Photogeology in Terrain Evaluation (Part – 1)

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Lecture – 07
Photogrammetry and its Significance

Hello everybody welcome back. So, when previous lectures we talked about the brief introduction of remote sensing, importance of photo geology and some part of photogrammetry also. But we would like to have a little more information on the photogrammetry and then we will move ahead when talking about that how to calculate the height of the object. In the previous lectures we talked about that how we can obtain the scale of the photograph from which were taken from the aerial platform either using helicopter or airplane or either if you are using the satellite also.

Now, very quickly we will look at what exactly is the photogrammetry and then we will move ahead in this course.

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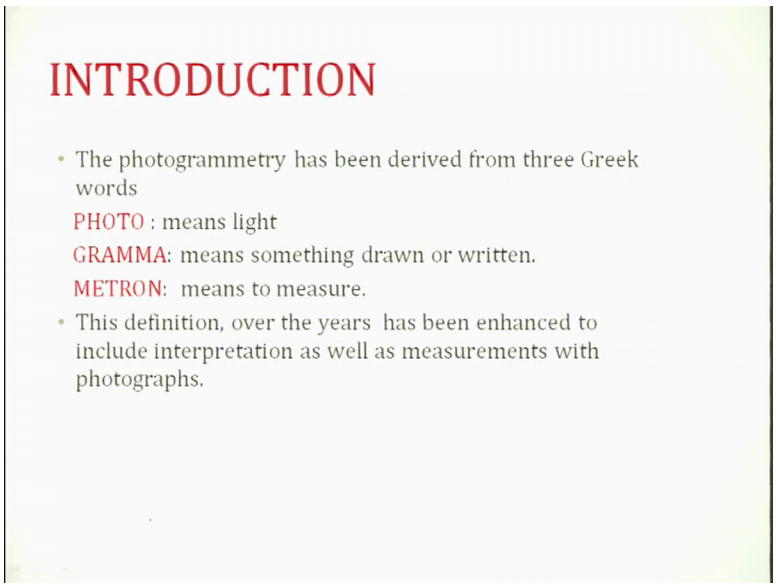

So, just an introduction that the photogrammetry has been derived from three Greek words - one is your photo means light, second is the gramma means something drawn or written, and third is the metron means the measure. So, this is what we will be doing that we will be measuring the objects, the height of the objects using the aerial photographs.

Now, this definition over the years has been enhanced to include interpretations as well as measurements with photographs, so that what we will be doing in this course further ahead.

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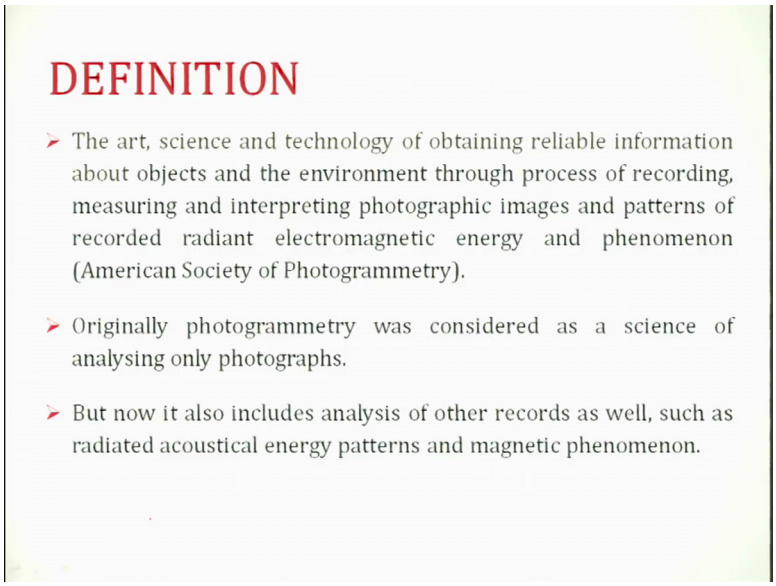

So, if you take in the definition and then we look at that this is the photogrammetry is the art, science and technology of obtaining reliable information about objects and the environment through process of recording measuring and interpreting photographic image and pattern of recorded electromagnetic energy. This we discuss in the first two lectures about the importance of the electromagnetic energy and their phenomena.

So, originally photogrammetry was considered as in science of analyzing only photographs ok, but now it includes analysis of other records such as radiated, acoustical, energy patterns and magnetic phenomena.

