# UNIT 7 VISUAL IMAGE INTERPRETATION

**Structure**



## 7.1 INTRODUCTION

In the previous units, you have studied about remote sensing sensors, platforms and their types. We have also discussed about the concept of image resolution and its types. You know that characteristics of images such as resolution determine the level of detail present in the remote sensing data and extraction of information from them. In this unit, we shall discuss about visual image interpretation and its elements and keys. Let us look at the meaning of visual and interpretation. ***Visual*** perception is the ability to interpret information and surroundings from the effects of visible light reaching the eye. ***Interpretation*** is the process of extraction of qualitative and quantitative information of objects from aerial photographs or satellite images.

Visual image interpretation is very useful in various fields such as geography, geology, agriculture, forestry, environment, ocean studies, wetlands, conservation of natural resources, urban and regional planning, defence and many other purposes. Interpretation technique requires extensive training and it is labour intensive. To translate images into information, one should be well-versed with both the subject knowledge and also the image interpretation basics. For example, interpretation of geological features requires expertise in geology along with image interpretation skill.

## Objectives

After reading this unit, you should be able to:

- define image interpretation;
- discuss aerial photo interpretation;
- describe elements and keys of visual image interpretation;
- explain the importance of image scale; and
- define minimum mapping unit.

# 7.2 VISUAL INTERPRETATION

***Interpretation*** is the process of extraction of qualitative and quantitative information of objects from aerial photographs or satellite images. Interpretation is generally called ***image interpretation*** except for the case when the interpretation is carried out on aerial photographs. Interpretation of aerial photographs is known as ***aerial photo interpretation***. Based on the mode of the interpretation, interpretation can be categorised into visual and digital interpretation. ***Visual interpretation*** involves visual analysis of aerial photographs and satellite images. When the interpretation is carried out with the help of computer software, it is known as ***digital interpretation*.**

***Visual image interpretation*** is a process of identifying features seen on the images by an analyst/interpreter and communication of information obtained from these images to others for evaluating their significance. This process, however, is not restricted to making decisions concerning what objects appear in images but it also includes determination of their relative locations and extents. Success in visual image interpretation varies with the training and experience on the pictorial data analysis. If the interpreter has an artistic and photographic sense then information derived from the interpretation process may be more authentic and reliable. You have read earlier that visual interpretation of satellite images are applied successfully in many fields including geology, geography, agriculture, water resources and forestry.

Digital interpretation involves analysis of remote sensing data and extraction of information with the help of computers. Steps involved in digital interpretation would be discussed in detail in the Block 4 of MGY-002. However, merits and demerits of visual (human) and digital interpretation are compared in Table 7.1 for completeness.

**Table 7.1: Comparison of merits and demerits of visual (human) and digital interpretation techniques**

| | Visual (human) interpretation | Digital interpretation |
|---|---|---|
| **Merit** | • Image analyst's experience and knowledge is available<br>• Very good for extraction of spatial information | • Time effective-requires much less time for interpretation<br>• Results can be exactly reproduced for any number of times<br>• Extraction of quantitative information is possible and easier |
| **Demerit** | • Time consuming<br>• Interpretation results may vary with time and person depending upon their experience and knowledge | • Image analyst's experience and knowledge is not available<br>• Poor in extracting spatial information |

In this unit, we shall focus on the visual image interpretation however, we shall also briefly discuss about the photo interpretation and aerial photography since the basics of visual image interpretation have come from the photo interpretation.

***Aerial photo interpretation*** is a process of examining and extracting useful information from aerial photographs. During this process, some features may be easily identifiable while others may not, depending upon your own perceptions and experience. The reliability of information collected from aerial photographs depends on the quality of aerial photographs, instruments used for interpretation, working conditions and personal experience with photo interpretation techniques. In addition, preliminary knowledge of the area of interest which comprises of its geographic location, past and present climate conditions, vegetation and published literature are always useful for accurate identification of features.

Aerial photography was the first method of remote sensing and is even used today in the era of scanners. In the mid 1800s, aerial photographs were taken using pigeons, balloons and kites. Aerial photographs record all visible features on the Earth's surface from an overhead perspective.

The photographs taken from an aircraft or helicopter using a precision camera are termed as ***aerial photographs***. Cameras are the simplest and oldest of sensors used for remote sensing. One of the models used for aerial photography is shown in Fig. 7.2.

