Photogeology In Terrain Evaluation (Part – 1)
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Lecture – 09
Stereoscopy and Methods

So, welcome back, as we discussed not in this lecture, we talk about the stereoscopy, let us move ahead. So, stereoscopy the word, stereo which most of you are familiar with is for the stereo that is the sound.

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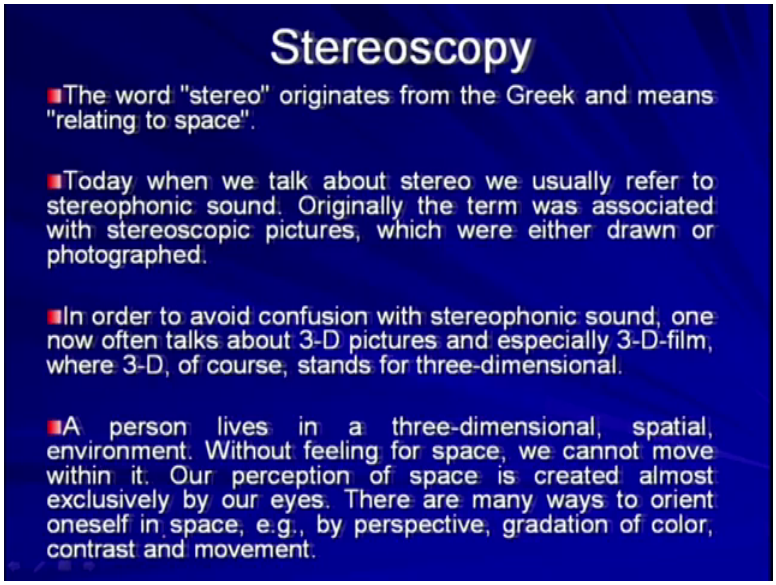

So, you basically use the stereo, the word originates from Greek and; means relating to space actually. So, it is related to space and today when we talk about the stereo, we usually refer to the stereophonic sound. So, we are most interested in having the stereophonic sound in our TV room or, maybe in our car and all that. So, originally, the term was associated with the stereoscopic pictures, which were either drawn or photographed.

So, in order to avoid confusion, with stereophonic sound; one now often talks about 3D pictures. So, 3D pictures are the same, what we are using are the stereoscopic pictures they are the same and, specially 3D films where 3D of course, stands for 3 Dimensional, a person lives in a 3 Dimensional, word spatial environment, without feeling for space we cannot move within it actually.

So, we need to understand the perception of any object or, the terrain otherwise you would not be able to move anywhere. So, our perception of space is created almost, exclusively by our eyes. If you are viewing the terrain by one eye, then you will have some issues in understanding the distance, in understanding the depth of the terrain and all that, you may lead to some miscalculations.

So, there are many ways to orient on, oneself in space example, by prospective graduation of color contrast and the movement again. So, in our surrounding we will experience all this. So, it this is what is extremely important that, whatever we are viewing, we are viewing everything in 3D actually, with our two eyes.

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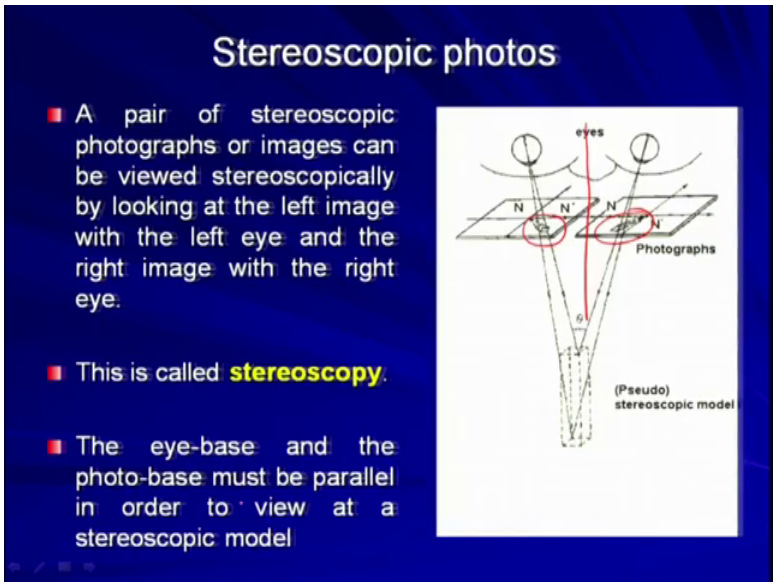

