

Photogeology In Terrain Evaluation (Part-1)

Prof. Javed N Malik

Department of Earth Sciences

Indian Institute of Technology, Kanpur

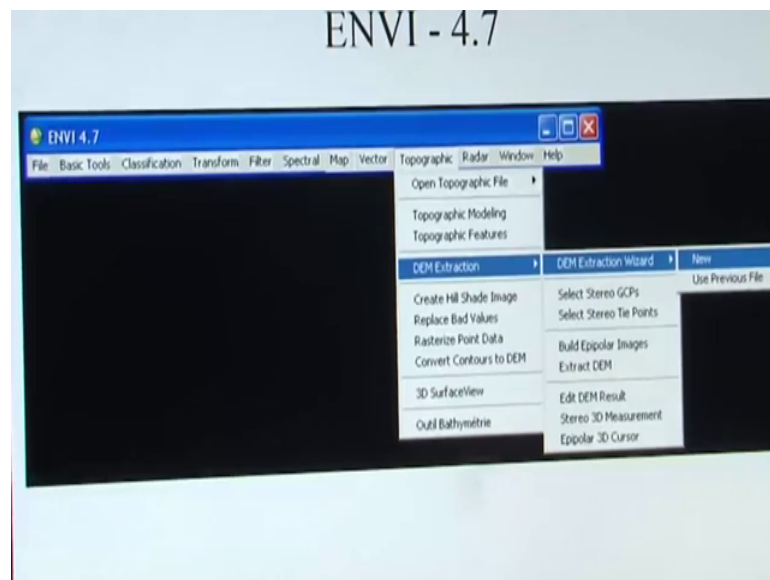
Lecture - 21

Generation of Digital Elevation Model and Anaglyph

So, welcome back, today we are going to conduct a very interesting lab that is on anaglyph and making of DEM that is digital elevation model ok. And it is going to help you a lot in extracting information about the objects on the surface of the earth and you can conduct your practical in a way to map some area to make 3D images of that area in the form of an anaglyph ok.

So, in this way you can use a data from a satellite which you can use to make an anaglyph and DEM of an area. So, today we are going to conduct this lab. So, the name of this lab is Preparation of Digital Elevation Model and Anaglyph from Cartosat-1 using ENVI software the version is 4.7.

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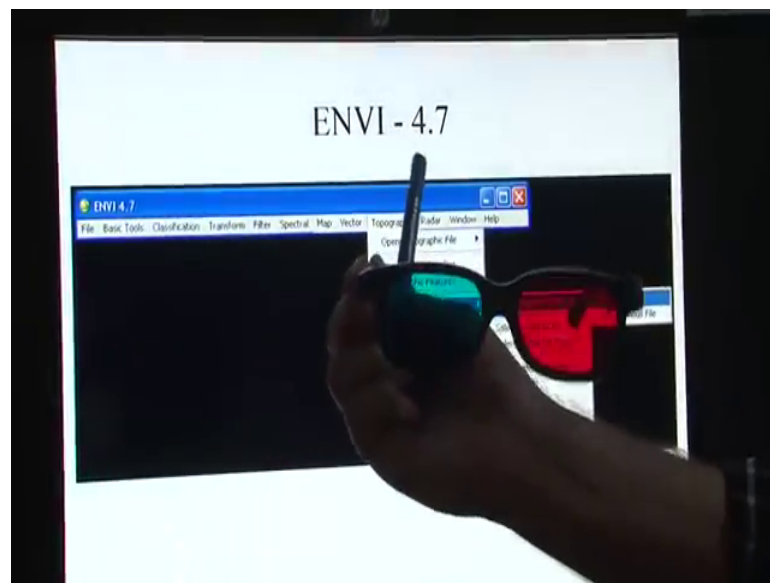


In this lab what we basically do we select a data of from the Cartosat-1 and we first do the topographic analysis of that data. So, we first do the DEM extraction ok. In the DEM extraction wizard we can go and we can create some new image files. So, here in case of all data we are having the image files in a directory which we have already placed on our

desktop ok. So, in that directory you will find one forward image another is an afterward image.

So, you will select the forward and after image to create the stereo model and to create digital elevation model as well as your anaglyph which you can see with the help of this 3D anaglyph glass ok. You know that this glass, whenever you go for a 3D movie in the theater outside you will be given this type of glass ok. So, this is called 3D anaglyph glass.

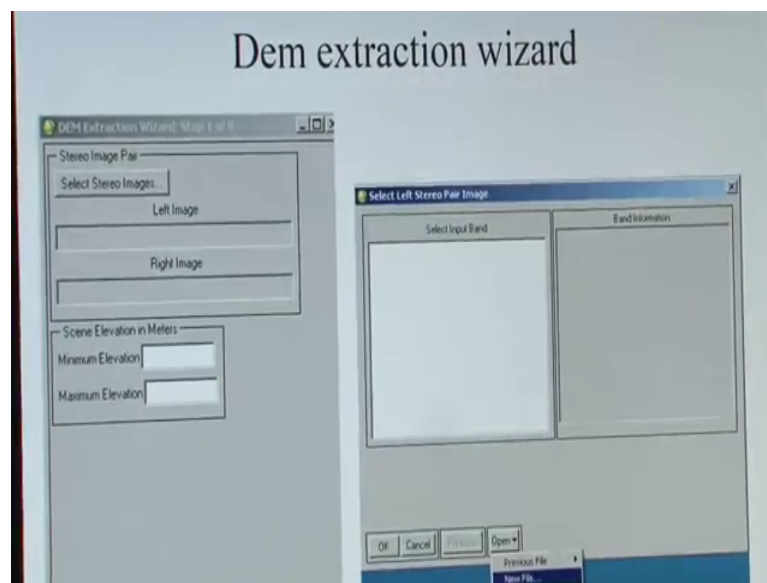
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So, it has on the left eye side it has some cyan or this reddish color and on the right side it has bluish color ok. So, this glass you will use after creation of the anaglyph through this exercise.

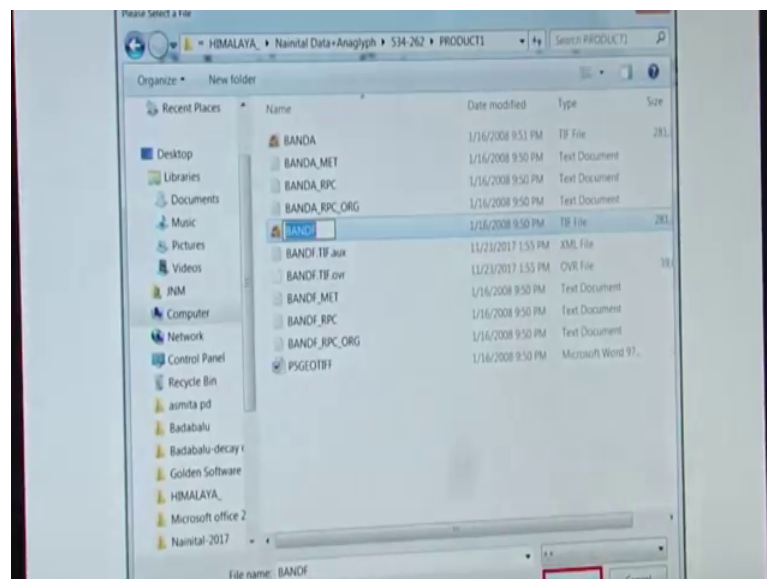
So, first what we do? We select the topographic data from the DEM extraction wizard and we select our files, like this.

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So, from here there are two options right either you can select your files with this option open new file or you can also select your image files from the first window that is file. So, from this option of file you can also select your the forward and after image. So, then you will select first the forward image then the afterword image like this.

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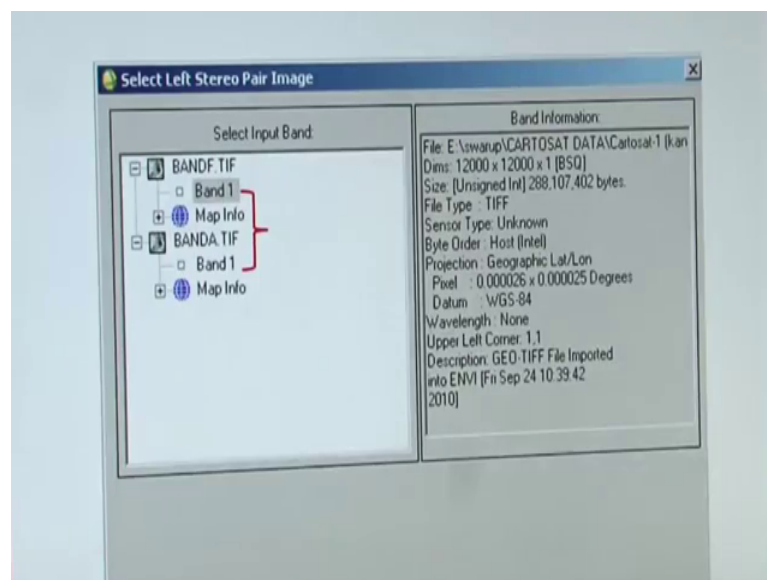
So, this is band f, f means forward and a means afterward. So, band f and band a. So, this is these are the image files in the form of tiff in this format.

First you will click on band f file and open. So, then you will go with the band a file then again you click on the open. So, first I should share some information on ENVI software. So, that you have an idea that what we can do with this software ok. So, ENVI is actually a product family which provides a variety of software solutions for processing and analyzing geospatial, imagery used by scientists researchers or maybe image analyst. And these type of software help us in processing and doing the image analysis with some meaningful information from imagery ok. So, we can extract some meaningful information from our images.

So, ENVI combines advanced spectral image processing and proven geospatial analysis technology with a modern user friendly interface. So, these are some advantages of the software which you can use and also you can use panchromatic radar, synthetic aperture radar, multispectral or hyper spectral imagery with these softwares ok. So, with this software you can do the analysis of this much of data ok.

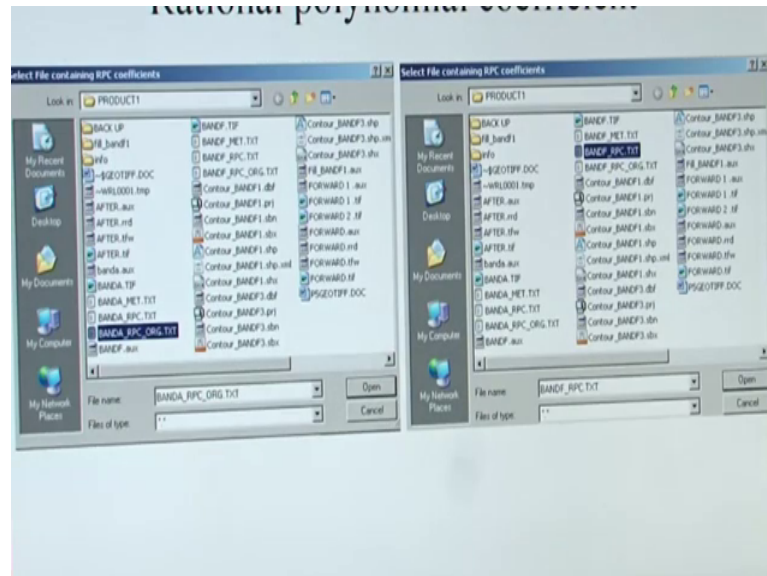
So, now, let us go ahead with this process of DEM extraction and anaglyph creation. So, first you will select , f then you will select your after image then click open.