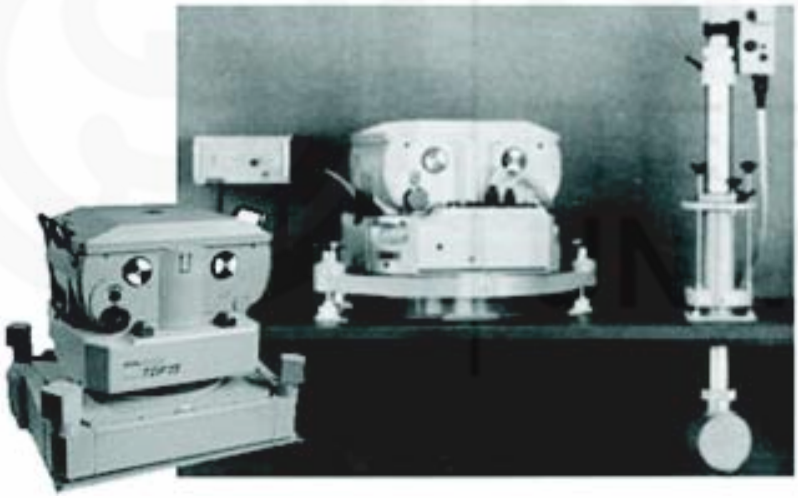

**Fig. 7.2: Model of a camera required for taking aerial photograph (source: http://rst.gsfc.nasa.gov)**

Aerial photography has many applications such as cartography, urban and rural planning, environmental impact studies, civil law cases, real estate evaluations and can even be used as wall art. Following are the advantages of aerial photography:

- **Synoptic Viewpoint:** Aerial photographs give a bird's eye view of large areas enabling us to see surface features in their spatial context.
- **Permanent Recording:** They are virtually permanent records of the existing conditions on the Earth's surface at one point in time and are used as an historical document.
- **Capability to Stop Action:** They provide a view of dynamic conditions and are useful in studying phenomena e.g., flooding, wildlife, oil spills, etc.

In 1858, Gasper Felix Tournachon "Nadar" took the first aerial photograph from a captive balloon from an altitude of 1,200 feet over Paris.

In 1903, Julius Neubronne patented a breast-mounted camera for pigeons, which was capable to expose automatically at 30-s (s stands for intervals) (Fig. 7.1).

**Fig. 7.1: Camera mounted in a pigeon for aerial photography (source: Curran, 1988)**

You may note that there are following types of aerial cameras:

- aerial mapping camera
- reconnaissance camera
- strip camera
- panoramic camera
- multi-lens camera
- digital camera

- **Three Dimensional Perspectives:** It provides a stereoscopic view of the Earth's surface and makes it possible to take measurements horizontally and vertically.
- **Spectral and Spatial Resolution:** Aerial photographs are sensitive to radiation in wavelengths that are outside of spectral sensitivity of the human eye. They also have better spatial resolution than many ground based remote sensing methods.
- **Availability:** They are readily available at a range of scales for much of the world.
- **Economy:** They are much cheaper than field surveys and are often cheaper and more accurate than maps.

The aerial image differs from everyday photograph in the following aspects:

- overhead perspective
- beyond visible light spectrum and
- unfamiliar scales and orientation.

You will find that information extraction from aerial photography is based on the characteristics of image features of aerial photographs such as tone, size, shape, texture, pattern, shadow, site and association as shown in Fig. 7.3.

Aerial photographs may be classified on the basis of the scale of photograph into:

- *Large Scale Photographs* (1: 15,000 and larger)
- *Medium Scale Photographs* (between 1: 15,000 and 1: 30,000)
- *Small Scale Photographs* (smaller than 1: 30,000)

*Tone* is the most basic of the interpretive element and refers to the relative brightness or colour of elements on an aerial photograph. *Size* of objects must be considered in the context of the scale of a photograph. The scale will help you to determine if a water body is a pond or lake or sea. *Shape* refers to the general outline of objects and regular geometric shapes. *Texture* is the impression of smoothness or roughness of image features and is caused by the frequency of change of tone in photographs. *Pattern* or *spatial arrangement* is formed by objects in a photo which can be diagnostic. *Shadows* aid interpreters in determining height of objects in aerial photographs. *Site* refers to topographic or geographic location. *Association* refers to position of the objects of interest in relation with the other objects.

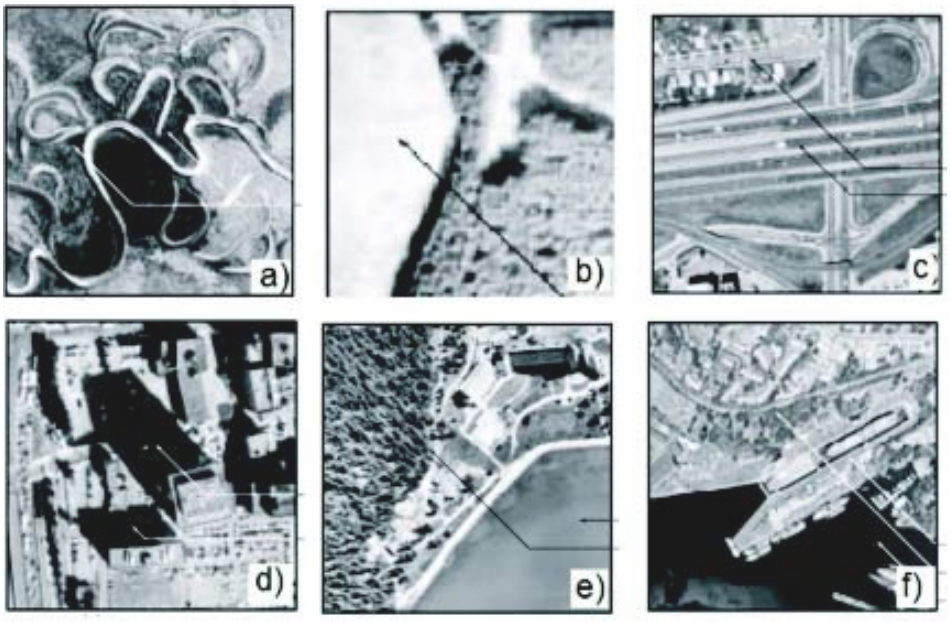


**Fig. 7.3: Identification characters used in the image interpretation of the aerial photographs. (a) Shape - U-shaped ox bow lake, (b) pattern forest area, (c) size and shape, (d) shadow, (e) texture and (f) association (source: http://airphotos.nrcan.gc.ca)**