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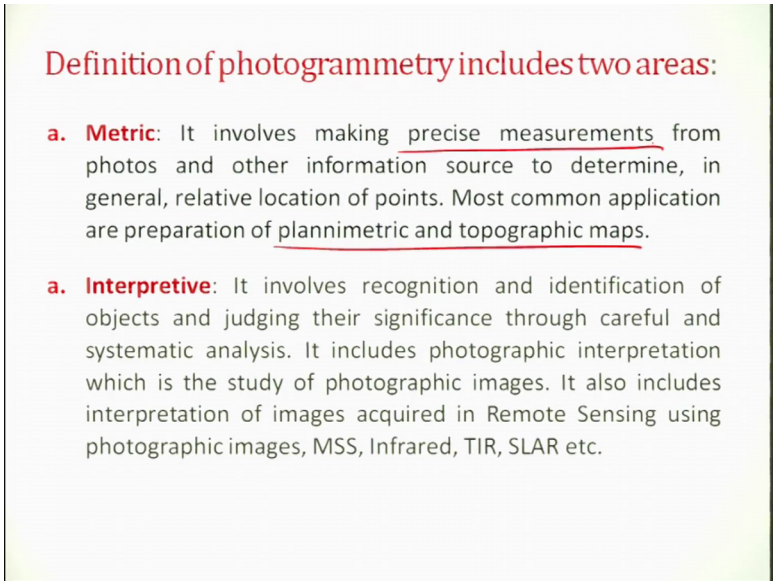

Further this is what is the important part one is symmetric what we call and this involves making a precise measurement from photos. Another information source to determine in general relative location of the point most common application are preparation of plannimetric and topographic maps. So, what we are doing here is that we are doing a precise measurement from the photographs. So, this helps in preparing the topographic maps also.

Then we are having interpretive it involves a recognition and identification of object and judging their significance through careful and systematic analysis. This includes photographic interpretation which is the study of the photographic images, it also includes the interpretation of images acquired in remote sensing using photographic images multispectral data or you are using infrared or thermal infrared or SLAR through those sensors. So, these are the two most important part of the photogrammetry and that is metricand interpretive, where you can use this for preparing the topographic map as well as interpreting the objects or the terrains through careful examination.

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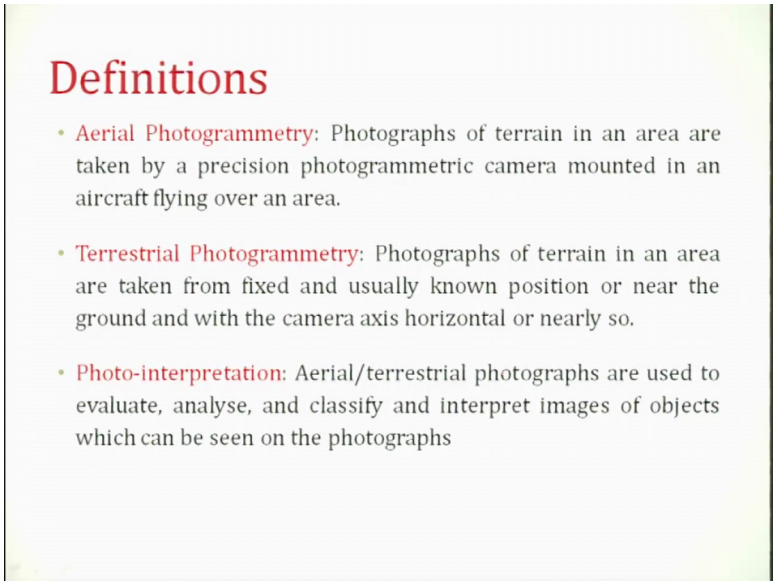

Further, we have aerial photogrammetry. Photographs of terrain in an area taken by precise photogrammetry camera mounted in the aircraft or in the satellite. So, these in the coming lecture will talk about different type of cameras. Then we are having terrestrial photogrammetry. Photographs of the terrain in an area are taken from fixed and usually known position or near the ground with the camera axis horizontal or nearly. So, then we have photo interpretation aerial terrestrial photographs are used to evaluate analyst analyze and classify and interpret images of objects which can be seen on the photograph.