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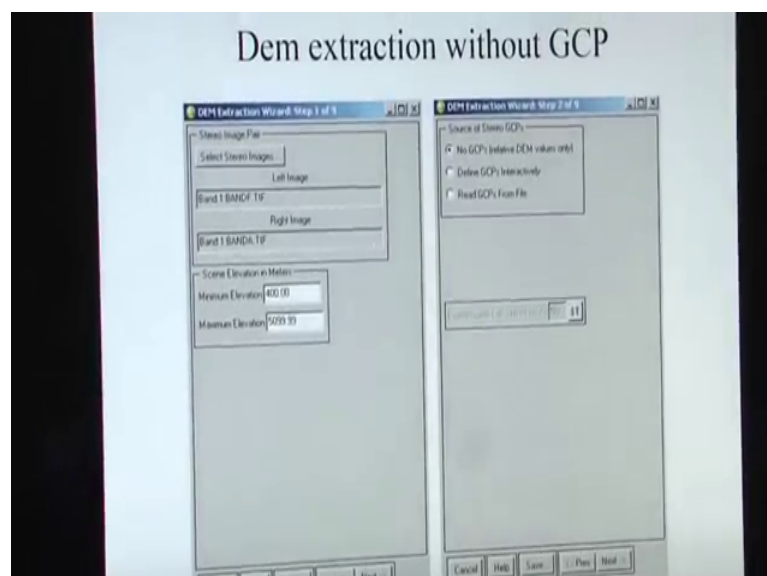


So, here now, you can see that the stereo pair images are having now, band 1 and band 1 of forward and after both images this is for, this is for forward and this is for after. Then here you will have some information about the type of these files, like the type of files is

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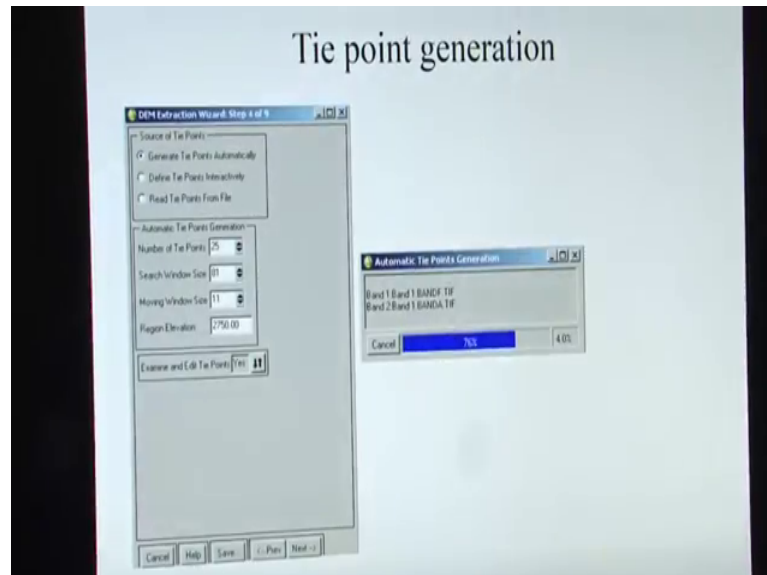


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So, similarly in this step also you will select first for your forward then press open. Then for the afterward then press open.

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So, then there will be a window like this which will ask you. So, source you will have to tell here source of this stereo GCPs, GCPs means ground control points. So, here you have 3 options after selection of the RPC in format images. So, then you have 3 options, either you select no GCPs or define GCPs interactively or read GCPs from files. So, in all the 3 ways most probably you will not get the accurate points on your both the images the forward and after images, because this is automatically done by this software.

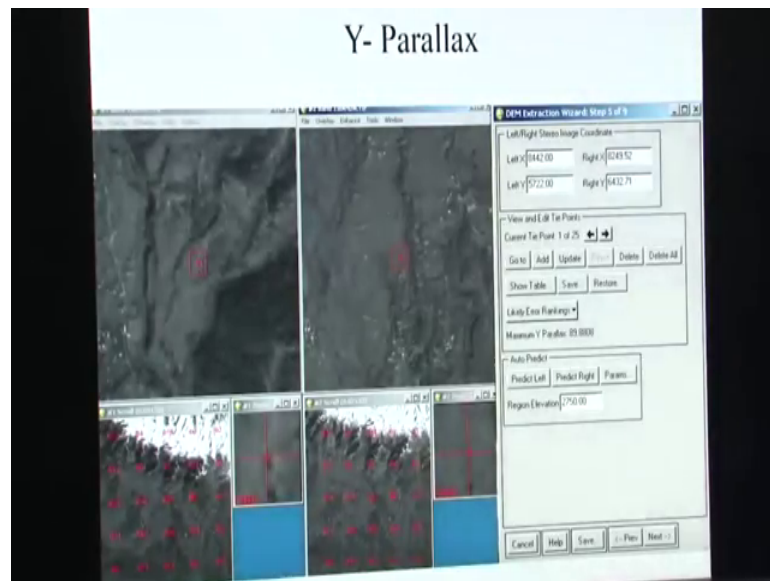
So, this is the reason you have to manually select points on your image and you have to manually match those points on both the images. So, this is the concept behind this lab that you can see in them it is given like minimum elevation and maximum elevation which is this information has been read by the software and it is giving for this particular data. So, moving ahead you suppose you are selecting it generate tie points automatically.

So, automatically means the tie points which are which you are having on both the images like you have selected the intersection of the roads as a point as a tie point on first image and the same you point you have to select on the other image also which is on your right hand side. So, those points are called tie points, because these are have to be

matched properly and this is done manually because it will not give us the automated corrected tie points. So, if we have to do it manually.

So, now, moving ahead, now when you select it will automatically process these tie points and will give you it on the images.

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So, likewise these are your forward in after images and here you can see that this is your a band a image this is your band b image. And this is actually the complete image at this part the there is a on this image which is showing the zoom up part of this image and this is square is showing the zoom up part of this area ok. So, this area is zoomed up here in this window zoom 1 and zoom 2, window is for this image the after image ok.

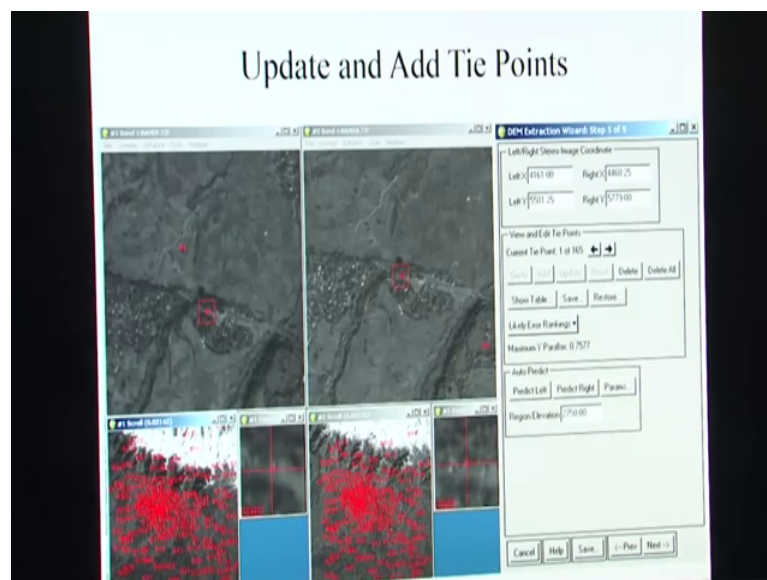
So, as you can see here the software has automatically detected 1 to 25 points the total number of points on your image is 25 and it is giving also the reading for left X, right X, left Y, right Y ok. So, these are some coordinates, stereo image coordinates. So, here you can see another the important thing is that the points which are located on this image the corresponding 25 points will also be located on this image ok.

So, but what happens? The positioning of those points is not correct this you have to do manually in this exercise and the result of this effect is the maximum Y parallax ok. So, here also in this terms you can understand it easily that the point of observation is different for both the images and that has been resulted into this effect of parallax. So,

here the acceptable parallax is 0 to 1, but you can see here the it is showing like 89.8808. So, this is not acceptable to generate a DEM or anaglyph ok, so that will give you a wrong data wrong interpretation of this area. So, you have to manually correct it.

So, what is done actually you can see these points one by one like this is on the software when you click on this arrow these two arrows when you click on this. So, this is giving you point 1, so then 2 of 25, 3 of 25 like this ok. So, here you can see you have to do corrections to minimize this parallax ok, you have to you have to mention this parallax between 0 to 1 by correcting of these points and as number of points you can select on the image. So, more number of points matched on the image images, more corrections, more accuracy and more precision in your DEM or anaglyph you will have, ok.

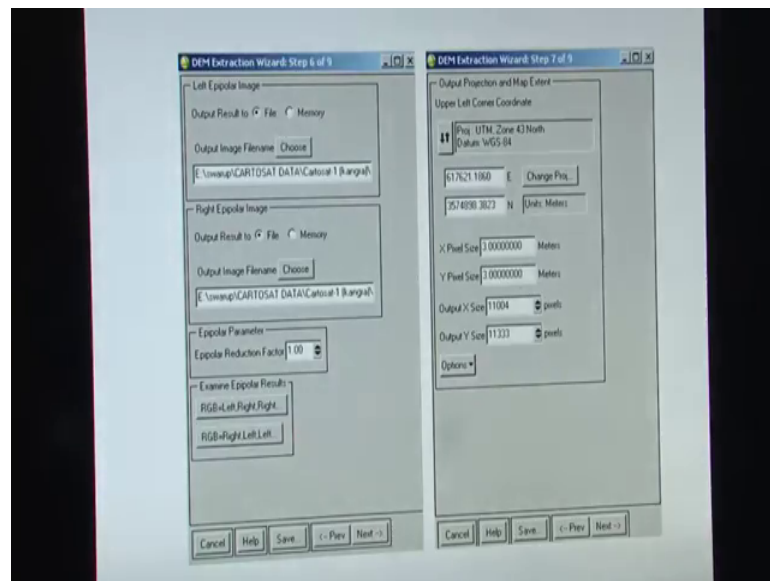
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So, let us move ahead. So, by having this suppose we are having point number 1 here and point number 1 here on this image and here you can see point number 2, point number 3 ok. So, if you see in this zoom apart, so you can see that here a road is going like this and, but the point the accuracy of these points is not much because it is giving like. In this part you can see the point both the point 1 here and point 1 on this image is almost located at same positions. So, the positioning on these points are little bit accepted to us because you can see the maximum Y parallax is given here as 0.7577. So, it is acceptable because should be within the range of 0 to 1 ok.

Now, similarly you are having lots of points distributed all over the image because we need more points to correct this image ok, to get corrected digitized digital elevation model as well as anaglyph ok. So, in this process we will have both the things as an outcome to our exercise. So, now, because it is acceptable you have to do same for all the points when all the points are having this parallax between 0 to 1. So, that is a stage when you can accept those points and you can move ahead by clicking next ok.

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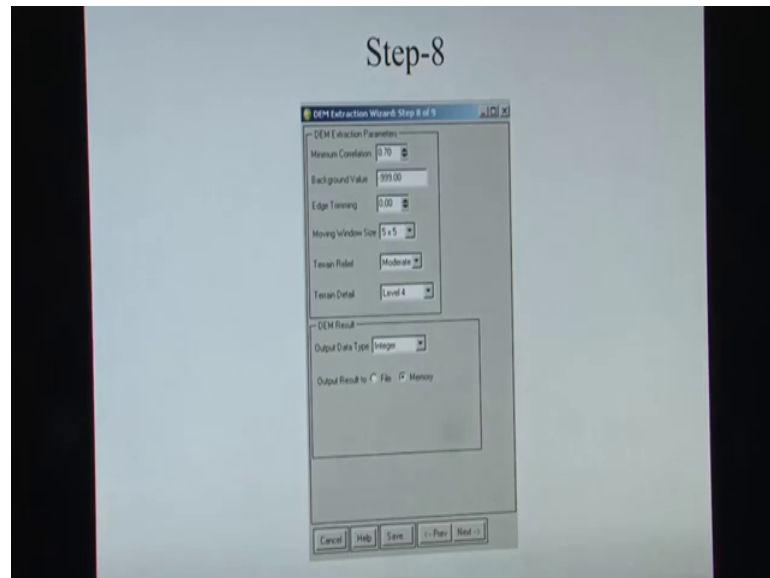


So, then you will have the suppose we have done the correction the manual correction for all the points. Suppose we are having 100s of points on the image and remember your point should be split all on all over the images because if you are having concentration of points at 1 corner or 2- 3 corners , but not having enough points on the other one other side. So, then it will not give the correct data generation ok. So, remember you have uniformly distributed points over your image.