To interpret aerial photographs, a number of sophisticated instruments such as pocket stereoscope, mirror stereoscope, or plotter are used for measuring area, height and slopes of different parts of the Earth. Stereoscope is used for viewing the area in 3-dimension and is important for determining topographical relief of an area, as well as the height of objects such as trees and building. Stereoscopic imagery is the result of overlap (generally 60%), which is the amount by which one photograph includes an area covered by a neighbouring photograph. For mapping, inventory and vegetation studies, for example, a survey is flown in a series of to-and-fro parallel strips with side overlaps between strips over the entire area. For non-stereoscopic coverage, used in crop sampling or pollution detection, the photographer may choose a 20% forward overlap.

### 7.2.1 Image Interpretation Tasks

The image interpretation procedure is a complex task and requires several tasks to be conducted in a methodical manner which include:

- classification
- enumeration
- mensuration and
- delineation.

**Classification** is the assignment of object, features, or area to the classes based on their appearance on the images. Often the distinctions are made between three levels of confidence and precision namely- detection, recognition and identification. *Detection* is the determination of presence or absence of the feature. *Recognition* implies a higher level of knowledge about a feature or an object such that the object can be assigned identity. And, *identification* means that the identity of an object or feature can be specified with enough confidence and detail to place it in a specific class.

**Enumeration** is the task of listing or counting discrete items visible on an image. **Mensuration** or **measurement** is an important function in many image interpretation problems. Two kinds of measurements are important, first, is the measurement of distance and height, and by extension, volumes and areas as well. A second form of measurement is quantitative assessment of image brightness.

Finally, the interpreter must delineate, or outline, regions as observed on remotely sensed images. The interpreter must be able to separate distinct aerial units that are characterised by specific tones and textures and to identify edges or boundaries. The image analyst may simultaneously apply several of these skills in examining an image. Recognition, delineation and mensuration may all be required as the interpreter examines an image.

### 7.2.2 Prerequisites for Image Interpretation

Now you know that following are the requirements for image interpretation:

- remote sensing system
- knowledge of image and sensor characteristics

- proficiency based on knowledge of the subject and
- adequate familiarity of the geographic region and locality.

*Spend 5 mins*

**Check Your Progress I**

1) How is the aerial photograph different from an ordinary photograph?

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2) What are the advantages of aerial photographs?

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3) Name the types of aerial photographs based on the scale.

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## 7.3 ELEMENTS OF VISUAL IMAGE INTERPRETATION

You have read in the previous section that visual interpretation of aerial photographs involves the study of various basic characteristics of an object. In case of interpretation of satellite images, these characteristics of objects are studied with reference to a single or multiple spectral bands because there are generally more than one images acquired in different spectral regions of electromagnetic spectrum. However, the basic elements are tone, texture, shape, size, pattern, shadow, location and association, similar to those used in aerial photo interpretation. Image interpretations employ combination of the following eight elements (Fig. 7.4):

- tone
- size
- shape
- texture
- association
- shadow
- site and
- pattern.

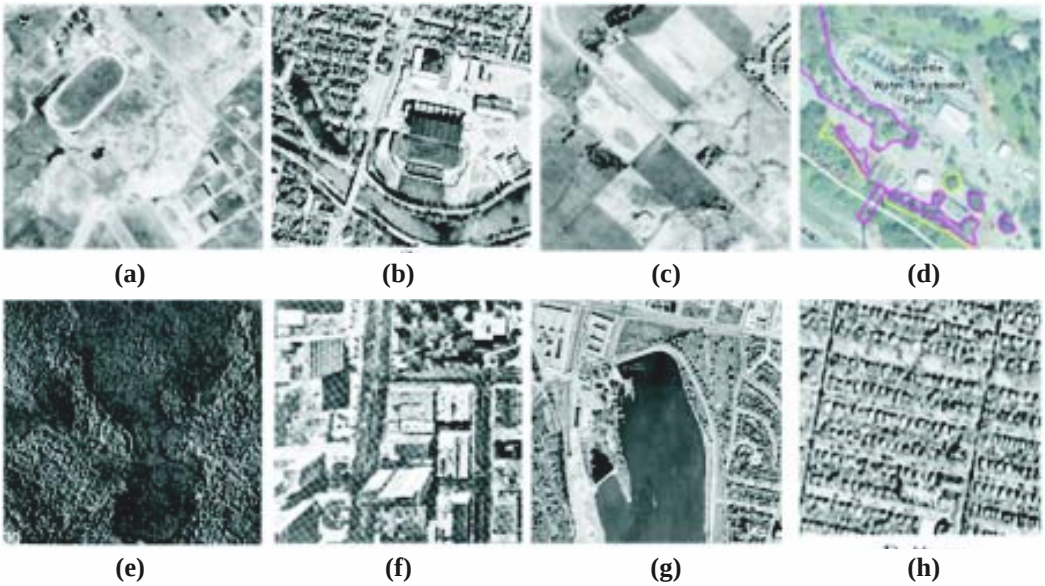


**Fig. 7.4: Representative examples of the eight elements of visual image interpretation. (a) Shape, (b) size, (c) tone, (d) site, (e) texture, (f) shadow, (g) association and (h) pattern (source: http://ccrs.nrcan.gc.ca)**

