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# The Application of Remote Sensing in the Field of Natural Resources Recognition

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**Abstract**

One the key applications within this project is the operational use of high resolution optical and radar data to confirm conditions claimed by a farmer when he requests aid or compensation. The use of remote sensing identifies potential areas of non-compliance or suspicious circumstances, which can then be investigated by other, more direct methods. As part of the Integrated Administration and Control System (IACS), remote sensing data supports the development and management of databases, which include cadastral information, declared land use, and parcel measurement. This information is considered when applications are received for area subsidies. A proper considerations of analytical factors will help in our effort. As there are various types of rock a photographic representation or guide line is not of much importance. In fact the number and relative effectiveness of geological events and various process (causes) that have acted upon them is of much importance to evaluate such features. This paper concentrate on the recognition of natural resources with the help of the Aerial photographic study.

**Keywords:** 1. Remote Sensing 2. Photograph 3.Natural resources.
**Sub Area** :**Remote Sensing**
**Broad Area** : **Civil Engineering, Engineering**.

**Introduction**

For the purposes of this course, we will use the following general definition: "Is the technology of measuring the characteristics of an object or surface from a distance".

In the case of earth resource monitoring, the object or surface is on the land mass of the earth or the sea, and the observing sensor is in the air or space.In order for an observing sensor to acquire knowledge about remote object, there must be a flow of information between the object and the observer. There has to be a carrier of that information. In our case, the carrier is the electromagnetic radiation (EMR). Hence, the main elements in the process of data collection in remote sensing are the object to be studied, the observer or sensor, the EMR that passes between these two, and the source of the EMR.The process of remote sensing involves an interaction between incident radiation and the targets of interest. The figure above shows the imaging systems where the following seven elements are involved. Note, however that remote sensing also involves the sensing of em**itted energy and the use of non-imaging sensors.**

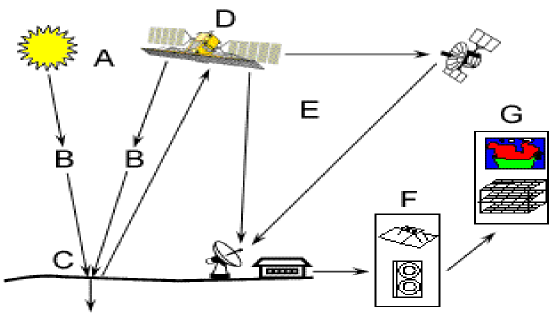


**Figure : Electromagnetic Remote Sensing of the Earth Surface**

Remote sensing is a technique by which collection of information about any object on the earth surface by recording device that is not in physical contact with it. This technique is usually restricted to mean methods that record reflected or can say radiated electromagnetic energy, rather than methods that that involve significant penetration beneath(in to) the earth. With the help of Remote sensing technique, taking photograph [aerial photograph] and interpret it. In fact geological studies are mostly dependent on the field and lab studies , but aerial photo explaination provides sufficient informative data. The stereoscopic examination of aerial photographs makes possible the identification, selection, demarcation and delineation of lithographic units and enables to establish the stratigraphic sequence. Black and white photographs several standard such as tone, texture, landform, topographic expression, slope, drainage pattern and texture, soil, vegetation, mode of weathering and surface features help in the identification of rocks.

**Theory of Application of Remote Sensing**

Aerial photographs as well as satellite imageries occur with the implementation of remote sensing with employing electromagnetic energy as the means of measuring any detection, target or objects character. It has applicability to various fields because of Four-Fold reasons:

1. It provides a permanent record of any objects at any moment of time to the observer.
2. Characteristics feature of Any object which is not visible, can transformed into image clearly.
3. Certain types of aerial photographs and imagery can provide a **3-D** view clearly.
4. It represents a relationships among larger area of Earth from a perspective view and provide a format by which we can study of any objects.

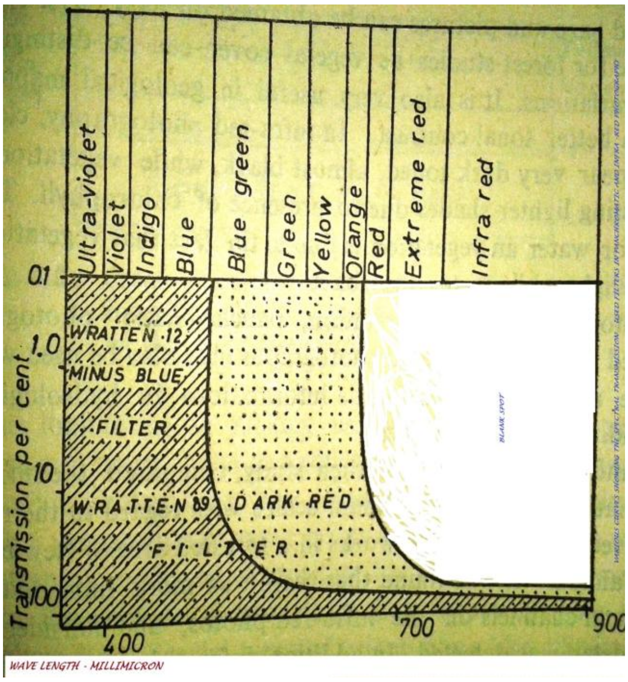


Fig-1

**Calculation and Estimation of natural Resources**:

On the vertical aerial photograph, scale is as follows:

S = f/h : f=Focal length of the camera lens.

h= Flying height over the datum line.