So, there are various like definitions which we have discussed here. So, in short what we are trying to extract from this as one is that we are using the satellite photographs or aerial photographs and through a complete process what we are calling is photogrammetry we are trying to identify the objects, we are trying to extract the information in terms of their size or maybe we can say the height or the elevation of the terrain. So, we are doing precise measurement and that is what we see when this information is transferred on the topographic maps.

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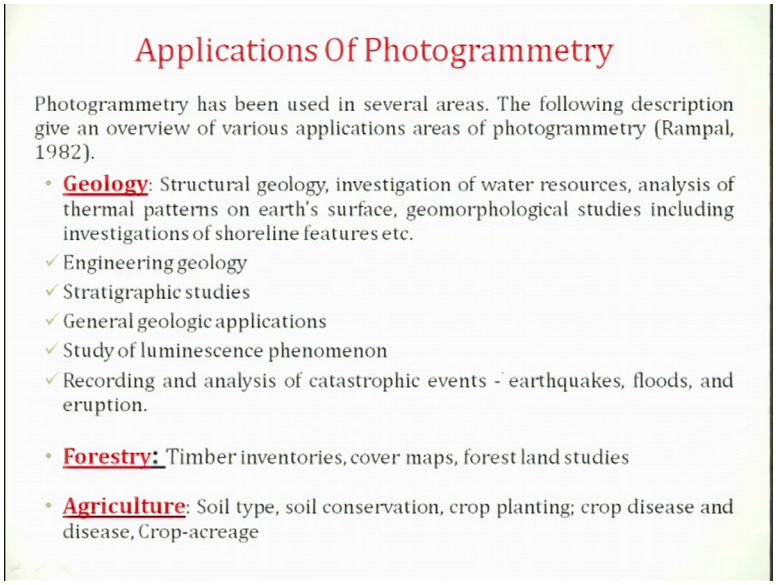

So, application of photogrammetry if you take has been used in several areas the following descriptions are given here. So, one is geology, which is extremely important ok. We say the structural geology investigation, investigation of water resources, analysis of thermal pattern of our surface geo morphological studies including investigation of the shoreline features etcetera ok. Then we are having engineering geology within that we are having stratigraphic studies mainly the exposed letho sections if we are having. Then we are having general geological application, we are having study of luminescence phenomena, recording and analysis of catastrophic events like earthquakes, floods and eruptions, volcanic eruptions mainly.

Then we use this for forestry to understand the forest cover and all that. People have used to come up with an inventory of particular trees also using the aerial photographs taken at different span of time.

You can also use this for agricultural purposes to try to identify the soil type mainly useful soil conservation, crop plantation, crop disease also and crop area which has been covered up. So, this is in short leave as we that we discussed in the beginning in one of the lecture that what is the advantage of aerial photographs and what is the disadvantage of the satellite images. Those aerial photographs you can take at any time and you can try to identify the area of your interest, fly over the area and try to understand the pattern of

either you are looking at agriculture or the forestry or theology. So, basically it helps in evaluating the terrain or we look at actually.

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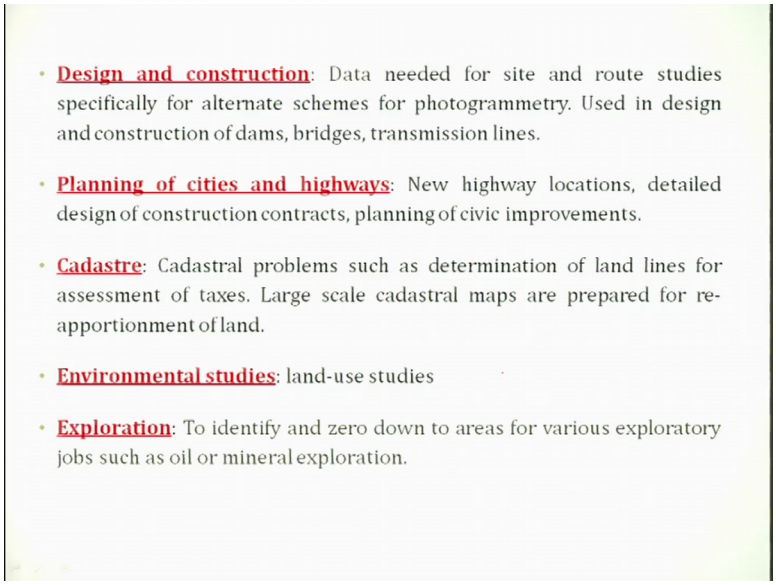

Then design and construction the data needed for site and route studies specifically for alternate schemes for photogrammetry. Used in design and construction of dams, bridges, and transmission lines.