Now, stereoscopic photos are mainly, what we are viewing from our two eyes and, when you view the same object on the photograph, by your two eye that is, from your left eye and the right eye, you will be generating a pseudo stereographic model in your brain, that will give you the 3 Dimensional view of the object.

So, a pair of stereo graphic photographs or images can be viewed stereographically, by looking at the left image, with the left eye and the right image, by the right eye. So, you cannot cross it. So, you need to and that will be your divide here that is your nose. So, in a stereographic projection or this, when you are using stereograph on stereoscope you are viewing the two photographs of the same area, with the different eye. So, right image

with right eye and left image with left eye, this is the process which is known as stereoscopy.

The eye base and the photo base, must be parallel in order to view at a stereographic or stereoscopic model. That should be parallel, you cannot have the oblique eye and try to see the image.

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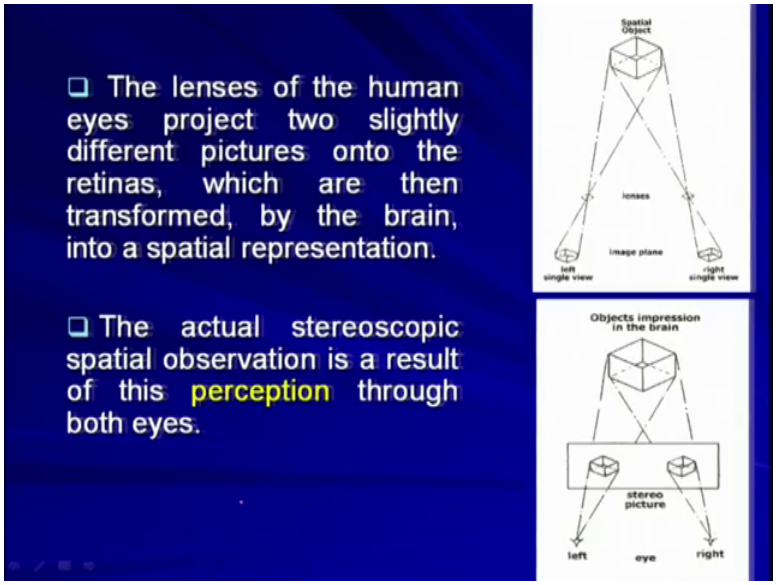

So, the lenses of the human eye, project two slightly different picture onto the retinas, which are then transformed by the brain, in a spatial representation. The actual stereographic spatial observation is a result of their perception through both eyes and that will give you the amount of understanding, that how? What? Which area is low? Which area is higher? That will give you the depth perception.

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For example, if you view this two photographs of the same object, with your right image with your right eye and, left image with your left eye, I am sure that you will be able to generate the 3 Dimensional picture of this. So, you may try on your screens, viewing this photographs of the same object and try to view the image in 3Dimension, but make sure that you view, the right image by right eye and, left image by left eye. If you will cross this, you will not be able to generate the 3 Dimensional view.

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This what I was talking about, that even you can use, simple the previous image was also taken by and simple SLR camera. This is an oblique photograph, which I took in 2001, from the aircraft. This is from kutch area, again if you look at there is an overlap between these two photographs and, if you try to look at; I mean with left image with left eye and, right image with the right eye, you will be able to generate the 3 Dimension of the stream.