Take an example, if in any aerial photography f = 6 inches[6"] and H = 15,000 feet, the scale will be develop as:

S = f/H => 6 inches/15000feet

Now change the all measurement in same unit, final result will come out: 1/ 30000 or 1: 30,000

This scale is expressed as a fraction always and known as representative fraction or ratio.

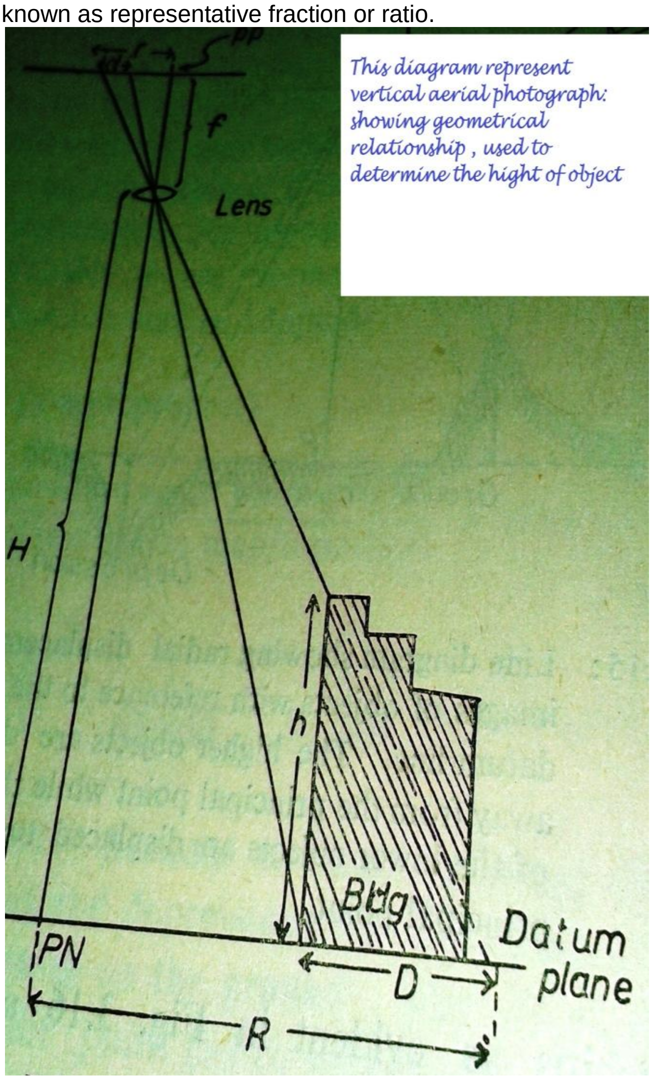


**Fig-2: Plane of Photograph**

In the aerial photograph, to determine the vertical height of any point of any object, is very simple with the formula **d = h x r / H . [This relationship comes from relief displacement equation, h/H = D/R=d/r]**

For example [see Fig-2] is known to be 4000 feet, r is measured as 0.025 ft and d is measured as 0.0012feet, the height of the building is determined as follows:

h = 4000 feet x 0.0012feet / 0.025 feet.

=192 Feet.

Thus, the volume of ores/ minerals can be determined by the help of its length, breadth and vertical height of each section of mineral/ore zone.

**Systems of identification of rock types**:

1. “KEY” System: This is the most commonly used system. In this a set of photographs of known lithology is used to compare with those to be identified.
2. Systematic study of a photographic feature: This is done in terms of several aspects that are previously unknown made known, on the photographs.Variation in mineral and physical composition are the causes of surface slope, drainage types, differential topography, detail surface features, weathering colors, vegetations and general character.

   Natural resource management is a broad field covering many different application areas as diverse as monitoring fish stocks to effects of natural disasters (hazard assessment).

Remote sensing can be used for applications in several different areas, including:

i Geology and Mineral exploration
ii Hazard assessment
iii Oceanography
iv Agriculture and forestry
v. Land degradation
vi. Environmental monitoring,…

Each sensor was designed with a specific purpose. With optical sensors, the design focuses on the spectral bands to be collected. With radar imaging, the incidence angle and microwave band used plays an important role in defining which applications the sensor is best suited for.

Each application itself has specific demands, for spectral resolution, spatial resolution, and temporal resolution.