You can also use this information of failure photograph as well as the photogrammetry what you are doing for planning of cities and highways for cadastre, mainly for the taxation. Then environmental studies, land-use studies you can do, provided you are taking the photographs for different time of swan ok. So, you have you can compare it and try to understand that what is the pattern of land use over the time and you can identify how it is growing and whether it is properly growing or not. Then for exploration to identify and zero down to the two areas for various exploratory jobs such as oil and mineral exploration, these are also carried out using aerial photographs.

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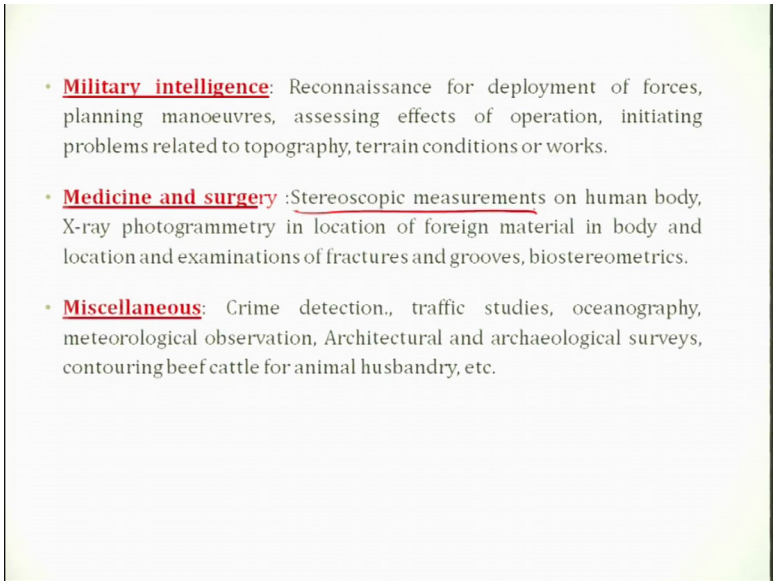

Then for military purposes. Now, the question comes is that how you can fly solo and try to look for or do the recognitions of the for the deployed forces, but in this case one can use the high resolution satellite photos to identify the locations of their deployed forces.

Then for medicine and surgery. So, this is again very important when stereographic measurements, this will be coming in the next coming lectures where we will be talking about the, what is stereoscopy and how we are using the stereo scopes to look the terrain in three dimension ok. So, this is another one which has been used for, again this is in part of the photogrammetry actually because the stereographic images or viewing any portion of your interest in three dimension will help you in identifying the depth either if it is the any area is undulating, then you will be able to identify the depth you will be identify, you will be able to identify that relief of the area and even you can carry out the measurements of the particular object. So, this plays an important role in medicine and surgery.

Then miscellaneous either you are using this photographs for crime detection, traffic studies, oceanography, meteorological observation, architectural and archaeological surveys, contouring beef cattle for animal husbandry etcetera. Provided as I have been telling you from the beginning provided you take the photographs from time to time that will help you in identifying either the land-use pattern either you are using for military purposes or for any miscellaneous purpose.

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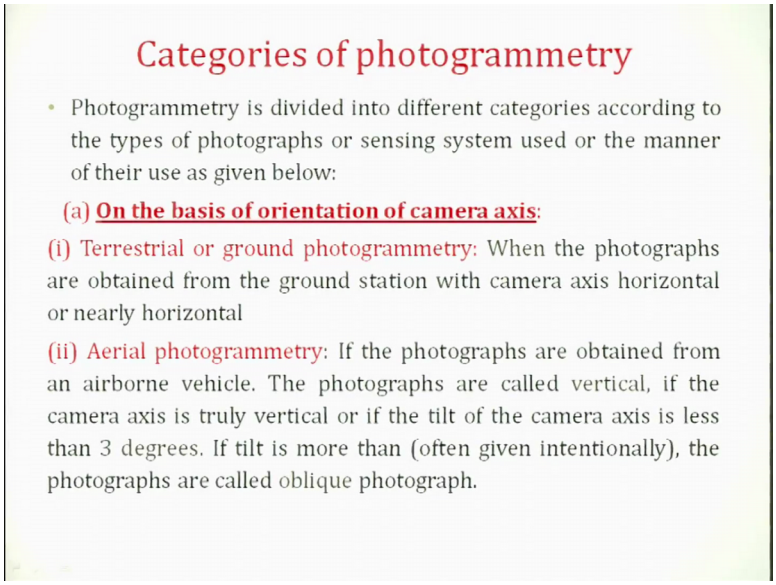