So, in this wizard you can see now we have accepted because we are having corrected points manually. So, we can move ahead by clicking next. So, then in that in this stage you, you have first have to generate left epipolar image and right a epipolar image ok. Epipolar image means because they are in two they will be in two different colors because you are having this anaglyph glass with you. So, they will also be in two different colors in the same colors ok.

So, you have to give some output folder for generation of these files for left epipolar image and right epipolar image and then these are some default by default information.

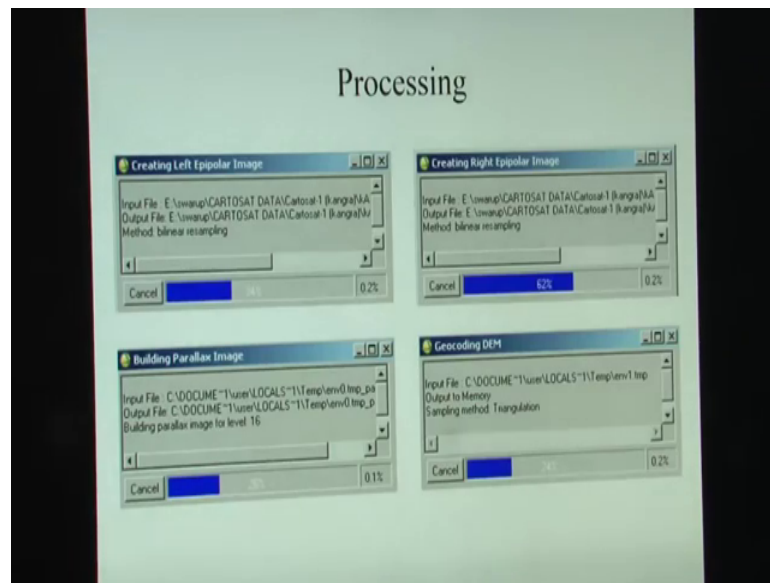
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So, you do not need to rectify any of this you just click next at this stage and you will get to see this much of information, terrain relieve, terrain detail the edge trimming. But you should not change anything here because it has been set as default by the software and it is it has been taking correctly.

So, just DEM because here you have to create your DEM ok. So, you have to give a name for your DEM in the next window.

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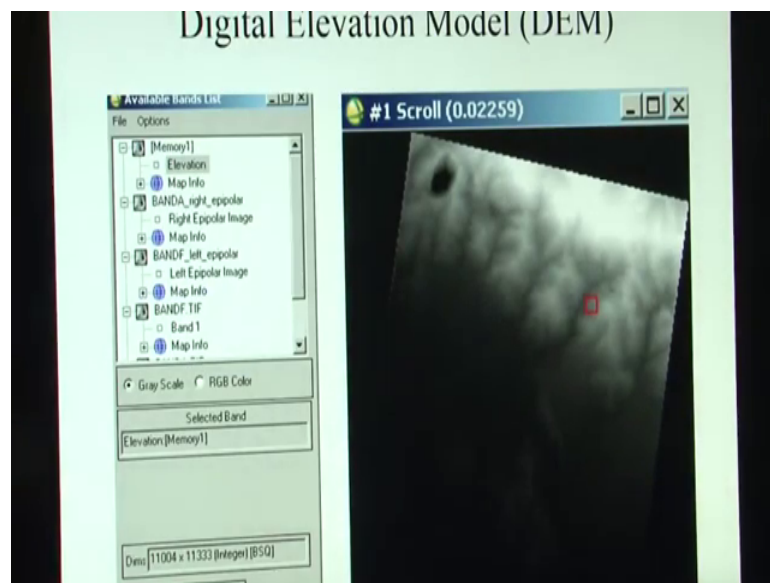


So, suppose you have selected your DEM and output is a result you can select a file and then you can take a folder where your DEM should be because this is the DEM extraction wizard ok. So, this I will show you in the software the idea how to set an output folder for this DEM.

Now, click on next, when you will click, click on next on this wizard you will have the these 4 processing windows one by one. First it will create the left epipolar image by bilinear resampling method, then it will create right epipolar image again by bilinear the sampling method then it will build a parallax image ok. So, here some factors given for that and then finally, it will geocode your DEM ok. So, here in this result you will see that here is geocoding dem.

. So, the method use this triangulation method. So, suppose we are having 3 points on the image 1, 2, 3. So, it will have the method of the section or so, for to create the to get the coordinates of other points which are interpolated in between these 3 points ok. So, this is done with the method of triangulation.

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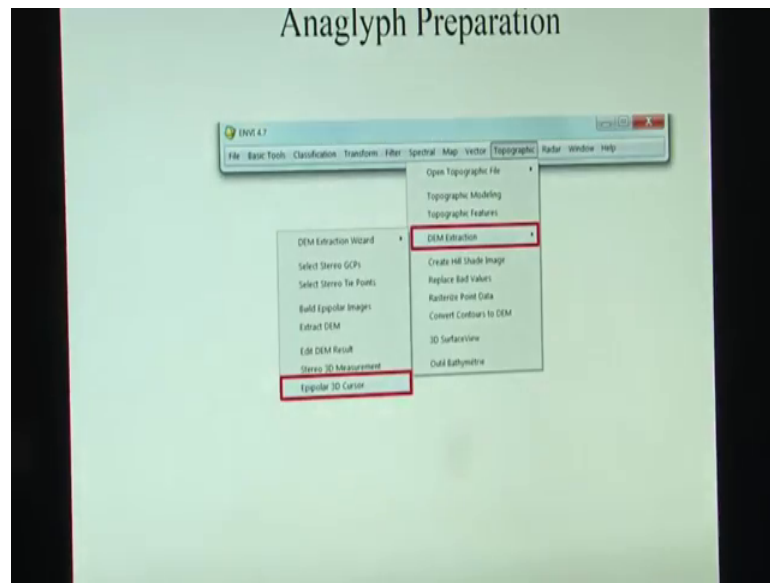


So, then after the processing you will get this window for digital elevation model this window will be automatically opened in our software and you can see here it has, it is showing some streams like this and this is a main stream called trunk stream which you learn in your geomorphology fluvial geomorphology lectures ok.

So, this area is having a drainage pattern and tributaries are coming and joining the main trunk stream in this manner because the slope is the higher slope is in this region and this part defines the lower elevation or the planar area. So, always reverse originated at the higher elevation like in indian case like in himalayas. So, then they move through these slopes ok, the topographic slopes and then they will join they generally joins the trunk stream or the main river channel like cozy and other rivers are coming and joining the Ganga mainstream of this ok.

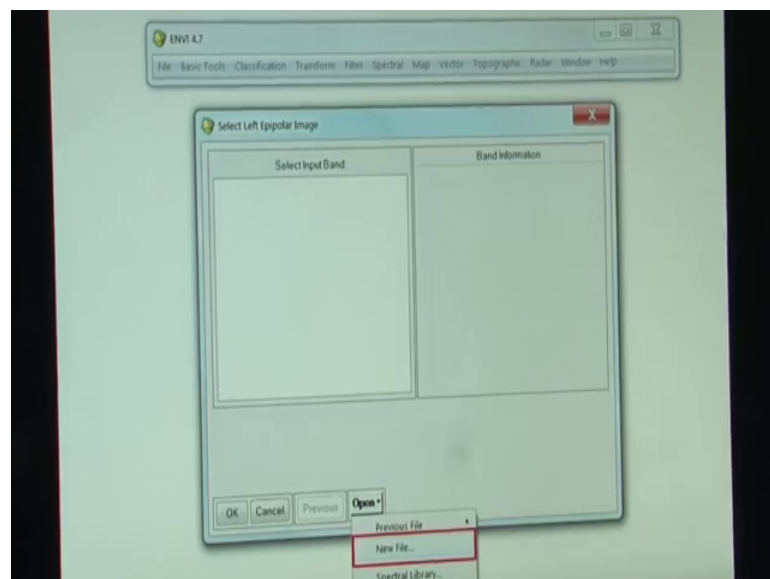
So, here you can see this much of data you have generated available band list ok. So, first one is elevation data, and other is right epipolar image, and left epipolar image. So, you can read your digital elevation model from here.

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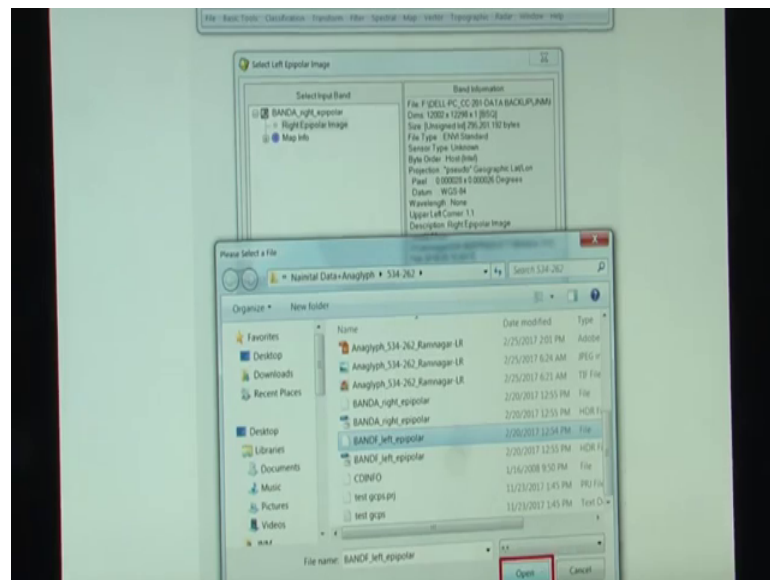
And now, for anaglyph you have to go again with the options of topographic analysis, then you have to select DEM extraction and then you have to select epipolar 3 cursor because anaglyph are generated in two form of images like left epipolar and right polar. So, you have to manually select it from the folders in which you have kept it, kept your files ok, your files are saved in the folder.

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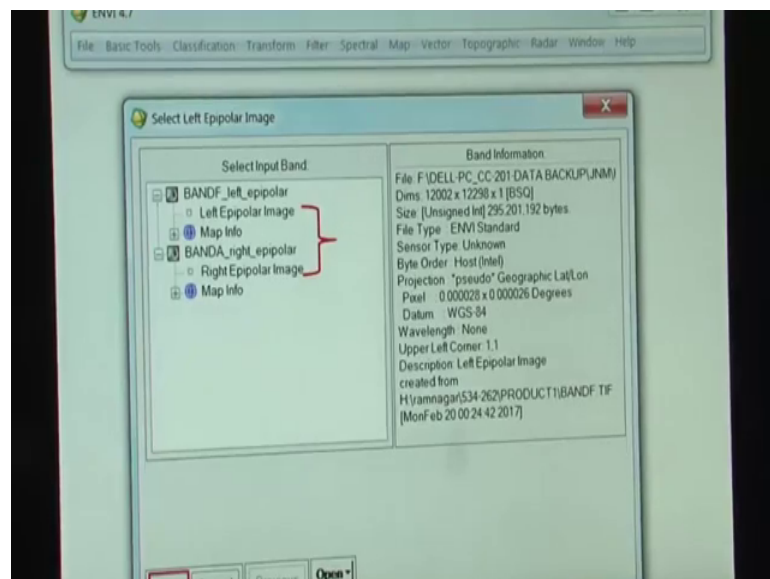
So, now, moving ahead this window will be opened and now, you have to select from this data home list open new file.

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First you have to select the left epipolar image, click open.