A systematic study and visual interpretation of satellite images usually involves consideration of two basic elements, namely *image elements* and *terrain elements*. Out of the eight elements listed above, the first seven elements comprise image elements and the 8th element; pattern is the terrain element such as drainage, landform, erosion, soil, vegetation and land-use patterns. These elements are shown in the order of their complexity in Fig. 7.5.

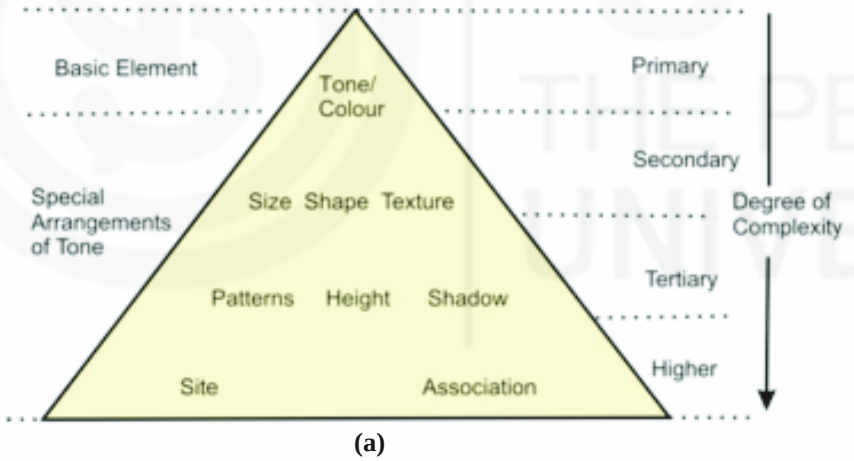


**Fig. 7.5: (a) Ternary plot showing the primary ordering of image elements that are fundamental to the image analysis process and (b) diagrammatic represetation of elements of visual image interpretation (source: http://rst.gsfc.nasa.gov)**

We shall now discuss the elements of image interpretation. Though, they have been discussed with examples separately under different subsections but you should frequently refer to Fig. 7.4, while reading the forthcoming subsections.

### 7.3.1 Tone

Tone refers to the colour or relative brightness of an object in colour image and the relative and quantitative shades of gray in black and white image. As studied earlier, the tonal variation is due to the reflection, transmission or absorption characteristic of an object. This may vary from one object to another and from one band to another. Tone is one of the most basic elements because it is difficult to discern other elements without tonal differences.

In general, smooth surface tends to have high reflectance than rougher surface with less reflectance. Tone in aerial photographs is influenced by the following factors:

- light reflectivity of the object
- angle of reflected light
- the geographic latitude
- type of photography and film sensitivity
- light transmission of filters and
- photographic processing.

Strong tonal contrasts on satellite imageries are always desirable for better image interpretation. Similarly, in thermal imagery, objects at higher temperature are recorded in lighter tone compared to objects at lower temperature, which appear of medium to darker tone. Similarly, top soil gives dark tone compared to soil containing quartz (silica) sand. In Figs. 7.6 and 7.7, which show colour and gray scale images, respectively, you can observe different tones for different features.


**Fig. 7.6: Satellite imagery of Indira Gandhi National Open University campus at New Delhi. Place mark shows the New Academic Complex (source: www.earth.google.com)**

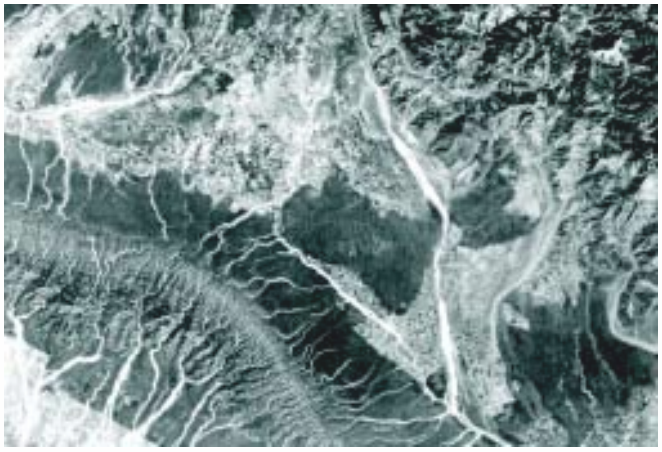

**Fig. 7.7: Satellite image showing Doon valley and surroundings. The drainage patterns and lithological differences can be clearly observed (source: Rao, 2002)**

### 7.3.2 Size

Objects can be misinterpreted if their sizes are not evaluated properly. Size of objects in an image is a function of scale hence, the size of objects must be considered in the context of the scale of a photograph/image. Although, the third dimension, which comprises of height of the objects is not readily measurable on satellite images but valuable information can be derived from the shadows of the objects.