The common objects the here, this one is here you can easily make out, but here and then this; hill top you can see this one here this one is here, these are the two photographs which were taken by the same camera, but at a different angle.

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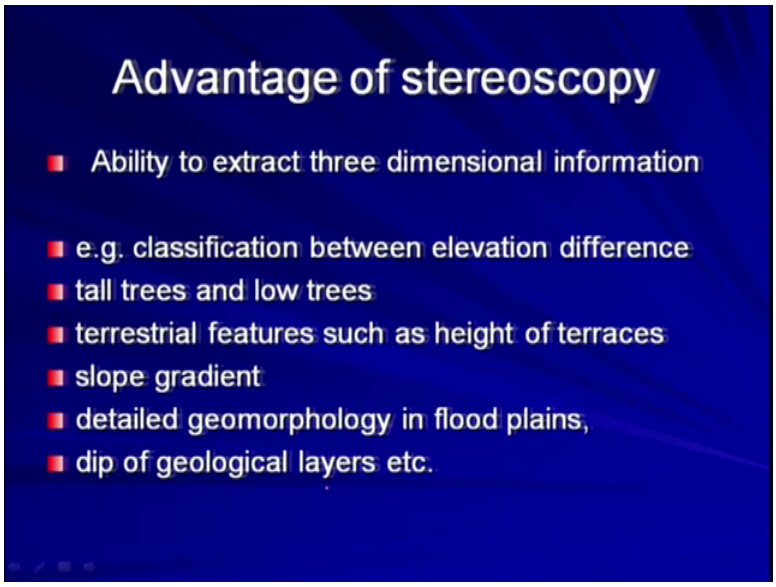

So, advantage of stereoscopy, has an ability to abstract 3 Dimensional information example, classification between elevation difference, that you can do with the stereographic images. Tall trees or you are having low trees, this is just an example, but any terrain whether it is higher or having low elevation, you will be able to make out, even the buildings, you will be able to make out.

Whether they are the buildings are taller or shorter, then terrestrial features such as height of the terraces, these are the landforms, which are associated with river valleys. Then slope gradient also you will be able to make out, it will be easier to make out the correct slope gradient, if you are having vertical photographs, detailed geomorphology in flat plains or any terrain.

So, geomorphology is the morphology of the surface, you are looking at a dip of geological layers or geological strata, you can easily make out with the stereographic images or the photographs.

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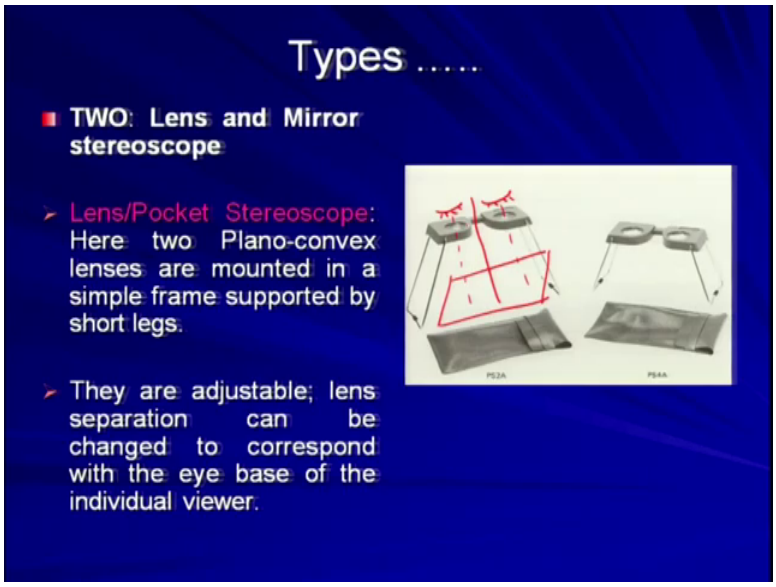