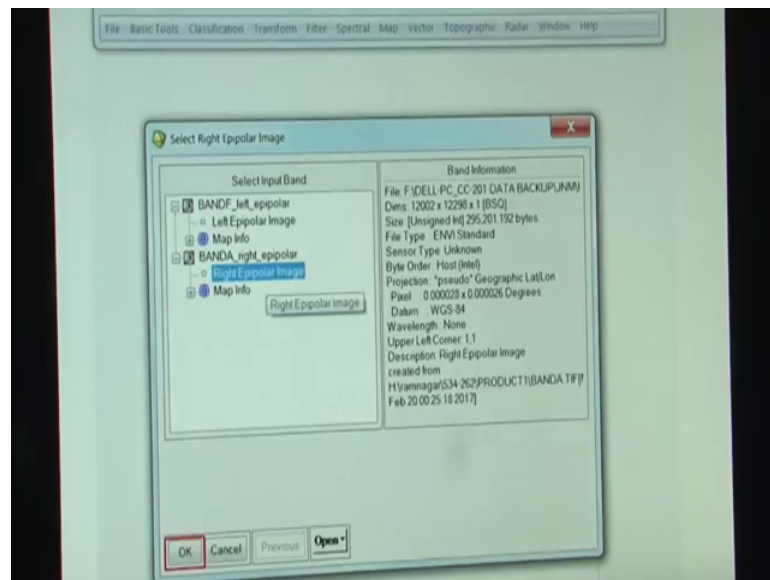
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Then you have to select right epipolar image click open ok, in the same manner and then you will get your both the images on the left side panel like left epipolar and right epipolar image.

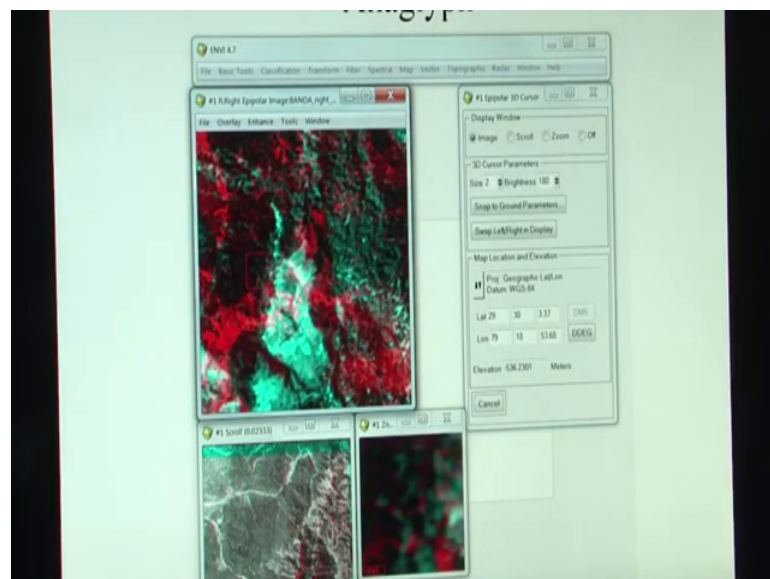
So, now, you have to select it one by one and then press ok. So, you have to click this, if you click this there will not be anything ok, so because these are your resulted epipolar images.

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When you click ok, first select right and left and you will have this window ok.

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So, this will give you the anaglyph of your area you can see here it is showing two colors the area in two colors like the same reddish and bluish color ok, which you have on your this anaglyph glass.

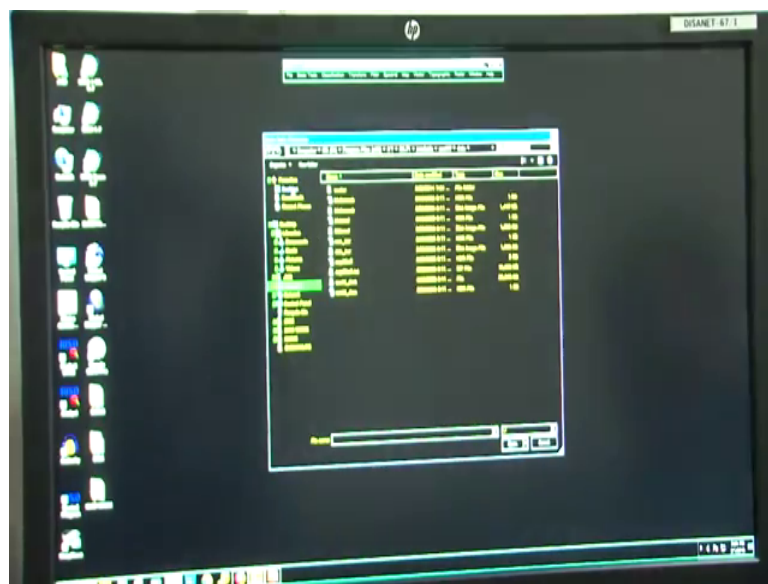
So, when you see this area through this with the help of this glass I wearing this glass you will have a correct depth perception of this area because now you will be able to see the 3D vision of these two photographs ok. So, this is the magic of anaglyph. Here you

are having some information for your generated anaglyph and on the next window this is your anaglyph.

So, we know that you do not have this, these materials with you like software and these data. So, what you can do? You can see this image on your videos also, you can pause your video here and you can reality this anaglyph glass and then you can see this image ok. So, when you see you will also have the same depth perception what we have by having the hard copies of these with us ok. So, there is no difference. You can also see in your videos ok. So, just you have to buy this anaglyph glass you can get it from anywhere from online shopping also you can get it.

So, now, we are going to move with our practical by using the software first. You have to select the ENVI 4.4; 4.7 version from here these are some supporting software panel for ENVI.

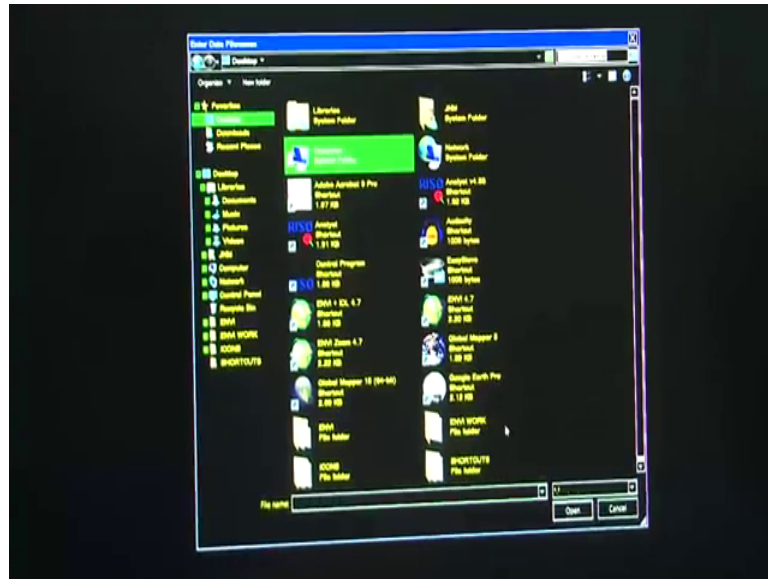
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From here what you can do first you can select your image file your image file. We have given a folder if you see it in a zoom you can, we have place the folder on desktop name that it has and we work. So, in this folder we are having our images in this product one folder ok.

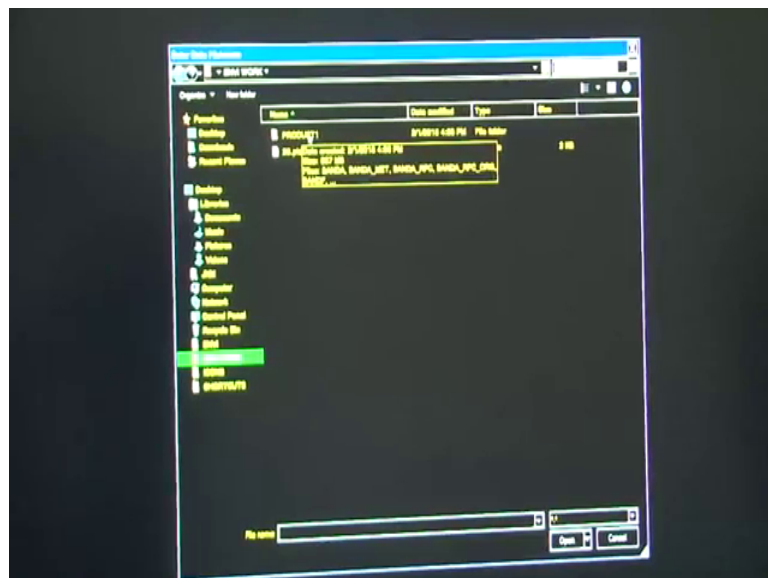
So, what we did? We first click on file then open image file, then we will select our folder from desktop or any drive where we have saved it.

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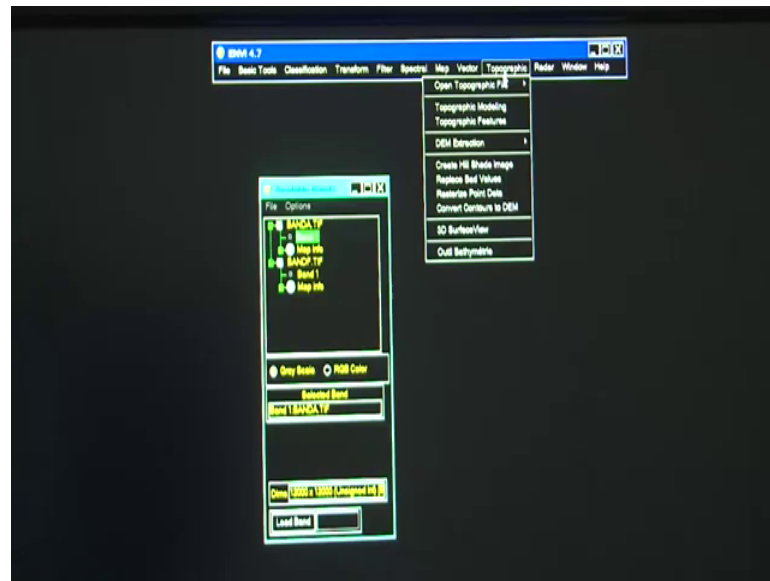
So, we have saved it in ENVI work open it and double click on your product or any folder which contains your forward and afterward images ok.

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So, what I explained? First you have to select your forward image then click on open it. Then again , so this will be a there will be a panel which is showing that you have selected this band f 5. So, this is the band for that.

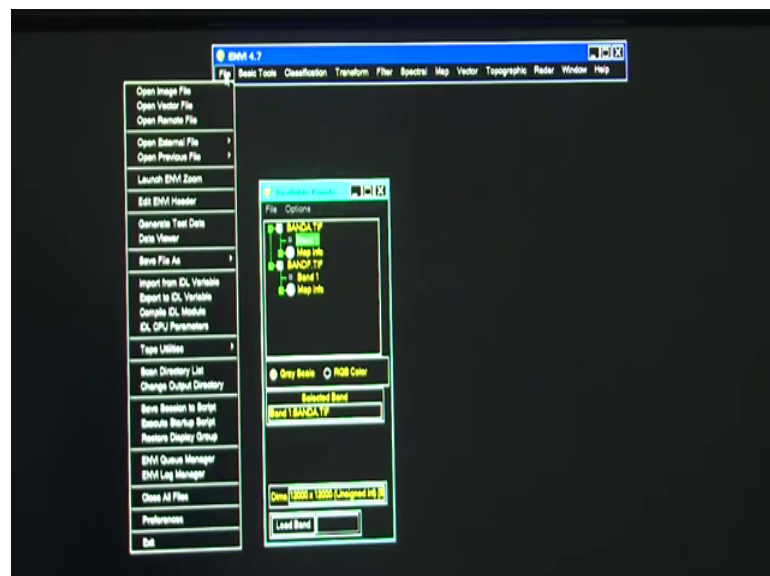
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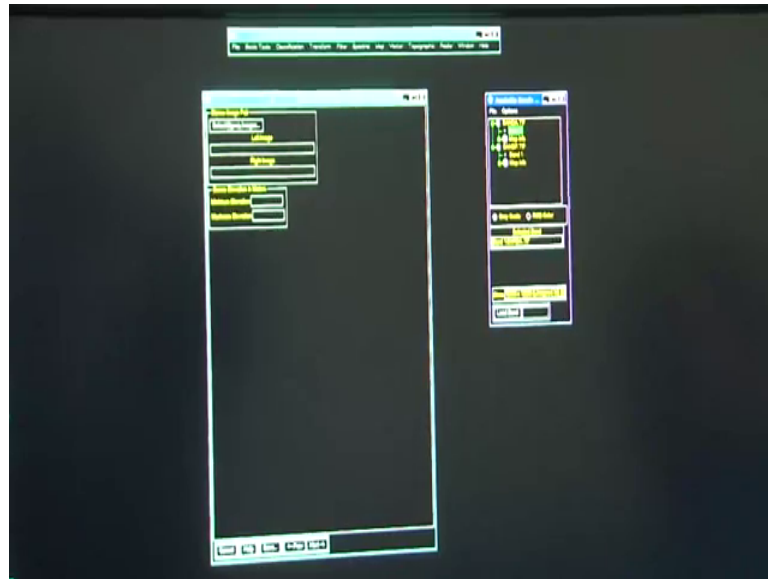
So, then again you have to click on file open image file. So, now, you have to select the afterward image click on open. So, now, you can see in this panel first only band 1 for forward image was showing and now band 1 for both the images are showing here for forward and afterward. So, now, you have to go with this option topographic file ok.