Size of an object can be important tool for its identification, in two ways. First, the size of an object or feature is relative in relation to other objects on the image. This is probably the most direct and important function of size, as it provides the interpreter with an intuitive notion of the scale and resolution of an image even though no measurements or calculations may have been made. This role is achieved by recognition of familiar objects like dwellings, highways and rivers as shown in Fig. 7.8. Second, absolute measurement can be equally valuable as interpretation aids. You should remember that size of an object in an image depends on the scale and resolution of the image.

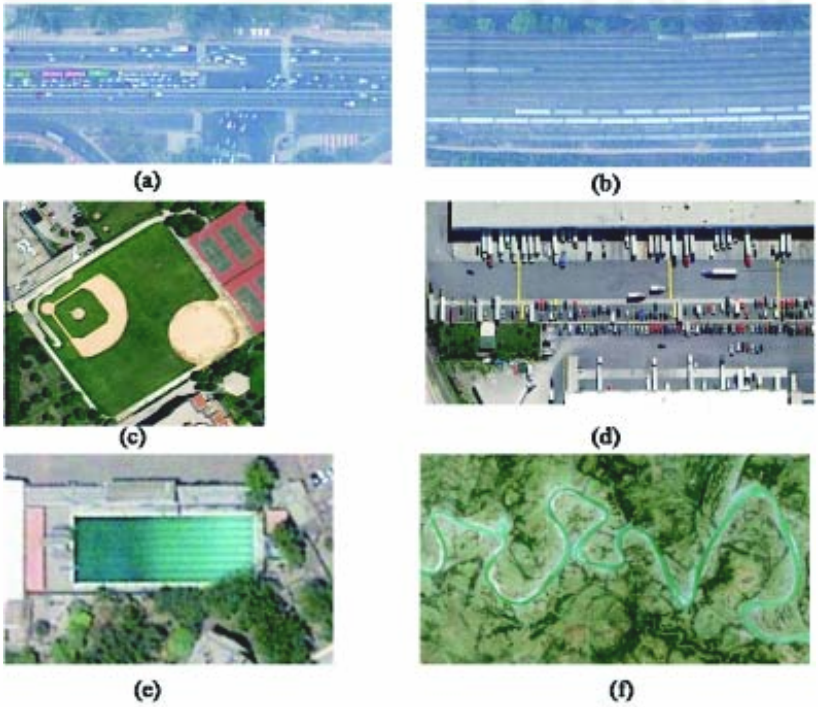


**Fig. 7.8: Variation in size and shapes in the images provides clue for different objects. (a) Automobiles, (b) railway track, (c) baseball court, (d) trailer, (e) swimming pool and (f) a meandering river (source: www.earth.google.com)**

### 7.3.3 Shape

Shape relates to the general form, configuration or outline of an individual object. Shape is one of the most important single factors for recognising objects from images (Fig. 7.8a-e). Regular geometric shapes are usually indicators of human presence and use. Similarly, irregular shapes are usually indicators of natural objects as shown in Fig. 7.8f. Some objects can be identified almost solely on the basis of their shapes. For example, a railway line is usually readily distinguished from a highway or an unmetalled road because its shape consists of long straight tangents and gentle curves as opposed to the shape of highway as shown in Fig. 7.8b. You should remember that shape of an object viewed from above may be quite different from its profile view. For planar objects, it is easier to calculate the areal dimensions on imagery e.g., river as shown in Fig. 7.8f. Features in nature often have such distinctive shapes that shape alone might be sufficient to provide clear identification e.g., beach, ponds, lakes and rivers occur in specific shapes unlike others found in nature.

### 7.3.4 Texture

Texture is an expression of roughness or smoothness as exhibited by the images. It is the rate of change of tonal values (frequency of tonal changes). Texture signifies the frequency of change and arrangement of tones in an image and is produced by an aggregate of unit features too small to be clearly recognised individually on an image.

Texture can be expressed qualitatively as coarse, moderate, fine, very fine, smooth, rough, rippled and mottled. It is rather easier to distinguish various textural classes visually than in the digital oriented techniques. Texture is, thus, dependent upon tone, shape, size, pattern, and scale of the imagery, and, is produced by a mixture of features that are too small to be seen individually. For example, grass and water generally appear ‘smooth’ while trees or a forest canopy may appear ‘rough’ as shown in Fig. 7.8e.

### 7.3.5 Association

Association is occurrence of features in relation to its surroundings. Sometimes a single feature by itself may not be distinctive enough to permit its identification. It specifies the occurrence of certain objects or features in association of a particular object or feature.

Many features can be easily identified by examining the associated features. For example, a primary school and a high school may be similar flat roofed building structures but it may be possible to identify the high school by its association with an adjacent football field.