Now, type of stereo scopes if you, look at we are having a smaller one that is, we term this as an pocket stereoscopes, which we will be showing in demo, when we are doing labs. So, two lens and mirror stereoscope we are having. So, one is lens and another is mirror stereoscope. So, lens or the pocket stereoscope. So, here what we are having is, that we have plano convex lenses, which are mounted on a simple frame, supported by a shorter legs. This portion you can move, depending on the your eye base distance because, not all will have same eye base ok

So, you can move this, the important part is that, this allows your eyes to be focused, on the photograph through this lens only. So, the area is restricted. So, you would not be able to view this side. So, you are forced to view the photograph. So, you will be able to focus here, you will be able to focus here and try to see the image in 3 Dimension. They are adjustable that is what I was talking about, that this portion is adjustable, lens separation can be changed, to correspond with the eye base of individual viewer.

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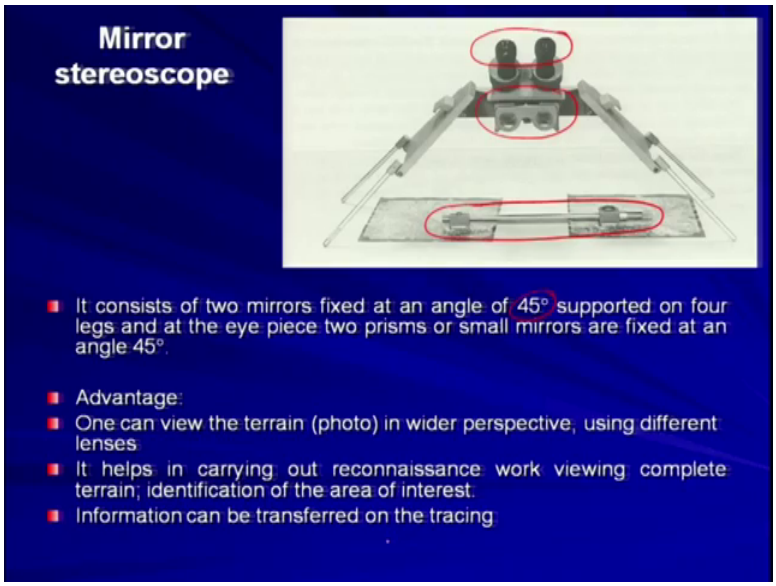

So, another one is mirror stereoscope, now here we have again there are two mirrors which are mounted here. So, it consists of two mirror fixed at an angle of 45 degrees, supported by or supported on four legs and at the eyepiece two prisms. So, here which is not been seen, but you can, we will try to show you, in the day when we are doing lab that there are two prisms, which are mounted close to the eyepiece and these two prisms or small mirrors are fixed again at an angle of 45 degrees.

So, this are viewed here, this photographs and then, they are transferred to the prism and through prism, you will be able to view the later in here. Now the advantage of this is that, you will be able to view larger area. So, one can view the terrain in wider prospective using different lenses. So, this you can change; so, the eyepiece you can change, depending on your requirement and you can have the terrain enlarged and viewed.

It helps in carrying out reconnaissance work, viewing complete terrain, identification of the area of interest. So, first you can use the low-resolution lenses or the eyepieces and try to see the complete area, exposed from the photograph. And then, after having your area of interest, you can change the eyepieces. And another important thing, which is been shown here, this is your what we term this as an parallax bar.

So, this again we will be doing in the lab, this will help us in identifying or measuring the height of the objects, this will be doing the lab part. So, information can be

transferred on tracing paper; so this is another advantage, that you can put a tracing sheet on this and transfer your information, that is you can draw or the terrain you can identify and stripe the information on your tracing sheets

So, this is what we call the conventional technique viewing the satellite photos or aerial photos, having stereographic images and you can see the area in 3 Dimension. So, this I think we have completed, but if not then we will just look at.