So, in the PPT I explained that you can do it from both, with both the options like you can go here. Then you can select your files by this clicking new, and you can also select your file by clicking open image for it ok.

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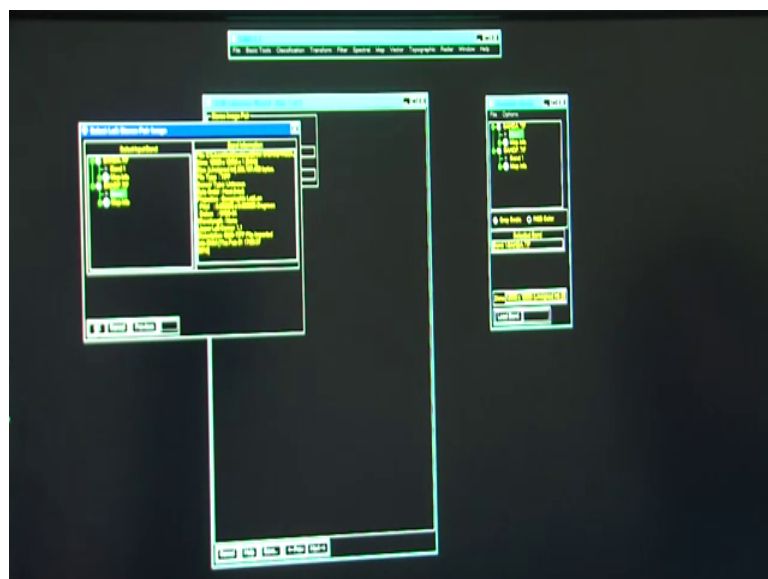


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So, click on stereo image, select stereo images ok.

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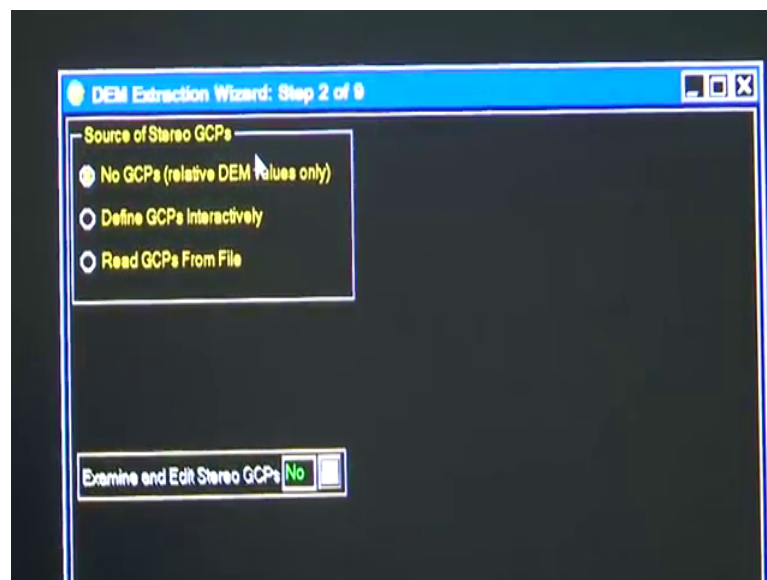
And when you click here will give you the same images ok. So, first you will select forward then click on open then it is saying like this select right is stereo pair first it was saying select left is stereo pair. So, you selected your f then now, it is saying that try select tried stereo image. So, now, you will select your for a, band a click on ok.

So, now, it is what it is saying it will guide you this software will guide you automatically what to do next. So, select file containing RPC coefficients ok. So, we

have placed the RPC coefficients in the same folder that is a and b work and b work. So, first in the same manner we have to select RPC underscore org ok, for f open then it is saying select file containing RPC coefficient again. So, it means that, it needs the after RPC, RPC for the band a underscore r ok.

Please remember to select RPC underscore org, not this one because this is a x document, open ok. Now, you have selected both the images left image and right image. So, now, you have to click next. So, are you able to see these options? You can see it by zooming your video; no, so there is option for source of stereo GCPs. So, GCPs means ground control points.

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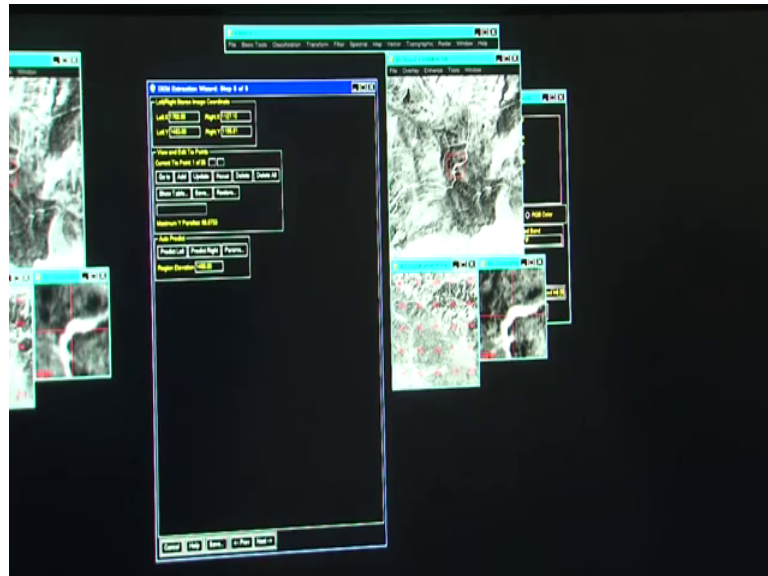
So, ground control points we can give only when we have some GCPs by visiting the that area or some doing some field work and collecting some ground points ok.

So, but we have in case because when we need DEM for a large area it is not possible to go everywhere and collect the ground set points. So, for large area we will select it automatically or first we will do it automatically then we can select the tie points manually if within this software.

So, let us move no GCPs, because we do not have GCPs here ok. So, click on next simply. So, then it will ask you source of tie points ok. So, whether you have your own tie points or you want to select it manually.

So, let us say we want to check what is the factor of a parallax with tie points generated automatically ok.

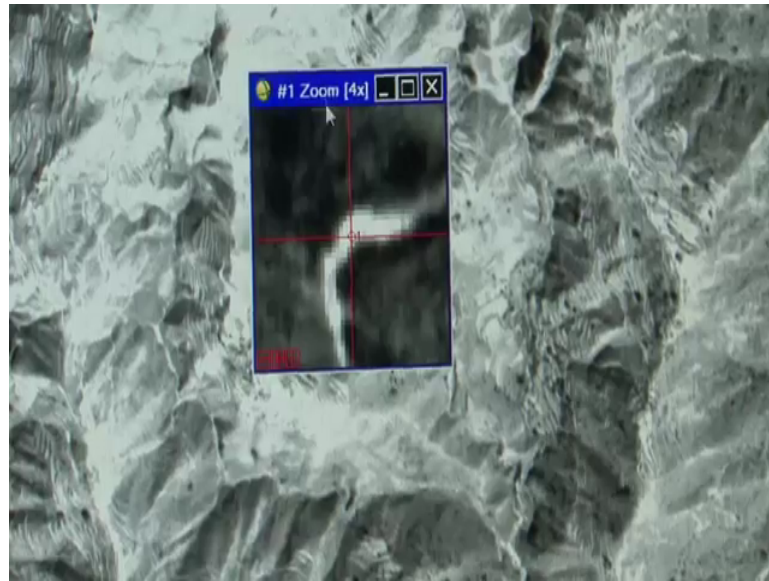
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So, click on the generate tie points automatically, then it will process both the images and here you can see, we can zoom these image also ok. So, at this stage the image is shown like this because we are in the process of creation of anaglyph.

Now, take it back, back again. So, this is the complete image use if you see here this window this is the complete image and these are the distributional points on this image ok. So, let us see how many points it has selected generally it selects around 25 points, and this is the zoom window of this one, this large image.

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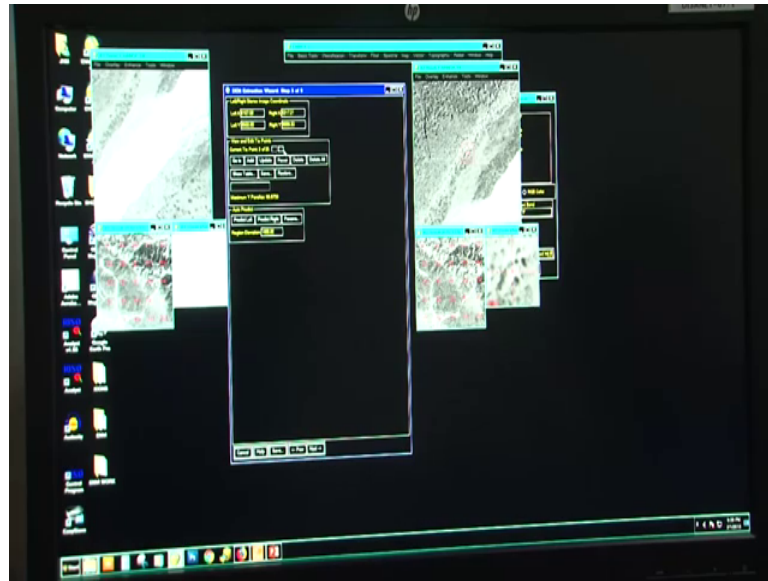
Because this is, this is covering the complete area and this image, this image this image is com is covering this area this is square ok. You can see as a rectangle on this image this window covered in the rectangle shaped box is shown here in the form of this transformation and the part of this large image, a little part of this large image like here is covered by a small square. So, this is square is showing in form of this window ok.

As you can see there is a road and it is covered in the d square and same is shown here also. So, same is with the other image, let is let, let us take it back again. So, same for this image this for the forward and this is what in the afterward. So, we have we have to have these two images for generation of the digital elevation model ok.

Similarly, you can see that there are 25 points here it is mentioned a 25 points current tie points 21 of 25. So, , but it is showing at this stage only point number 1 ok, if you see let us now zoom this image ok. So, at this stage it is showing point number 1 on here ok. So, this is the tie point remember this is not the GCP because we do not have GCPs with us.

So, let us say what is the parallax for this point. So, if you see you can see the value of the Y parallax, maximum Y parallax is 66.8733 which is not acceptable what I have explained only acceptable value will lie within the range of 0 to 1 ok.

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So, let us say for some other point this is point 2 ok. So, you can see that this point is placed in between the river because this white patch it is a river floodplain ok, in white color because the sand reflects most of the light because it is of light color and the darker objects absorb more light ok. So, this is the sand the fresh sand of a river channel. So, this may be a red bar or a floodplain part of a river.