For a brief, spectral resolution refers to the width or range of each spectral band being recorded. As an example, panchromatic imagery (sensing a broad range of all visible wavelengths) will not be as sensitive to vegetation stress as a narrow band in the red wavelengths, where chlorophyll strongly absorbs electromagnetic energy.

Spatial resolution refers to the discernible detail in the image. Detailed mapping of wetlands requires far finer spatial resolution than does the regional mapping of physiographic areas.

Temporal resolution refers to the time interval between images. There are applications requiring data repeatedly and often, such as oil spill, forest fire, and sea ice motion monitoring. Some applications only require seasonal imaging (crop identification, forest insect infestation, and wetland monitoring), and some need imaging only once (geology structural mapping). Obviously, the most time-critical applications also demand fast turnaround for image processing and delivery - getting useful imagery quickly into the user's hands.

Let as consider an application, in concrete the use of remote sensing in the forest inventory. Forest inventory is a broad application area covering the gathering of information on the species distribution, age, height, density and site quality.

For species identification, we could use imaging systems or aerial photos.

For the age and height of the trees, radar could be used in combination with the species information assessed at a first stage.

Density is achieved mainly by an optical interpretation of aerial photos and/or high-resolution panchromatic images.

As for site quality, is one of the more difficult things to assess. It is based on topological position, soil type and drainage and moisture regime. The topological position can be estimated using laser or radar. However, the soil type and drainage and moisture regime could be more profitably collected using ground data.

**Aerial Photographic Character**

**Infra-red:** The suitability of aerial Infra-red photograph concerned with water-vegetation discrimination, records special characters with red and infra red part of the spectrum.

**Color Infra-red:** The suitability of Color Infra-red aerial photograph with studies of plant and crop diseases, land-water-vegetation discrimination and water pollution etc. This records spectral colors and infra-red in combination resulting in false colours.

**Color:** The suitability of Color aerial photograph with studies for more detailed investigation in mineral prospecting, forestry, agriculture , industry, town planning etc. This records all the reflections of visible spectrum in color or near natural colors[Fig.-1].

**Panchromatic:** The suitability of panchromatic aerial photograph with studies of general photo interpretation. This aerial photographs records reflections of visible spectrum.

**Radar Imagery:** The suitability of Radar Imagery aerial photograph with studies about topographic knowledge , morpho-tectonic studies and general conditions of ground. This aerial photograph records reflections of radar waves.

**Spectrazonal:** The suitability of spectrazonal photograph presents different parts of the spectrum suited to different aspects of studies and records only the selective part of of the spectrum.

**Thermal infra-red Imagery:** The suitability of Thermal Infra-red aerial photograph with studies involving temperature variation like geothermal studies, water pollution etc. Thermal Infra-red aerial photograph records only Thermal Infra-red emissions of objects.

**Explainations to the standard of Lithology**

There are as under:

**Unlikelyness of topography:** It is more understandable on aerial photos than on the spot or in the fields. Topography refers to the level of the land. The difference in level is because of differences in resistances and binding capacities between the rock constituents. It is because of this nature tough rocks like sandstones, quartzites granites make higher levels but the week rocks like clays and shales from lower levels.

**Slope of Surface**:

This also gives valuable informations with references to underlying materials. Harder rocks form steeper slopes , sandstone forms cliffs but shale forms lower angle slope.

On the other hand climate is an important factor in affecting the topography . Just

as lime stone in wet climate forms depressed topography while it is tough in dry

climate. Some igneous rocks also exhibit the same nature.

**Drainage:**

The drainage capacity of rocks of two types

(a) Macro drainage: It is like a surface drainage

(b) Micro drainage: This includes the pattern and textures of the internal drainage character. The internal drainage is a recognizable feature from an aerial photograph.

Impermeable rocks have short and closely formed deepish channels caused by the action of running water e.g. clay form low level land whole vegetation in thinly scattered. But sandstones which have high permeability and a tendancy to form a moving mass of water rather than forming gullies. Drainage texture is also related to spacing of joints and fractures.

**Geometry of Rock Units**:

[The shape and relative arrangement of rocks]

This enables the interpreter to distinguish consolidated form unconsolidated sediments and sedimentary from igneous rocks. Belted topography may be the result of tilted consolidated sediments and irregular. Dykes are generally noted by their forms and pattern. Acid dykes are more resistant while basic dykes are less in humid areas.

**Features of Surface**:

In topographic map this features will appear so small, but this is very important for topographical interpretation from aerial photographs. Various distinctive micro-features marks in this aerial photography for gneiss, gravel, shale, schist, rhyolite, sand-shale, siltstone, basalt, serpentine, granite , lava etc.

**Tone and Color**:

In this section, relative tones play very important role to detection of natural resources.

**Conclusions:**

This paper reveals that interpretation of aerial photographs always been one of the strong indication for the availability of natural resources. So the detail study of aerial photographs brings a broad knowledge and indication of volume of natural resources which presents in any terrain or deposits. Thus this may say that the photointerpretation of aerial and space photographs has to be seems in terms of the spectral characters and properties.

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