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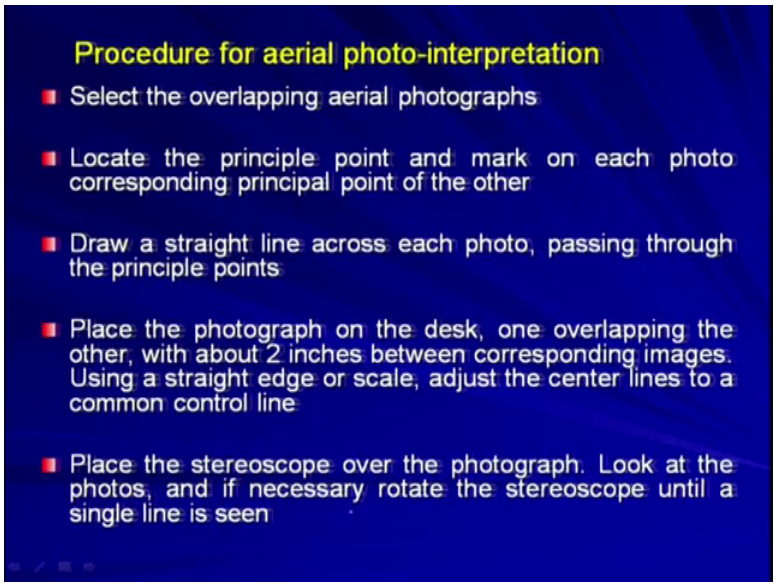

So, procedure for aerial photograph interpretation, select the overlap of the area on the photographs, locate the principal point and mark on each photos, corresponding principal point, of the other this we have already done, but I will just quickly look at. So, this will help also in identifying your line of flight. So, draw a straight line across each photo, passing through the principal point, place the photograph on the disc one overlapping other, with about 2 inches between the corresponding images, this is important.

Using a straight edge or the scale, adjust the centerline to a common control point, place the stereoscope over the photograph, look at the photos and if necessary rotate the stereoscope, until a single line is seen actually. So, this is another way, we can do it to focus or to view the correct position of any object or the landform, through stereoscope.

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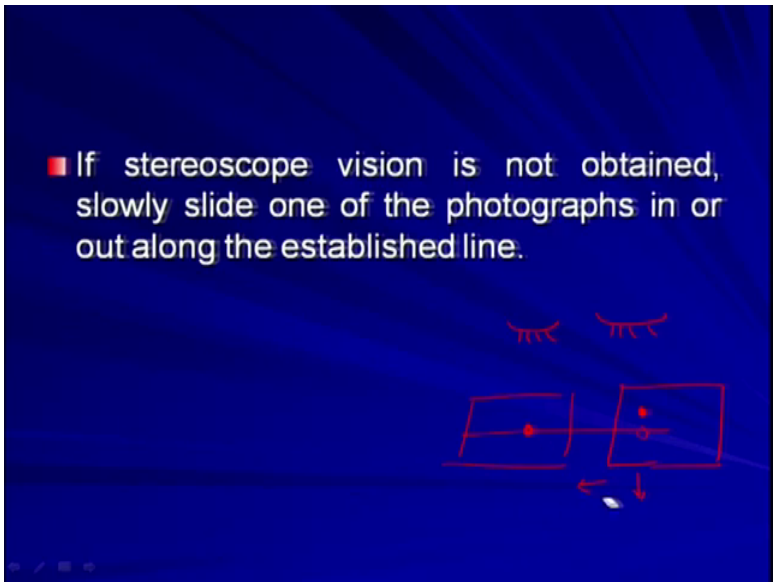

So, either you can rotate the stereoscope or, you can rotate the photograph. So, if the stereoscope vision is not obtained, slowly slide one of the photograph in or out, along the establish line. So, once you have drawn the line or you have established the line, along that only you can move in and out, and try to match. This is basically what we are doing, we are removing the parallax. So, we are overlapping one object with the another one.