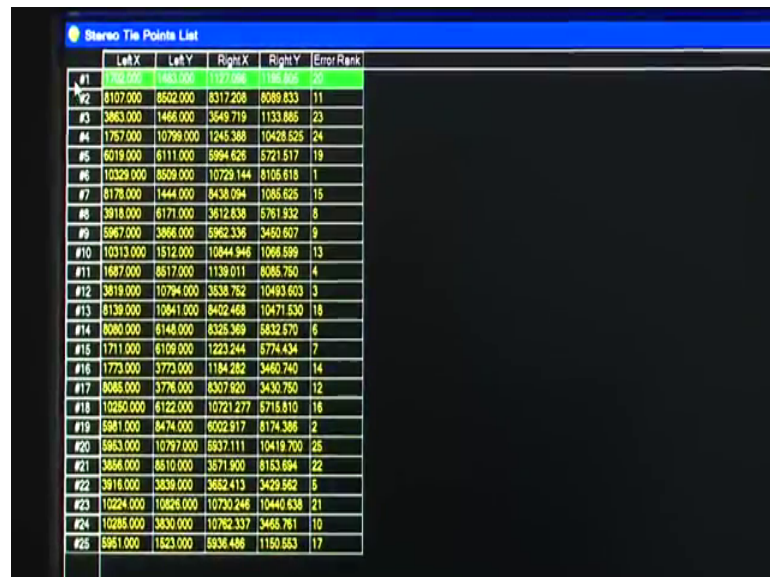
So, you can see that point number 2 on this image on the left image is lying on in between the floodplain part, but in this image in the after image. It is out outward placed from the floodplain area. So, that is why an error in this parallax is a great value for this parallax is shown here ok. So, this is the reason. Similarly other points also will have some kind of orientation distortion and or you can say the referencing of the points is not correct on these images ok.

So, you can similarly you can see one by one for all the tie points. So, this was for point 2, this is point 3, this is 4, this is 5. So, these are the corresponding points ok. So, like if I am saying point 5 of 25 it means that point 5 on the first image corresponds to point 5 of the second image. The position point 5 tries to show here is the same ok, but it is not geographically corrected. So, this is what we have to do manually in this exercise.

Similarly, we can see for other points 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23, 24, 25, again 1 ok. So, what we have to do? Because we know that these points are not corrected. So, what we can do, either we can select one by one all the points like point 1

and then first rectify point number 1, on both the images then we can rectify point 2, point 3, so if we are going to do this kind of thing. So, then first better to show to click on show table because this table we will show you the maximum number of error shown by all the points ok.

(Refer Slide Time: 39:19)

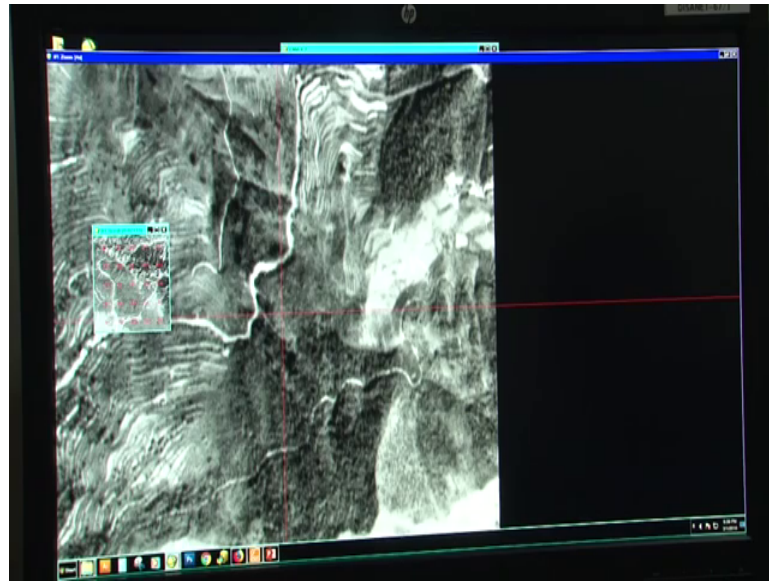


| | Left X | Left Y | Right X | Right Y | Error Rank |
|-----|-----------|-----------|-----------|-----------|------------|
| #1 | 1102.000 | 1463.000 | 1127.000 | 1196.806 | 20 |
| #2 | 8107.000 | 8502.000 | 8317.208 | 8089.833 | 11 |
| #3 | 3083.000 | 1468.000 | 3549.719 | 1133.886 | 23 |
| #4 | 1787.000 | 10799.000 | 1245.388 | 10428.525 | 24 |
| #5 | 6019.000 | 6111.000 | 5994.626 | 5721.517 | 19 |
| #6 | 10329.000 | 8509.000 | 10729.144 | 8105.618 | 1 |
| #7 | 8178.000 | 1444.000 | 8438.094 | 1085.626 | 15 |
| #8 | 3818.000 | 6171.000 | 3612.838 | 5761.932 | 8 |
| #9 | 5967.000 | 3868.000 | 5962.336 | 3450.607 | 9 |
| #10 | 10313.000 | 1512.000 | 10844.946 | 1068.599 | 13 |
| #11 | 1687.000 | 8617.000 | 1139.011 | 8085.760 | 4 |
| #12 | 3819.000 | 10794.000 | 3538.782 | 10493.603 | 3 |
| #13 | 8139.000 | 10841.000 | 8402.468 | 10471.530 | 18 |
| #14 | 8080.000 | 6148.000 | 8326.369 | 5832.570 | 6 |
| #15 | 1711.000 | 6109.000 | 1223.244 | 5774.434 | 7 |
| #16 | 1773.000 | 3773.000 | 1184.282 | 3460.740 | 14 |
| #17 | 8085.000 | 3778.000 | 8307.820 | 3430.750 | 12 |
| #18 | 10890.000 | 6122.000 | 10721.277 | 5715.810 | 16 |
| #19 | 5981.000 | 8474.000 | 6002.917 | 8174.386 | 2 |
| #20 | 5983.000 | 10797.000 | 5937.111 | 10419.700 | 25 |
| #21 | 3886.000 | 8610.000 | 3571.900 | 8163.694 | 22 |
| #22 | 3818.000 | 3838.000 | 3682.413 | 3429.562 | 5 |
| #23 | 10224.000 | 10826.000 | 10730.246 | 10440.638 | 21 |
| #24 | 10285.000 | 3830.000 | 10782.337 | 3468.761 | 10 |
| #25 | 5981.000 | 1823.000 | 5936.486 | 1150.583 | 17 |

So, there are this table will show you the error as you can see is showing error by rank wise ok. So, point number 1 have maximum error by rank then similarly for other points there is parameters XY, XY for left image for right image ok. So, this you can see by clicking on the table, so high table.

So, if you are going to do this exercise then you what you have to do? First, you have to concentrate on the left image ok, on this image you have to zoom this part and place your cursor anywhere you can place it ok. So, where you place it the intersection will fix at this at that location ok.

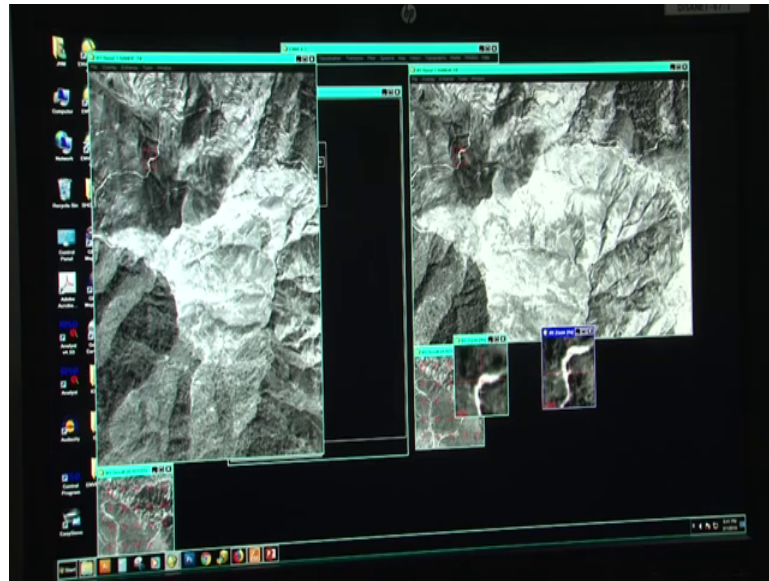
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So, the present location of the point is this shown by red color. So, we have to look whether this point number 1 is located correctly or not.

So, what we can do is we can take you can increase the size of our window so that we can see it clearly ok. So, then you should actually select point which is present at a location which you can mark very accurately, like intersection of the roads joining of rivers or some higher peaks ok. So, any kind of land mark points ok. So, you have you go for that only. So, this is to recommend you that we have to select we should select point like this ok.

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So, in this zoom window you can see this point is lying here ok. So, suppose we are putting it here on this image and also on the left image we are putting it here. There is some dot ok, so we can put it correctly on this dot.

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So, suppose we want to add this point because we know that this point is corrected. So, suppose we want to add this point. So, we can add we can click on add or update because this point is already present if we are going with point number 1, if we want to correct point number 1 then we have to click on update. So, it will automatically update point

number 1. So, if we want to add some more points other than already existed 25 points then we can click on add ok. So, let us say we want to update it, let us pickup any other point that is a point number 2 ok.

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So, we can see here on both the images that this the channel is having some sand some greenish island greenish in terms because we know that river has assigned island and consigned island there is some type of vegetation. So, in that term I am saying it some greenish island ok. So, you can see it on the color images, but not on this because these are the achromatic data.

So, now, you can see that this notch is very clearly visible on both the images ok. So, this is, this has the significance in selecting a point over here. So, suppose we want to select a point over here. So, first we directly put our this large this square box here because so that we can directly reach in this zoom window ok. So, you have to first select this part. So, from then you can easily select the pin point of this meeting area. In that case you can select the point the exact point of this meeting area this meeting point. Similarly you can select it on the left image, so for left image the zoom box is this is for the right image. So, suppose we are having we are taking our box here and then we can easily pinpoint our cursor here and the cross here we can put exactly on this meeting point.

So, what we can do? Because we want to select this point because we know that it will have some accuracy and will be helpful in creation of the DME. So, we will add this

point. So, you can see. Now, there is number 27, now it is showing number 27. So, the first fine what we added wall becomes the two point number 26 and this point what we have added has become point number 27 similarly we can add number of points. So, it is a lengthy exercise.

So, at this stage we just go ahead with the already corrected points ok, the point data which we have with us that is corrected. So, for that purpose what we have to do? First we should delete all the points present on our image ok. So, we have this image. So, let it keep in the mid side because that will be easy for you to understand. So, this is one image, this is another image. So, we are having. Now, 27 points on both the images , but at this stage we want to go directly with the DEM creation because this way we will take lot many odds to select the corrected points then process them.

So, first you have to delete all the point by clicking it delete all. So, it will ask you all the existing points will be deleted are you sure you want to do this yes ok. So, now, we are having a points spoiled with us. So, you can also select it you can select that point file by this option restore ok.

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So, click on restore and go in the same folder because we were working in this folder and we work ok. So, you can select it and this file you as you can see here 26 dot pts this these are the point files. So, these points we know that these are the corrected points which we have created earlier. So, click it and open it. So, it will show all these 26 points

distributed all over the image, you can see here also and you can see on this image on this image and on after image forward and after you can see of these 26 points on both the images.

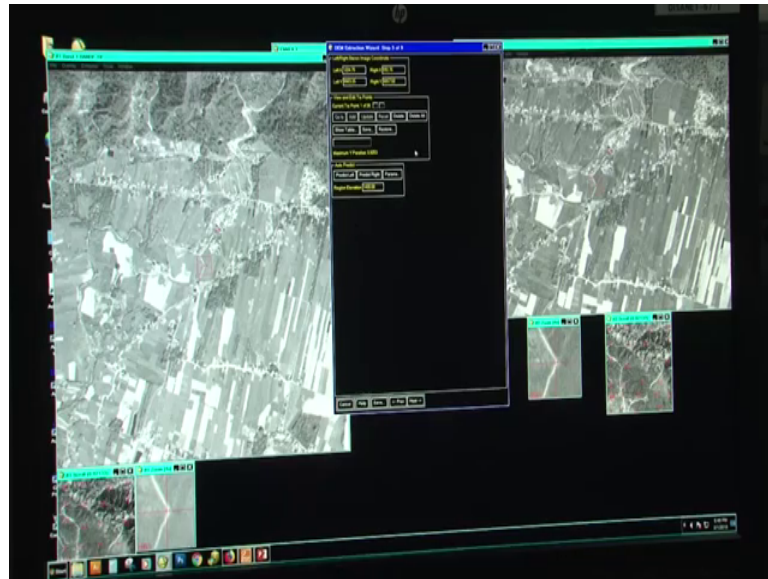
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So, now, you know that these are the corrected points and why how to check whether these are the most of the points are corrected or not you can see your maximum y parallax here. So, it has converted into 0.9 to 03 this is little bit accepted to us because it is lying between 0 and 1. It is very difficult to reach to take this factor near to 0 , but yes you can do it by taking your time and correcting these points up to the extent what you can do ok.