Now, the categories of photogrammetry if we take it is divided into different categories according to the type of photographs and senses or we can say the sensing systems used or the manner of their use as even below. One is on the basis of the orientation of the camera axis. So, terrestrial or ground photogrammetry: when the photograph is obtained from the ground station with camera access horizontal or nearly horizontal.

Then we have the aerial photogrammetry, if the camera or the photographs are taken or obtained from an airborne vehicle either it is helicopter or a small aircraft or a satellite images then we will call that as in satellite photogrammetry ok. But this is an aerial, so either you are using flying very low not at very higher elevation. So, the photographs are called vertical if the axis of the camera is truly vertical of or it has a tilt of less than three degrees this we discuss in the previous lecture also. And if the tilt is more then we classify that as an oblique photograph and this can be high angle oblique or low oblique photographs ok.

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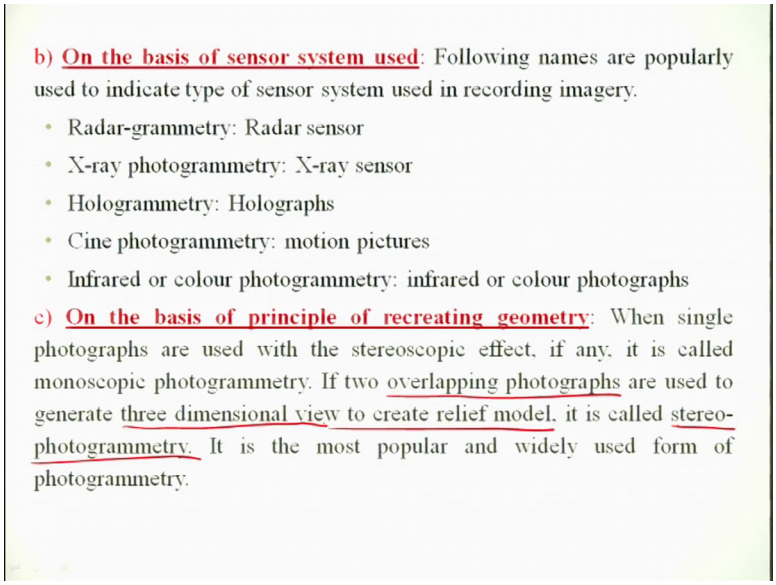

So, on the basis of the sensor system used following names are popularly used to indicate type of sensor system used in recording image raised ok. Radar-grammetry used in radar sensor X-ray, sensors X-ray photogrammetry and hologrammetry using holographs, cinephotogrammetry motion pictures which we see and watch the movies. Infrared or colored photogrammetry using infrared of colored photographs.

On the basis of the principle of recreating geometry: when single photographs are used with the stereographic effect if any it is called monoscopic photogrammetry ok, if it is an single photograph. If two overlapping programs are used to generate three dimensional view that is for creating your relief model it is termed as stereo photogrammetry. So, this what we are going to do. We are going to use the overlapping photographs for generating three dimensional view to really create the relief model ok it is most popular and widely used for photogrammetry.

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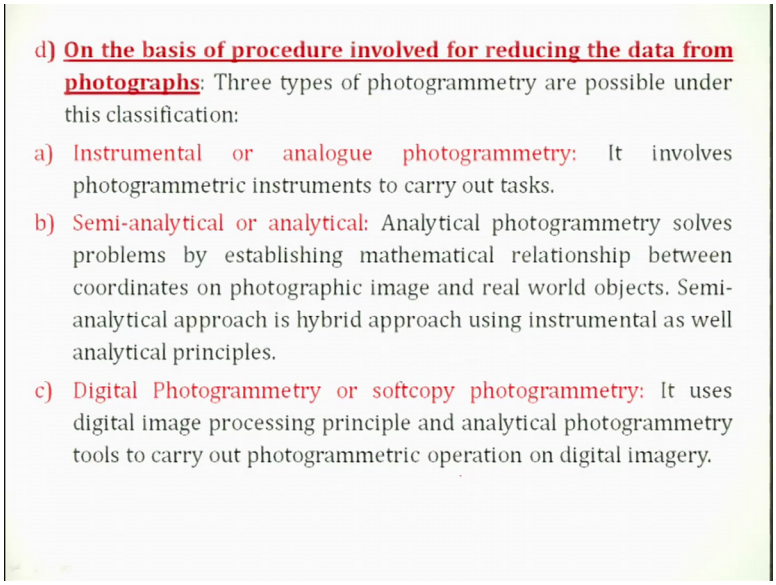

