during the life cycle),*
- (3) weather (the weather can cause significant short-term changes on an image), &*
- (4) scale of a photograph or resolution of an image.*

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Introduction: (continue)

Aerial photographs & satellite images are very helpful toll, in addition of saving time, money, & effort; they have five basic advantages over on-the ground observation. These advantages can be summarized as:

- 1. Improved vantage point; images gives a view of large areas, enabling us to see earth surface features in their spatial context.*
- 2. Capability to stop action; images can give us a “stop action” view of dynamic conditions, such as flood, moving wildlife populations, traffic, oil spills & fires.*

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- 3. Permanent recording; images are virtually permanent records of existing conditions on the ground at the time of exposure.*
- 4. Broadened spectral sensitivity; films can record over a wavelength range about twice as broad as that of the human eye (0.3 to 0.9 μm versus 0.4 to 0.7 μm). Multi-spectral scanners can have even wider ranges.*
- 5. Increasing spatial resolution & geometric fidelity; with the proper selection of camera, film & flight parameters, we can record more spatial details on a photograph than we can see with the unaided human eyes.*

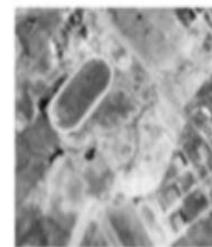
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Elements of Visual Interpretation:

Observing the differences between targets & their backgrounds involves comparing different targets based on any, or all, of the visual elements of shape, size, pattern, tone, texture, shadow, site, association & resolution.

Elements of Image Interpretation



Shape
(depends on the object outline)



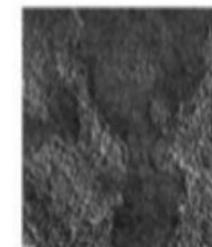
Size
(relative to one another)



Tone
(brightness-hue, color)



Site
(location helps recognition)



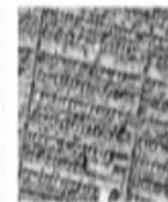
Texture
(smooth or coarse)



Shadow
(helps to determine height)



Association
(features that are normally found near object)



Pattern

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Elements of Visual Interpretation: (continue)

Shape refers to the general form, structure, or outline of individual objects.

Size of objects in an image is a function of scale.

Pattern refers to the spatial arrangement of visibly discernible objects. A parking space versus drive-in theater is good examples of pattern.



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Elements of Visual Interpretation: (continue)

Tone refers to the relative brightness or color of objects in an image.

Texture refers to the arrangement & frequency of tonal variation in particular areas of an image.

Site refers to the topographic or geographic location & it's particularly important aid in the identification of vegetation types.

Resolution of an image always place particular limits on image interpretation because some objects are too small or have too little contrast with their surroundings

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Elements of Visual Interpretation: (continue)

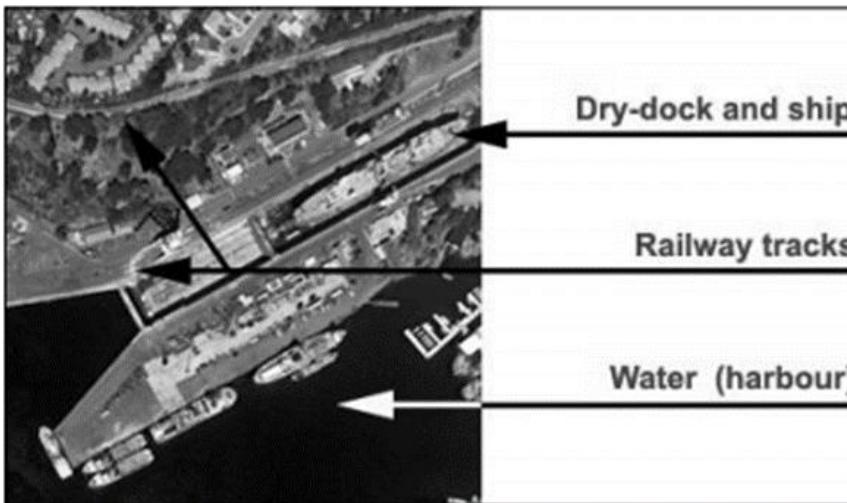
Shadow is also helpful in interpretation as it may provide an idea of the profile & relative height of a target which might make identification of a target easier. However, shadows can also reduce or eliminate interpretation in their area of influence.



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Elements of Visual Interpretation: (continue)

Association takes into account the relationship between other recognizable objects or features in proximity to the target of interest. The identification of features that one would expect to associate with other features may provide information to facilitate identification.



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Image Interpretation Keys:

Image interpretation process can often be facilitated through the use of image interpretation keys.

Image interpretation keys are shapes, figures, or diagrams that help the interpreter to evaluate information presented on an image in an organized constructive manners.

There are two types of interpretation keys differentiated by the method of presentation of diagnostic features;
(1) selective keys, & (2) elimination keys.