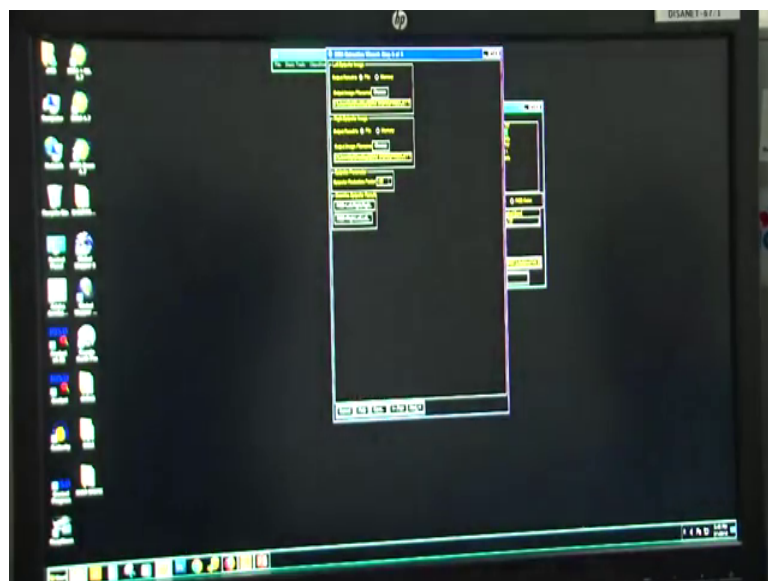
So, now, you can see that all these points are displayed here you can click on next, you can see all the table also, so then click on ok.

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So, now, we can move ahead by clicking next.

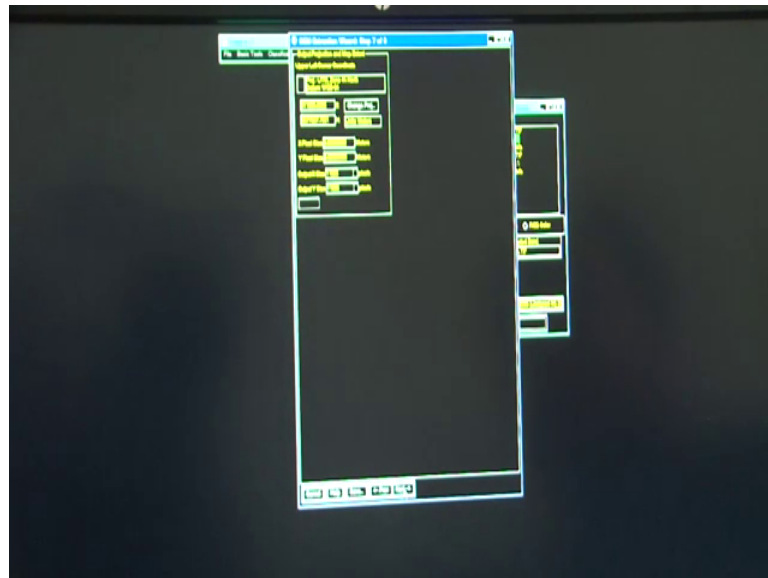
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Now, it will ask you. So, give a name for left epipolar image and write epipolar image ok. So, you have to select here the directories where you want to keep your generated files, So, suppose we first select the output image file name for left epipolar image choose you can go again in the same folder and be work and you can give it name band f left epipolar image, because this is for left epipolar image we can give it name as band f left epipolar image and just click here because it just needs a folder.

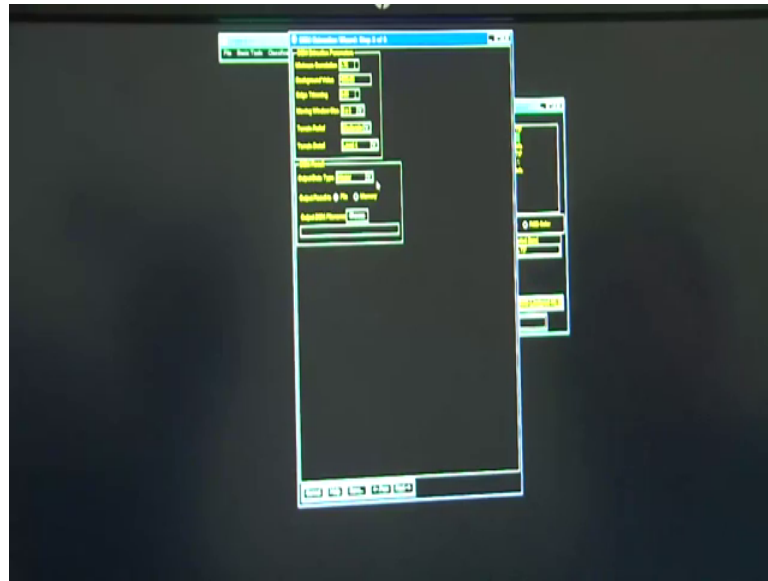
So, what you can do? You can create a new folder which you can give name anaglyph ok. So, you want to save your anaglyph images in this folder, click on this already a name is given click open, then choose file name for right epipolar images click on choose again go to ENVI work folder click on anaglyph where you want to save it. So, the name is given band a right epipolar image ok, click on open. Now, you have given names for your right and left epipolar image, just click on next.

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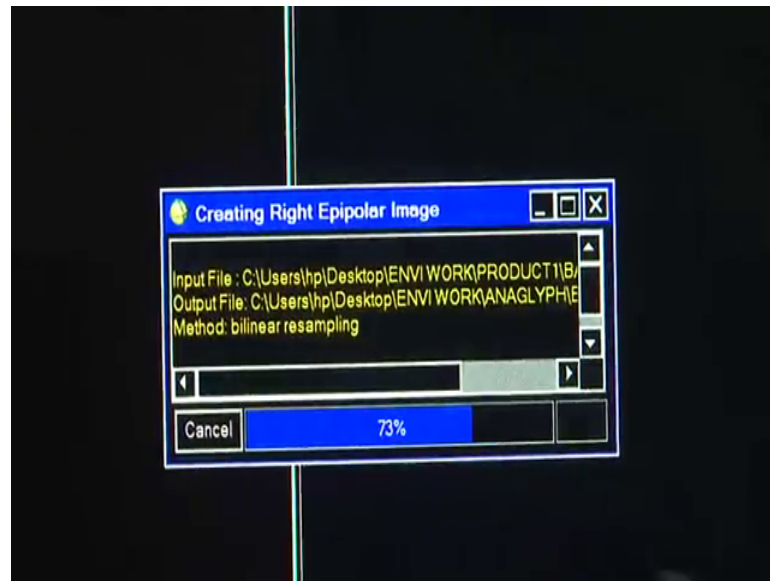
Now, it will ask you for output projection and map extent, output projection and map extent. So, these are the default parameters, you do not need to disturb any of this because this is the automatically set by default from by the software and the projection is utm zone is 44, 44 zone north and the datum used is WGS 84, so because these are the Cartosat side when data. So, this information is already set with our data ok. So, click on next.

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So, DEM result. So, it is asking for a DEM file, file name for your DEM. So, you suppose you are going to you have already given names for the anaglyph images. Now, it is asking for the name for the DEM image. So, DEM extraction parameters or this you do not need to change it also, do not need to change anything you just click on file and output DEM file and you can choose it from here and you can click on the you your folder ENVI work ok. So, create another folder which you can name you as DEM because you are going to put your DEM image in this, and give a name for this image DEM trial or any name, suppose what impugn the name of your area is the Garhwal region you can give it DEM for Garhwal region ok. Click on open, then click on next.

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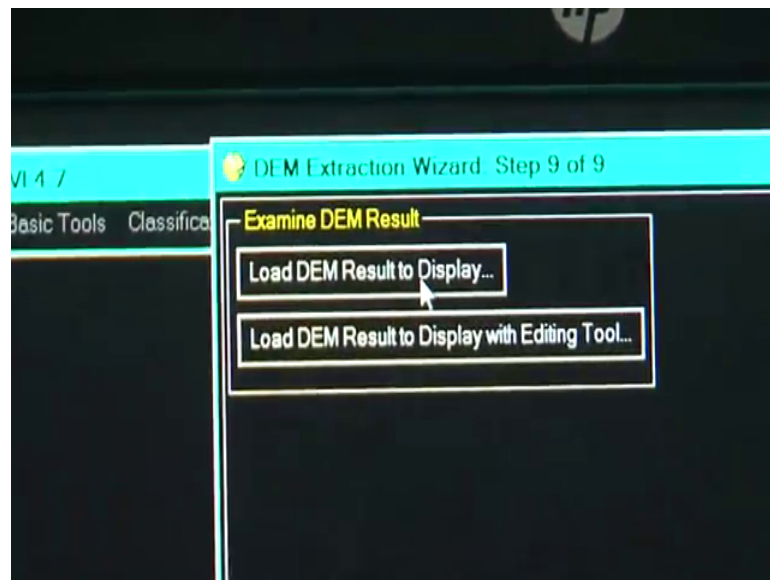


So, now, you can see you will find those 4 wizards one by one. First it is creating left epipolar image by bilinear resampling method ok. So, first it will process the left image which is your forward image. Then it will process your right image you can see creating the right epipolar image by the same method that is bilinear resampling. If you see it in zoom, so you will be able to see that it is saying like this it has already created in the left epipolar image it has created this and now, it is building your parallax the parallax what we have got in our last steps which is acceptable to us that was 0.92 something ok.

So, now, after taking all the parameters into consideration and the and all the points the 26 points which we have already created and be set in the software and so those points will be automatically calculated with the method of triangulations. And after that it will create the points remaining in between the areas which are not covered on the image ok.

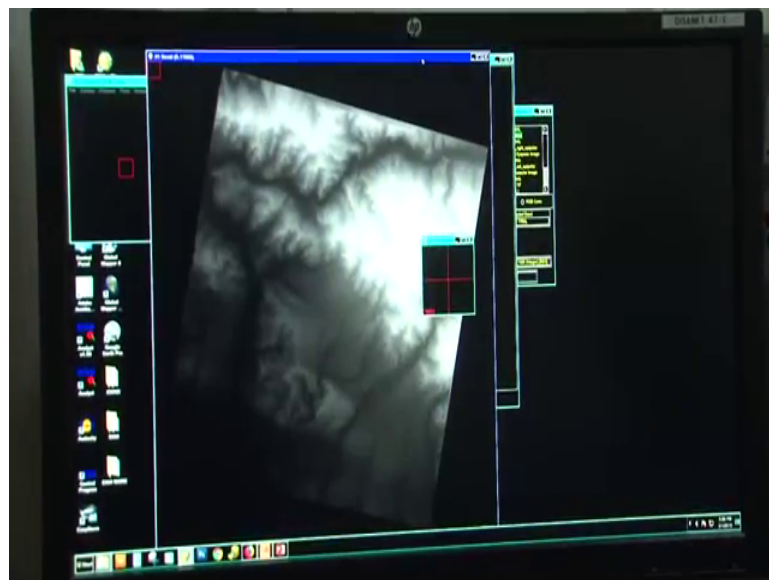
So, suppose we have created point number 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 like this. So, suppose we are not having any data in between point 1 and point 6. So, it will automatically create the data by interpolation this method triangulation. So, now, after doing all these exercise it is it is doing the geocoding DEM ok, by triangulation method.

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So, now, at this stage you will see your DEM here, DEM results examine DEM results, load DEM results to display.