So, on the basis of the procedure involved for reducing the data form three type of photogrammetry are possible under this classification. One is your instrumental or analog photography, it involves photogrammetric measurements to carry out tasks. Second is semi analytical or analytical, this photogrammetry solves problem by establishing mathematical relationship between the coordinates of the photograph and real world objects ok. So, this approach is hybrid approach using instrumental as well as analytical principles. Then third one is your digital photogrammetry, it uses digital image processing principles and analytical photogrammetry tools to carry out photogrammetric operations on digital imageries. So, these are the few procedures which can be used in photogrammetry. We will be using basically the mostly the first one actually.

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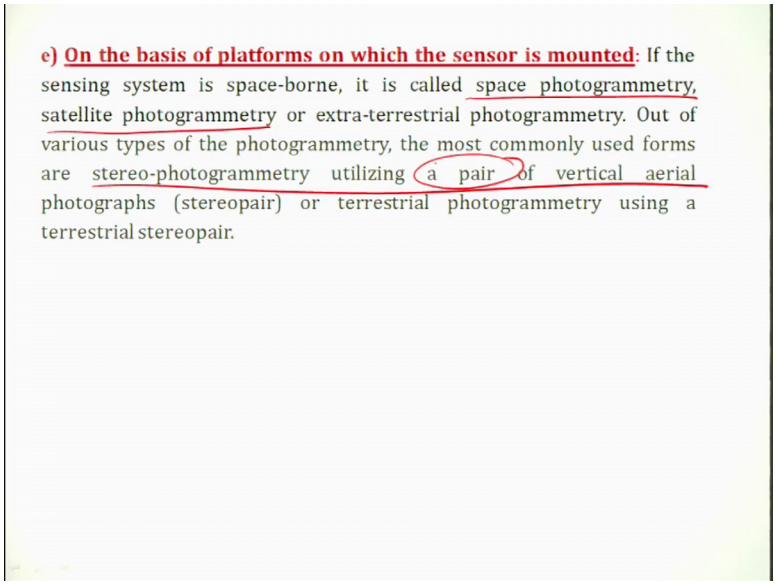

Then there is on the basis of the platform on which the sensor is mounted. If the sensing system is spaceborne it is termed as space photogrammetry or you can also tell that call that as a satellite photogrammetry. Out of various types of photogrammetry the most commonly used form are stereo photogrammetry, utilized in a pair of a vertical photograph. So, if you say pair here then we are having the two photographs of the same terrain taken from different angle.

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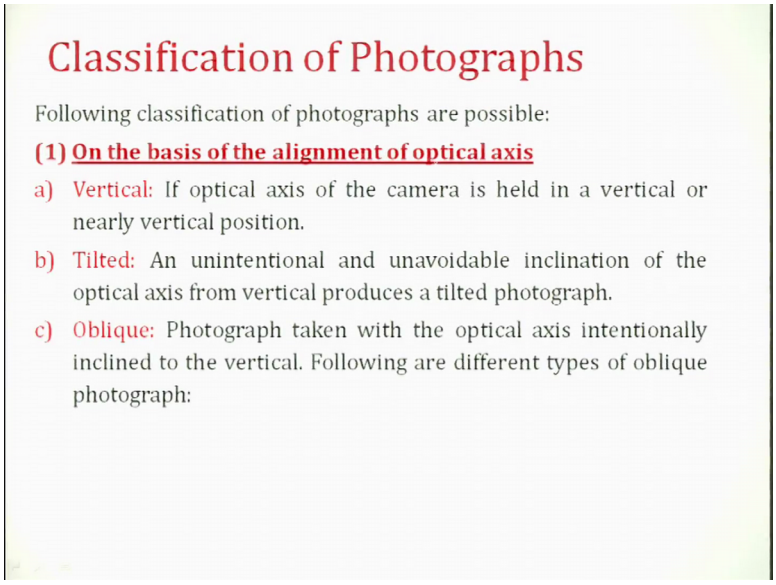

Classification of photographs on the basis of the alignment of optical axis this we have already discussed. So, I will just go ahead.