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Image Interpretation Keys: (continue)

**Selective keys
contain
numerous
example images
with their
supporting text.**

Black spruce



Aspen



White pine



White birch



Red pine

Eastern white cedar



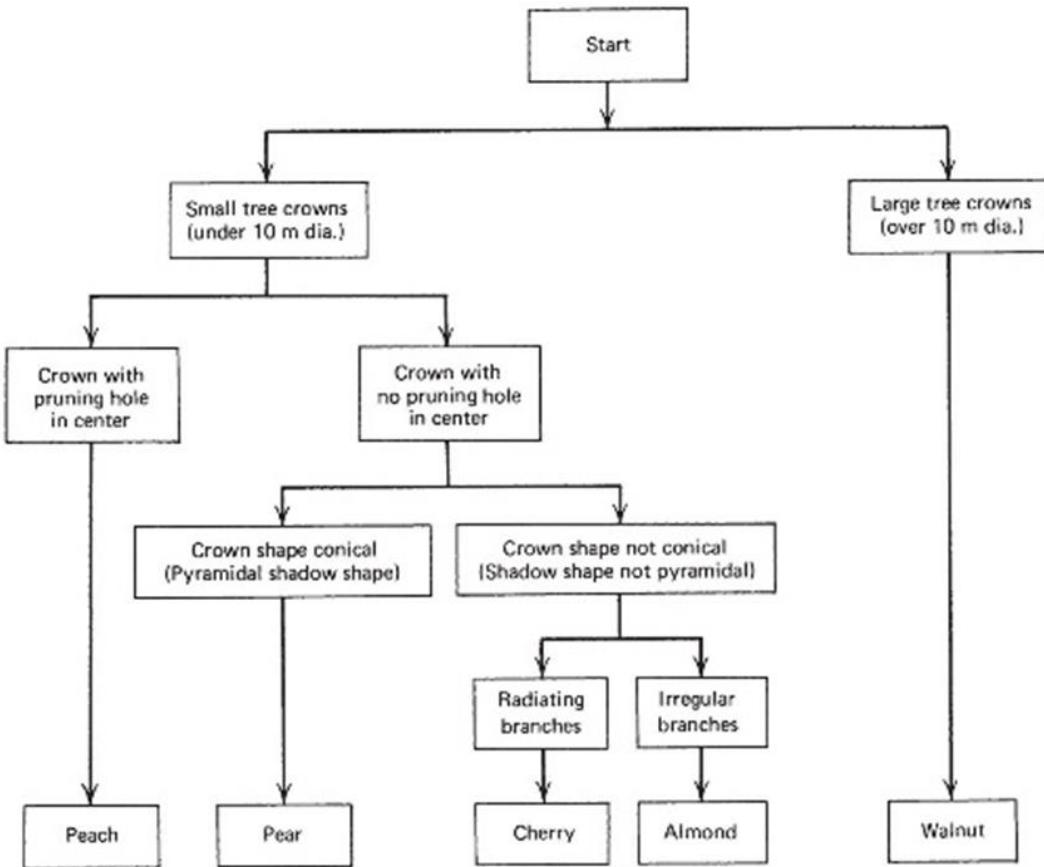
Balsam fir



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Elements of Visual Interpretation: (continue)

Elimination keys are arranged in a formation so that the interpreter proceeds step by step from general to specific.



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Approaching the Image Interpretation process:

There is no single “right” way to approach the image interpretation process.

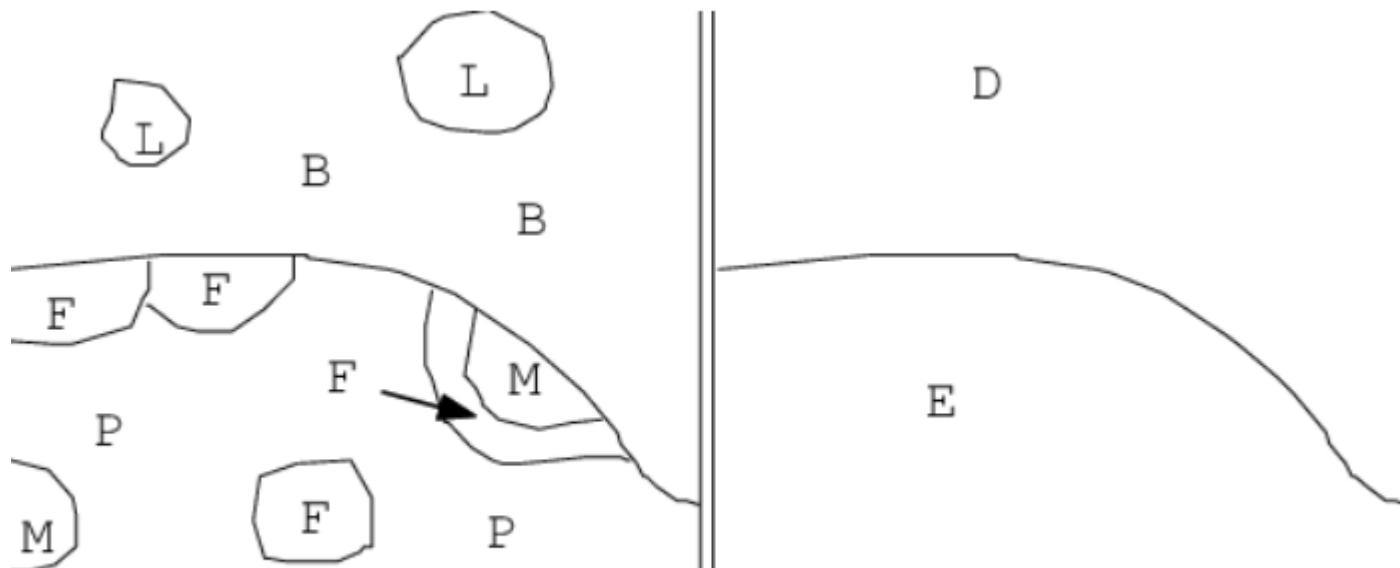
However, the specific goal of the interpretation process & the interpretation equipment available will, to some extent, influence the image interpretation process employed.