So, for example, you have the your eye here. For example, I am just trying to explain and then, if you are viewing the photograph here, another photograph is here and, you are trying to view for example, this image here, the object and another one here, but your you are unable to see. Because you need to generate the 3D, you need to see this image and they need the this object and, this object at the same time. So, sometime for example, your photograph is not exactly in the same line and this object is sitting somewhere here, then you would not be able to view this.

So, try to bring this along the same line here. So, in that case what you have done, you will move this photograph down. So, adjust it as well as bring in and out. So, that you can be able to view, the same object by different eyes on different photographs. So, that will help you in, viewing the terrain in 3 Dimension, otherwise it will be difficult.

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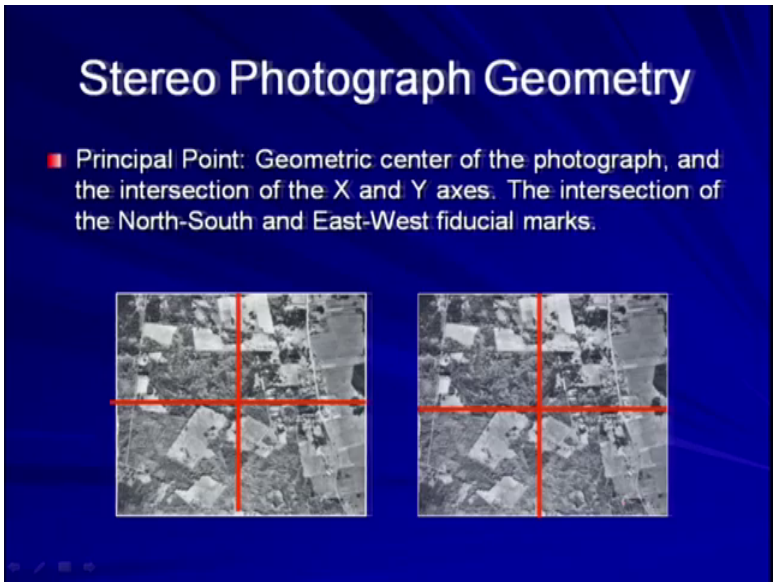

So, stereo photograph geometry if we take, we have principal point, this we have already talked about, how to identify using the fiducial marks. So, this is another exercise which is, important and can help you in identifying the line of flight, as well as orienting your photograph properly.

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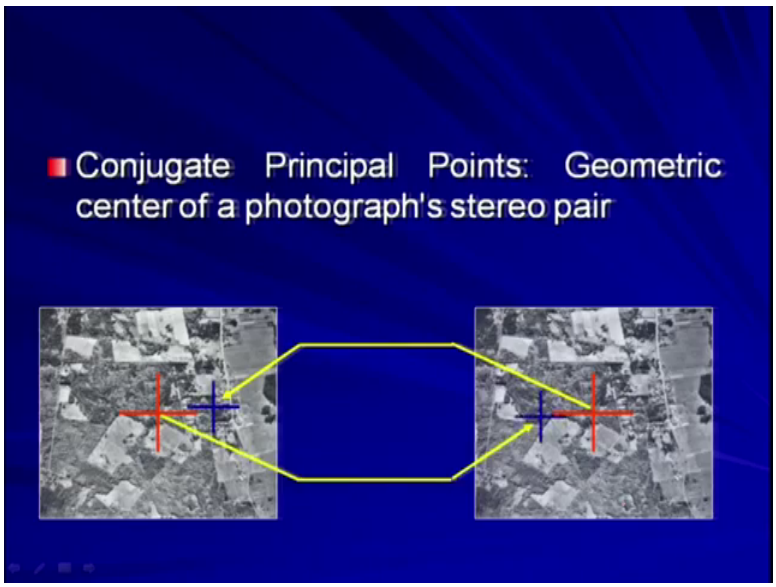