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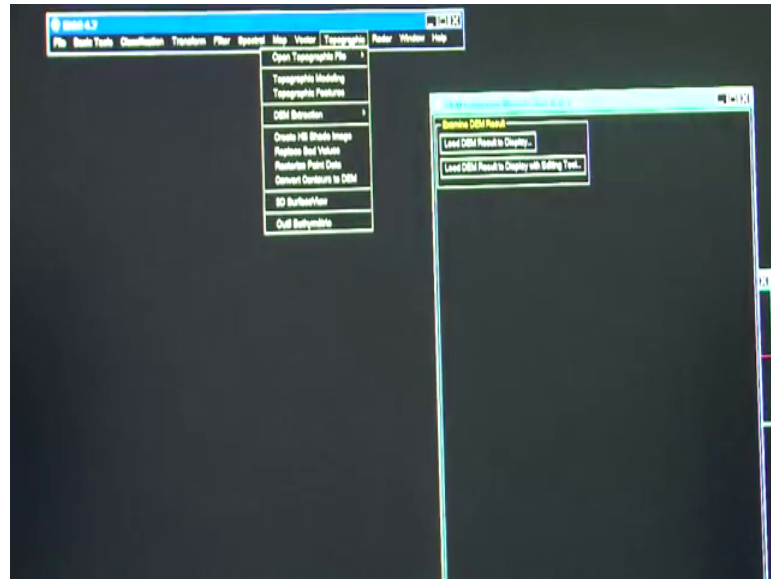
You can see the DEM for those two images has been created and shown like this ok. So, you can see here that these streams are joining the main river channel. So, this is the main river also called trunk stream in form of river fluvial geomorphology this is trunk stream this you must have learned in your geomorphology lectures ok.

So, the reverse are coming from the higher elevation and moving through slopes and through slope they are joining the main stream or the trunk stream. The DEM, you can extract number of information from your DEM. Like you want to profile, you want to get a profile from here to here you can put this DEM file in global mapper or any type of software which are dealing with such exercises. So, you can put your you can open this file in global mapper and you can do profiling mapping and etcetera you can extract number of information with the help of this digital elevation model ok.

So, you will have the more number of points distributed over the image the more accuracy and the more resolution you will get on your resulted DEM because we are having the points distributed like this ok. So, the resolution of this image is not very good, but of course we are able to see all the drainage system, but we cannot determine the features which are present located in between some few meters a few meters ok. So, for that we have to create more number of points for a high resolution DEM.

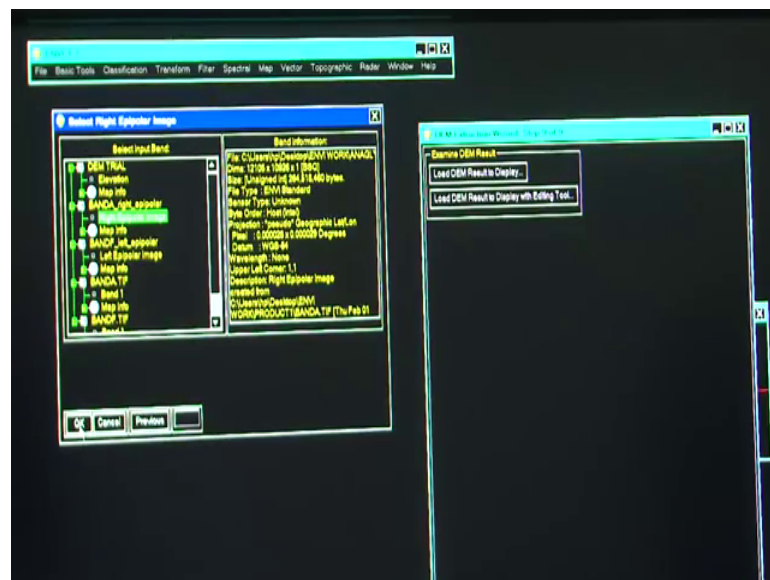
Now, we have to look for our anaglyph image ok, what we have generated through this exercise. So, that you have to open with this wizard as I have shown you. So, now, for being our anaglyph resulted from this exercise we have to again go with our topographic option ok. DEM is automatically generated and you can display it from here. Load DEM result to display, but for anaglyph you have to display your anaglyph result your left and right a epipolar images with this option, go to topographic option, then DEM extraction, then go to epipolar 3D cursor.

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So, if you see it in zoom you can see the options here ok. So, I am zooming it so that you can see the options listed over here. So, we can go in topographic option, then DEM extraction, then then you can select epipolar 3D cursor ok, click on this.

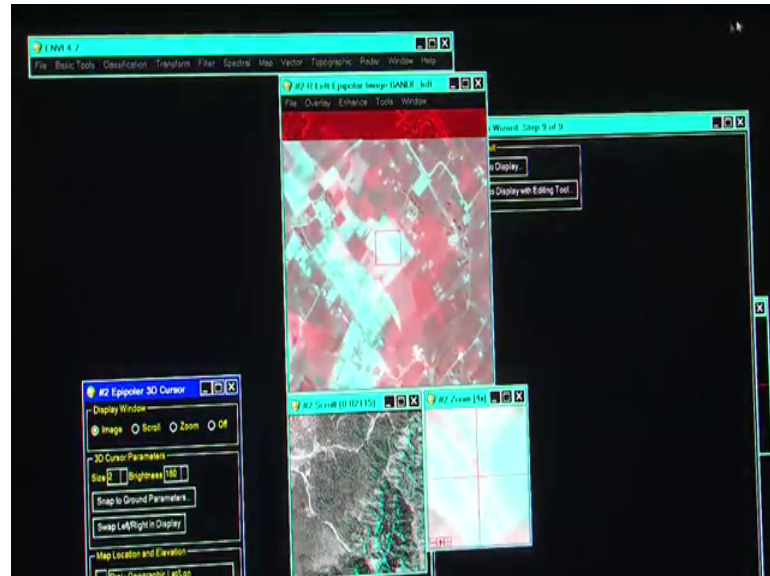
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So, then it will ask you select left epipolar image, first it will ask you select left epipolar image. So, where is your left this ok? So, here all the results are displayed, but you have to select only left epipolar image. So, this is your left epipolar image. Just click on this and click ok, then it will say will say select right epipolar image. Here is your right

epipolar image, click on it, and click on finally, you will have your anaglyph in front of you ok.

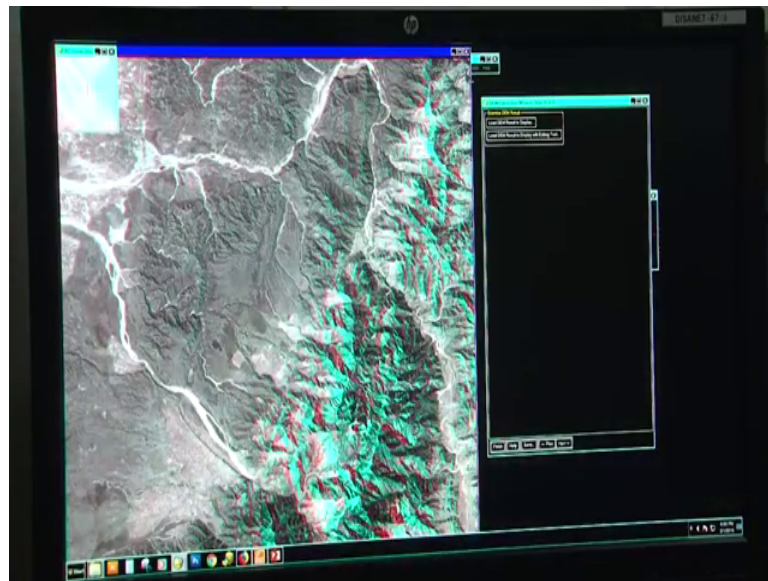
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So, enjoy your anaglyph with 3D anaglyph glass ok. As you can see this is zoom up part, this is a zoom apart like in the earlier wizard you see that this large image is a zoom up part of the rectangle shown over here on the full image. And this zoom part is coverage of this square which is placed here over this image.

So, for viewing complete the full image you can zoom here ok, you can maximize it. So, first let me tell you what information you are having here. You can see all the relief of the ground, you can observe the features the landforms and you can use this map for a number of purpose like you want to do some mapping some kind of wrapping over there ok, if you want to extract some information about the objects, if you want to have an engineering project in this area or if you want to do land use analysis for this area ok.

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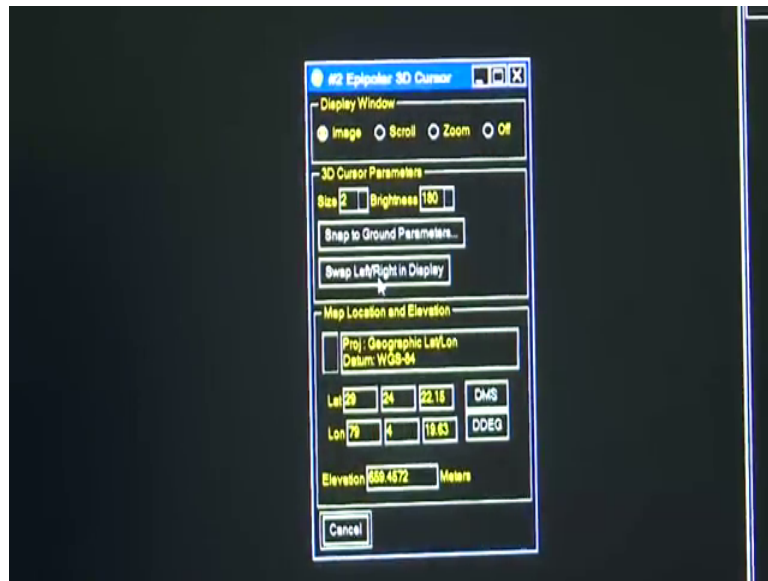


So, you can understand all the patterns in this region and then you can. So, now, let us again minimize it and zoom the full image. So, this is our full image. Let us take it in the middle, yes ok. So, this, when we are this these kind of anaglyph glass we can see this image in 3D ok. Remember you have to wear it you can buy it from anywhere. So, you when you wear it you will see this image directly and you will be able to see this terrain in 3D ok.

So, now, I am having a depth perception ok. What I am seeing? So, yeah one thing you have to remember. So, when you first display your anaglyph there may be not a correct representation of the ground because sometimes what happened your right image and left image our swiped ok. So, due to which what happens your reverse, you will your reverse you will find on the surface and the hills you will find on the depressions. So, there will be a negative depth perception the, so the higher elevations will be shown as a lower elevations and lower elevations as a higher elevations.

So, what you will do is a simple method you just minimize it and take this wizard ok, in which you have created your image ok, and then we just click on this option. Are you able to see it ok?

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So, you just click it left right in display ok. So, this will display the this swept images like the left will become the right and right will become left ok. So, if the pattern is not corrected all already. So, it will be corrected by this.

Now, if you see, now we have done it yeah, so now, let us again display our image ok, yeah let us again try to see it through this glass yeah. So, now, it is having a correct depth perception ok. So, now, I am able to see that the rivers are flowing in between the ridges. So, here is a ridge, another ridge is on the other side, these are the hilly areas having steep slopes and these patches like this one and this one and this one these are the higher elevation means the ridges areas ok.

So, these are the higher elevations and rivers are coming from here and you can see the tributaries are matching with the main river trunk the stream and here you can see a planar area, planer ground ok, where there is no relief changes. So, this area is used for the settlements or analization by the people ok. So, the river is going and coming from the higher elevation and going towards the low lower elevation what happens in natural in nature also ok.

So, when you look this image with this an (Refer Time: 65:16) glass you will be having a correct perception and you are looking through a video ok. So, I hope you may be able to see this area in 3D because you must be looking through these two lenses and you will have a depth perception like you will see a this river at a lower elevation, and you can

see the ridges at a higher elevation ok, and in between the two ridges on both the sides this river is flowing from higher elevation higher ground to lower ground.

So, suppose if I am moving my glass here you can see this river is originated at a higher elevation and now, it is moving through slope and going like this, and meeting the plains, plains, the plane area ok. And you will enjoy your anaglyph at as you are flying over this terrain ok. So, likewise in case of stereoscope we have the dapper section by having two images, in this case we are having only a single image which is made up of made up from two different images left and right forward and after. So, but we are having a single image of anaglyph and we can have the same kind of depth perception as we have under a stereoscope by having a stereo pair ok.

So, hope you have learned a lot in this exercise and so probably this may be your last exercise. So, thank you very much for your kind attention and hope to see you again.

Thanks.