### 7.3.6 Shadow

Shadow is an especially important clue in the interpretation of objects in the following two ways:

- the outline or shape of a shadow provides a profile view of objects, which aids in image interpretation and

- objects within shadow reflect little light and are difficult to discern on image, which hinders interpretation.

Taller features cast larger shadows than shorter features as observed in Fig. 7.9. Military image interpreters are often primarily interested in identification of individual items of equipment. Shadow is significant in distinguishing subtle differences that might not be otherwise visible.


**Fig. 7.9: Taller objects such as the Qutub Minar cast larger shadow than smaller objects such as buildings and trees (source:earth.google.com)**

### 7.3.7 Site

Site refers to the topographic position, for example, sewage treatment facilities are positioned at low topographic sites near stream or rivers to collect waste flowing through the system from higher locations. The relationship of feature to the surrounding features provides clues towards its identity. You can also consider the example of certain tree species located in areas of specific altitudes. Similarly, identification of landforms can help in deciphering the underlying geology. Often many of the rock types have distinct topographic expressions, for example, some kinds of sedimentary rocks are typically exposed in the form of alternating ridge and valley topography.

### 7.3.8 Pattern

You have read about the seven image elements. It is now time to discuss about the terrain element which is also a significant element in image interpretation. The terrain elements include drainage, topography/landform, soil, vegetation and land use planning patterns.

Pattern develops in an image due to spatial arrangement of objects. Hence, pattern can be defined as the spatial arrangement of objects in an image. Certain objects can be easily identified because of their pattern. A particular pattern may have its genetic relation with several factors of its origin. For example, urban and rural settlement areas can be easily identified based on the patterns created by the rows of houses or buildings. Similarly, drainage pattern

have orderly association with the underlying lithology, structure, soil texture and hydrological characteristics of the ground and hence provide clues about them (Fig. 7.7).

The drainage patterns and texture seen on images are good indicators of landform and bedrock type and also suggest soil characteristics and drainage condition. For example, dendritic drainage is most common drainage pattern found in nature which is developed regions of homogeneous rocks.

Landform patterns may be regional, for example, long ridges and valleys correspond to resistant and non-resistant rocks which together develop into ridge and valley patterns.

Soils also have a distinct pattern. Generally, fine textured, poorly drained soils are dark in colour due to higher water content whereas coarse textured soils, which are well drained are light in colour. Similarly, vegetation correlated to certain rock types could help in determining the lithology in an area.

The changes brought about in land use planning and pattern with time can be carefully monitored which can provide information about the land use pattern. Images of different years mentioned in Fig. 7.10 give you information about the land use planning in the area. You can observe the effects of urbanisation in this figure and evaluate the agricultural fields that have been converted to human settlements.