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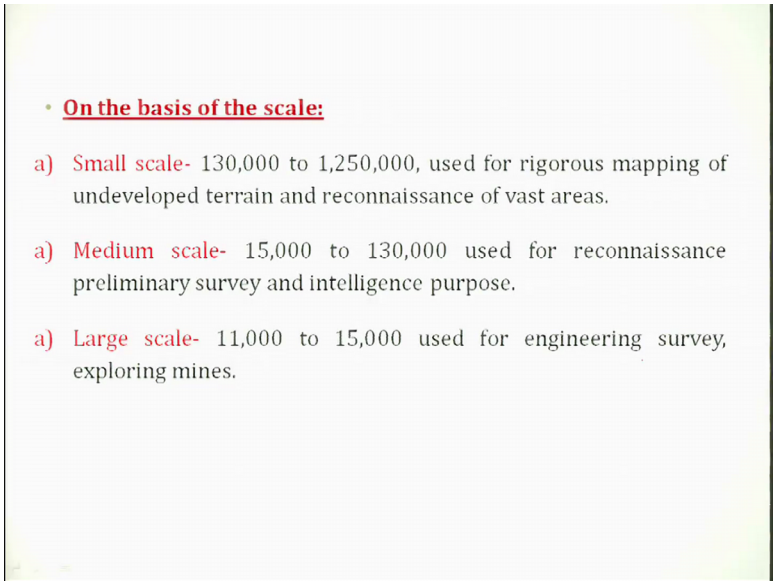

Now, we can have the classification on the basis of the scale also, like small scale medium scale and then your hand large scale photographs ok. And this photographs can be used depending on what you want ok that is user dependent. So, for example, small scale used for rigorous mapping of undeveloped terrain and reconnaissance of the vast area. Medium scale you can use for recognition of preliminary survey and intelligent purposes. Large scale used for engineering survey or exploring mines. So, depending on what is your purpose you can choose the scale.

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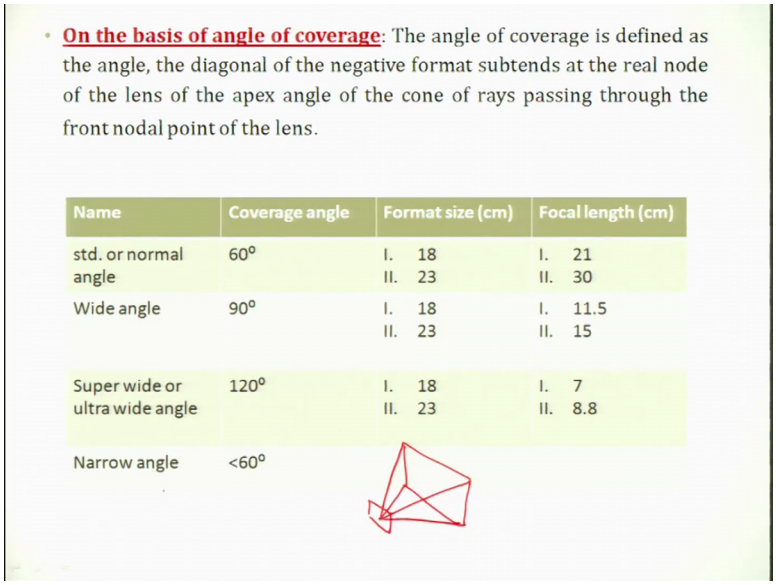

So, this is based on the coverage that is angle of coverage. So, for example, you are having like a lens here and then you are having the area which we are covering so, this is the area which has been taken into consideration for talking about the angle of coverage here. So, you can have normal angle this is the lens which we are talking about wide angle super wide or narrow angle. So, that will cover the wide angle, you will have wider area covered.