Two extremely important issues that have to be addressed before the image interpretation process take place; (1) the definition of the classification criteria to be used to separate the various categories in the image, &

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Approaching the Image Interpretation process: (continue)

(2) the selection of the minimum mapping unit (MMU) to be employed.



Influence of minimum mapping unit size on interpretation of vegetation. (a): Forest types mapped using a small MMU: B=Birch; L=Larch; F=Fir; M=Macrocarpa; P=Pine. (b): Forest mapped with large MMU: D=Deciduous; E=Evergreen. (a, Scale 1:5000) (b, Scale 1:50000)

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Basic Visual Image Interpretation equipment:

Visual image interpretation equipment's generally serve one of three fundamental purposes; (1) viewing images, (2) making measurement on images, & (3) transferring interpreted information to base maps or databases.



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Basic Visual Image Interpretation equipment: (continue)

Visual image interpretation process typically, but not necessarily, utilizes stereoscopic viewing to provide a three dimensional view of the terrain.

Measurement devices can be of low order accuracy, such as engineering scale, or high order accuracy. Nevertheless, accuracy can be improved by repeating measurements & magnifying lenses.

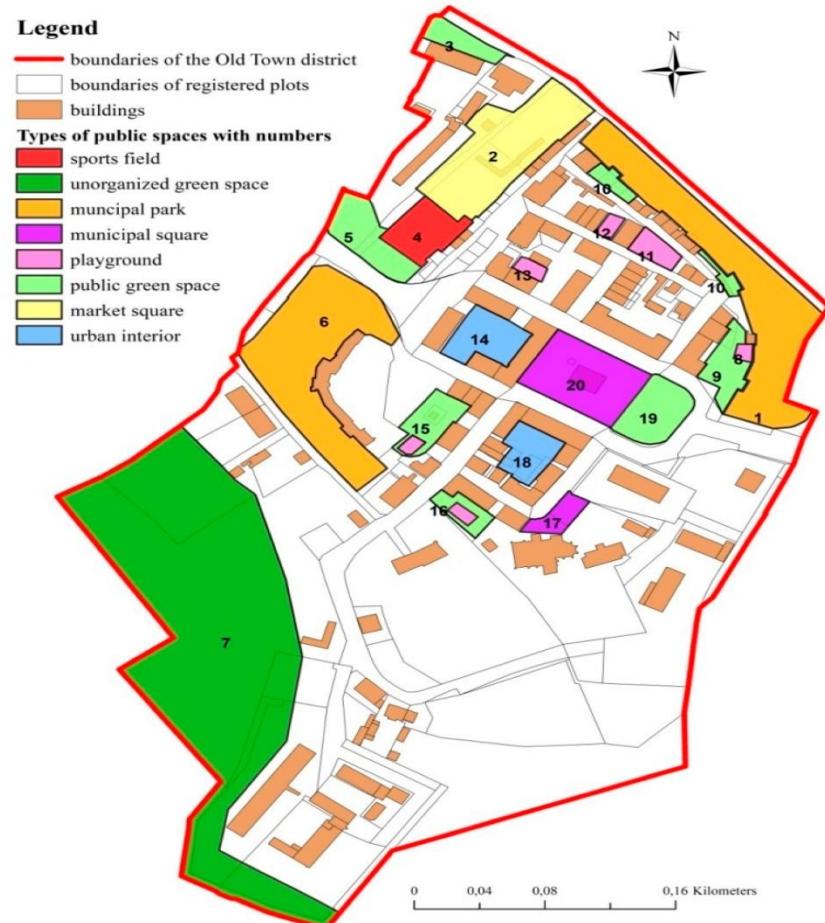
Transferring devices are used to transform information extracted from image to based map & data base.

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land cover/land use Mapping:

The term land cover relates to the type of feature present on the surface of the earth.

Conversely, the term land use relates to the human activity or economic function associated with a specific piece of land.



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land cover/land use Mapping: (continue)

But while land cover information can be directly interpreted from appropriate images, information about land use cannot always be inferred directly from land cover.

The size of the minimum area that can be mapped on any particular land cover/land use class depends, to some extent, on the scale & resolution of the image.

It also depends on the size of data compilation & the final scale of the land cover/land use map.