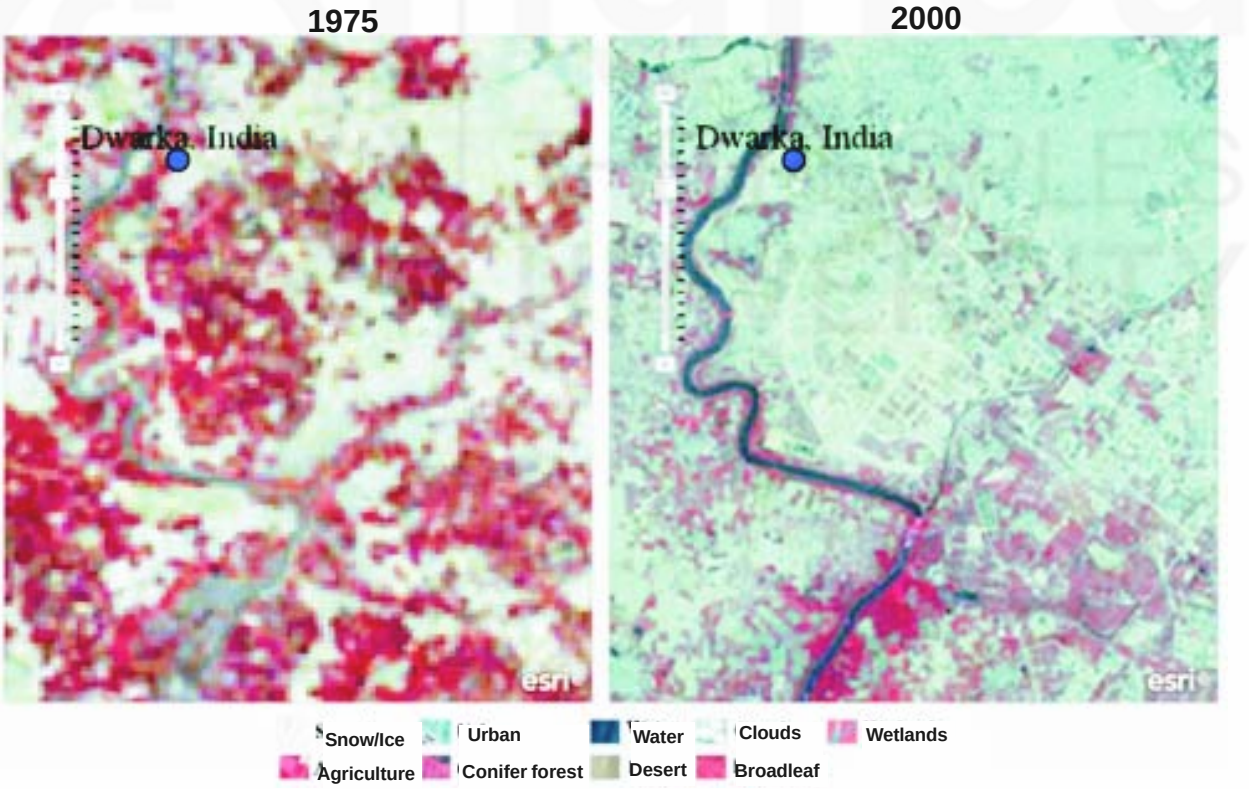


**Fig. 7.10: Monitoring land cover change over time. Here you can see agricultural field as observed in the image of year 1975 has been converted to human settlements in 2000 (source: http://changematters.esri.com/compare)**

The image interpretation elements discussed above and the typical adjectives and terms associated with them are summarised in Table 7.2.

**Table 7.2: Typical adjectives associated with interpretation elements (source: Bhatta, 2010)**

| Element | Common adjectives (quantitative and qualitative) |
|---|---|
| Location | x,y coordinates: longitude and latitude or meters, easting and northing in a map grid |
| Size | Length, width, perimeters, area: small, medium (intermediate) and large |
| Shape | An object's geometric characteristics: linear, curvilinear, circular, elliptical, radial, square, rectangular, triangular, hexagonal, pentagonal, amorphous, etc |
| Shadow | A silhouette caused by solar illumination from the side |
| Tone/colour | Gray tone: light (bright), intermediate (gray), dark (black)<br>colour = intensity, hue, saturation |
| Texture | Characteristics placement and arrangement of repetition of tone or colour; smooth, intermediate (medium), rough (coarse), mottled, stippled |
| Pattern | The spatial arrangement of objects on the ground; systematic, unsystematic or random, linear, curvilinear, rectangular, circular, elliptical, parallel, centripetal, serrated, striated, braided |
| Height/depth/ volume/aspect | Z-elevation (height), depth (bathymetry), volume, slope, aspect |
| Site/situation/ association | Site: elevation, slope, aspect, exposure, adjacency to water, transportation, utilities<br>Situation: objects are placed in a particular order or orientation relative to one another association: related phenomena are usually present |

**Check Your Progress II**

1) What are various elements of visual image interpretation? ***Spend 5 mins***

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## 7.4 IMAGE INTERPRETATION KEYS

Now we will discuss about the *interpretation key.* It is the criteria for identification of an object with interpretation elements. Image interpretation depends on the interpretation keys which an experienced interpreter has established from prior knowledge and the study of the current images. Generally, standardised keys must be established to eliminate the differences between different interpreters. Image interpretation keys can be graphic and/or textual. They aid in identifying thematic classes from image feature characteristics. You will find that it is necessary at the beginning of a project, to design and construct a key to be employed in a specific study.

Basically, interpretation keys can be one of two generic types: selective and elimination keys. ***Selective keys*** contain numerous example images with the supporting text. The interpreter selects the example that most closely resembles the feature or condition found on the image being studied. ***Elimination keys*** are composed of word descriptions ranging through various levels of broad to specific characteristic discrimination. Interpretation proceeds

step by step from general to specific and leads to elimination of all features or conditions except the one being identified. Elimination key often takes the form of dichotomous key. In ***dichotomous keys***, interpreter makes a series of choices between two alternatives and progressively eliminates all but one possible answer. The analyst progresses down through this hierarchy, making choices at branching description paths. Finally, objects are identified by the process of elimination.

For your understanding sample interpretation keys for forest mapping are given in Table 7.3 which have been standardised by the Japan Association for Forestry. The interpretation keys are specified with respect to the crown's shape, rim shape of the crown, tone, shadow, projected tree shape, pattern, texture and other factors.

**Table 7.3: An example of interpretation keys for forest mapping, Japan Association of Forestry (source: http://stlab.iis.u-tokyo.ac.jp/~wataru /lecture/rsgis/rsnote/cp7/t7-5-1.gif)**

| Feature | Tone | Crown shape | Edge of crown | Pattern | Texture |
|---|---|---|---|---|---|
| **Cedar** | Dark | Conical with sharp spear | Circular and sharp | Spotted grain | Hard and coarse |
| **Cypress** | Dark but lighter than cedar | Conical with round crown | Circular | Spotted | Hard and fine |
| **Pine** | Light and unclear | Cylindrical with shapeless | Circular but unclear | Irregularly spotted | Soft but coarse |
| **Larch** | Lighter than cypress | Conical with unclear crown | Circular with unclear edge | Spotted | Soft and fine |
| **Fir/spruce** | Dark and clear | Conical with wider crown | Circular with zigzag edge | Irregular | Coarse |
| **Deciduous** | Lighter | Irregular | Unclear | Irregular | Coarse |

Table 7.4 shows an example of an interpretation key for land cover mapping with Landsat MSS images in the case of single band images and colour images with different band combinations.