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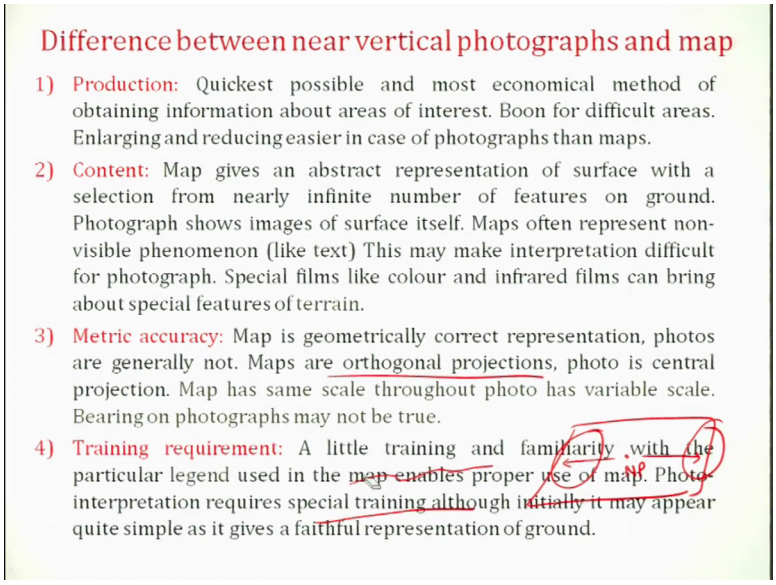

So, difference between near vertical photographs and maps. So, production in terms of production quickest possible and most economical method of obtaining information about area of interest. Boon for difficult areas. Enlarging and reducing easier in case of photograph than maps ok. So, this is the advantage of the aerial photographs ok. So, you can reduce, you can enlarge depending on your interest, where is it is will be difficult to enlarge the maps and reduce the maps. And nowadays we are having all photographs available on our screen that is a digital photographs, so then you can enlarge and reduce depending on your requirement.

Now, content map gives an abstract representation of surface with the selection from nearly infinite numbers of features on ground whereas, photograph shows image of surface itself ok. Maps often represent non-visible phenomena like text ok which we will not be able to see on the photographs. So, in maps basically you will see some texts insert like location names and other information has been given whereas, on the photograph we will not be able to see all this information. It gives just the information of the ground ok. So, text is not like it is non-visible phenomena because when you take the photograph it will not be visible. So, text is not there, text has been added on the map. So, this may make interpretation difficult for the photographs.

Now, spatial films like color and infrared films can bring about spatial features of the terrain ok. So, this is an advantage of the photograph it is compared to the maps here ok. Metric accuracy if you take, map is geometrically corrected photos are generally not, maps areorthogonal projection photo is central projection. So, these are the difference between the in terms of the accuracy.

Maps has or maps will have same scale throughout photo has variable scale. So, this will have because if you, when you are talking about the maps are orthogonal projection then you will have all same scale throughout. So, for example, you are having the map here of this area then all throughout you will have the same scale, whereas in the photograph what we are having the principal point if you are having the vertical photographs or we can say then a dir point, but the photograph scale will be variable on either side. So, one has to take care about that also because the lens through which we have taken this photograph we will have some distortion on the either side. So, this is another problem which is there, but there are few very good advantages and there are a few disadvantages in terms of if you take maps as well as the photographs.

So, we have advantages and disadvantages of aerial photograph as compared to the maps and finally, we are having the trimming requirement in terms of that if you take a little training or the familiarity with the particular legend used in map enables proper use of maps, whereas photographic interpretation requires special training ok. So, this is the way or because in maps mostly you will be able to see a lot of information will be available in legend ok. So, you will be able to understand that what exactly a particular symbol is talking about and you will have also the text on the map which will help you in knowing the locations and all that. But in terms of the photographic interpretations if you take you need in special training ok of how to interpret the landscape. So, you need to have the understanding of the landforms, you need to have the understanding of the terrain that what you are exactly looking at. For example, we say the geomorphology, the morphology of the landscapers very important to know.

So, as we discussed in the beginning in the introductory lecture that we will be using the photographs and try to evaluate the terrain. So, evaluation of the terrain will require the understanding of the geology what is the subsurface geology you are having what is the morphology of the terrain. So, in terms of the geomorphology either it is coastal terrain or it is the terrain in the Himalayas that is when hilly terrain or you are having looking at the in the desert region. So, you need to have this proper understanding of the landscape.

Hence and this is one again we can say the disadvantage that you need a training, but it is extremely important because you will be able to understand the overall the area, you will be able to know the relief of the terrain, another important landscape features which you will not be able to easily extract from the maps ok. So, I stop here and will continue in the next lecture.

Thank you so much.