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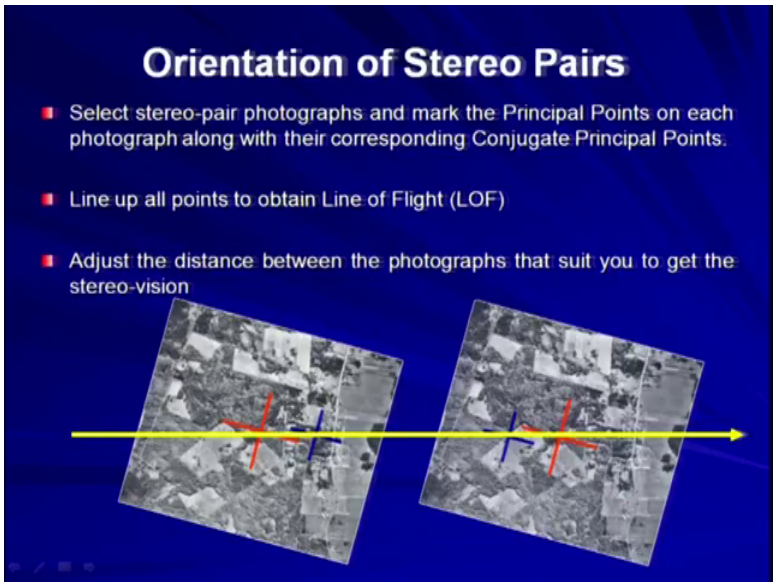

So, once we have obtained the line of flight, now you will be able to view the, if the terrain or the object in a proper way.

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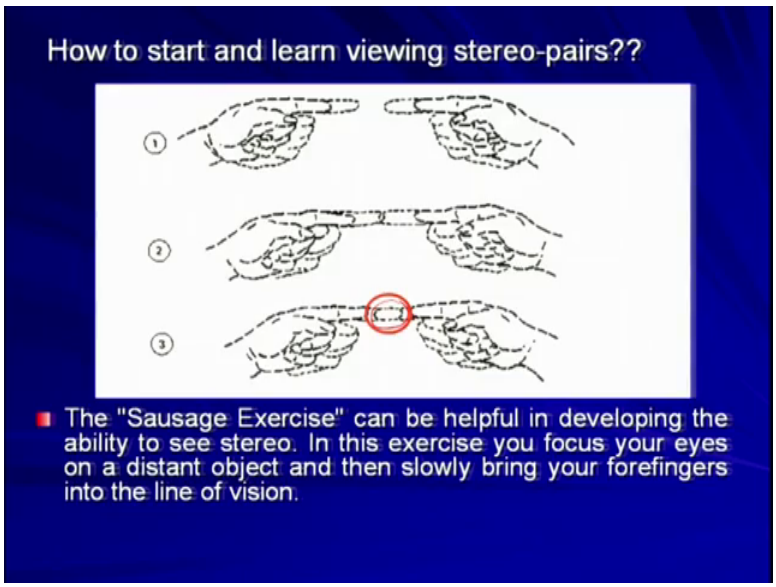

There is another one, which you can practice; what we call sausage exercise. So, what you have to do is, that you take any finger, the same finger of your of both, the hands and try to bring closer to one another, viewing the same method you have to follow. View this with your right eye, view this with your left eye and the time will come when this two overlaps, this will not touch each other, but you will be able to generate, an image at the

center here, which will you will be able to see that, they are hanging in air and that is your overlap.

So, similar thing you can do, for your photograph when you are putting it on the table. So, this is something like this, you view start viewing this, bringing closer to one another and the time will come, you will be able to see that one finger is going into another and then, in between you will have an object floating, that is your sausage effect.

So, that you are able to view the portion in 3D. So, you in the center you will find, that is what I was showing here, you will find that this area is hanging in air and you are having an image, which has been formed in your brain, without touching the two fingers. So, keep trying this and, we will continue in the next lecture discuss more about this one.

Thank you so much.