**Table 7.4: A sample of image interpretation keys used for interpreting for landcover mapping (source: http://stlab.iis.u-tokyo.ac.jp/~wataru /lecture/rsgis/rsnote/cp7/t7-5-2.gif). PW-Pure White, W-White, DRG-Dark Gray, R-Red, B-Blue, P-Pink, G-Green, LB-Light Blue, RP-Reddish Purple, GR-Gray, BL-Black, BY-Brandish Yellow and BP-Bluish Purple**

| | Band 4 | Band 5 | Band 6 | Band 7 | 457 (BGR) | 457(RGB) |
|---|---|---|---|---|---|---|
| **Snow** | PW | PW | PW | PW | PW | PW |
| **Cloud** | W | W | W | W | W | W |
| **Haze** | W | W | — | — | W | W |
| **Forest** | DGR | BL | W | W | R | G |
| **Grass** | GR | DG | W | W | P | BY |
| **Bare land** | GR | W | W | W | W | W |
| **Wet land** | GR | W | GR | DGR | LB | RP |
| **Urban** | GR | W | GR | DGR | LB | RP |
| **Water** | DGR | BL | BL | BL | B | BP |
| **Shadow** | BL | BL | BL | BL | BL | BL |

## 7.5 IMAGE SCALE

Scale is a prerequisite at the time of interpretation as it effects interpretation of image features. The scale of the image is carefully chosen depending upon the observations to be made. Scale of photograph/image should be such that it will permit differentiation of objects. For regional scale mapping, we need not choose data of very high resolution. For example, mapping the forest cover of national or state level you require data which has coarse to medium spatial resolution such as the WiFS or LISS III. Similarly, for mapping at local scale you require high spatial resolution data such as Cartosat PAN, IKONOS, etc.

You should remember that the choice of an appropriate scale for a particular application depends on several factors such as level of information desired, method of analysis to be used and spatial resolution of the data.

## 7.6 MINIMUM MAPPING UNIT

Maps derived from remotely sensed data are often presented using a minimum mapping unit (MMU). ***MMU*** is defined as the smallest size areal entity on the ground that can be identified in image and mapped as a unique and discrete entity. For a given map scale, the size or dimension below the MMU, a long narrow feature is represented as a line and a small area as a point. For example, streams and rivers below the MMU will be represented as lines and a pond as a point.

A key issue when generating a map from remotely sensed data is the selection of the MMU to be employed, which determines the extent of detail conveyed by an interpreter in the map. Selection of a MMU allows reducing the visual and spatial complexity of the information contained in the map, especially when the information corresponding to the smallest patches is of little or no interest to the interpreter for the theme for which the map is being generated (Davis and Peet, 1977).

## 7.7 ACTIVITY

Visit different parts of your city or village and observe various features such as park, schools, government offices, bus stand/railway station and shops / shopping malls. Make a record of the features observed on a particular route. Open Google Earth and bring the image to a suitable scale. Now try to identify same features on the same route and note the observations. Repeat the activity on different scale and compare how the features appear in different scales.

## 7.8 SUMMARY

Let us now summarise what has been discussed in this unit:

- Image interpretation is the process of extraction of information both qualitative and quantitative from aerial photographs and satellite images in the form of a map. This technique is used to collect information for a variety of purposes.

- Image interpretation is carried out either manually or with the help of computer software and is known as visual and digital interpretation, respectively.
- Visual interpretation is a process of identifying features seen on photographs/images and communication of information obtained from them to others for evaluating their significance.
- The information extraction from aerial data (i.e. photo interpretation) is based on the characteristics of photograph features, such as size, shape, tone, texture, shadow, pattern, and association. The basic elements of visual image interpretation are similar to those used in aerial photo interpretation.
- The criteria for identification of an object with interpretation elements are called an interpretation keys.

## 7.9 UNIT END QUESTIONS

1) Discuss in brief the elements of visual image interpretation.
2) What do you understand by image interpretation keys?
3) What is the importance of scale in image interpretation?

## 7.10 REFERENCES


- Bhatta, B. (2010), *Remote sensing and GIS*, Oxford University Press, New Delhi
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Information from above mentioned websites was retrieved on 10 February 2011. The last three websites mentioned in the references were accessed on 8 February 2012.

## 7.11 FURTHER/SUGGESTED READING


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- Sabins, F.F. (1987), *Remote Sensing – Principles and Interpretation*, 2nd Edition, W.H. Freeman and Co., San Francisco.
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## 7.12 ANSWERS

**Check Your Progress I**

1) The aerial image differs from everyday photographs in the following aspects: overhead perspective, beyond visible light spectrum and unfamiliar scales and orientation.

2) The advantages of aerial photography are synoptic viewpoint, permanent recording, and capability to stop action, three dimensional perspectives, spectral and spatial resolution, availability and cost effectiveness.

3) On the basis of the scale aerial photographs are classified into large scale photographs, medium scale photographs and small scale photographs.

**Check Your Progress II**

1) Elements of visual image interpretation are tone, texture, association, shape, size, shadow, site and pattern.

**Unit End Questions**

1) Refer to section 7.3
2) Refer to section 7.4
3) Refer to section 7.5