Geographic Information Systems
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Lecture-43
Demonstration through GIS software

Hello everyone! and welcome to a new demonstration on GIS software. And in this demonstration, what we are going to do? We are going to handle false colour composite images. As you know that one of the major sources of Data in GIS is coming from satellite based Remote Sensing mainly. So, we have to handle this also. This comes under the raster. As you know raster having two types; one is in grid form and that is best example is digital elevation model and then image form, that is what the satellite images which we will be doing.

So here we will be handling false colour composite images. How they are handled on a GIS platform?

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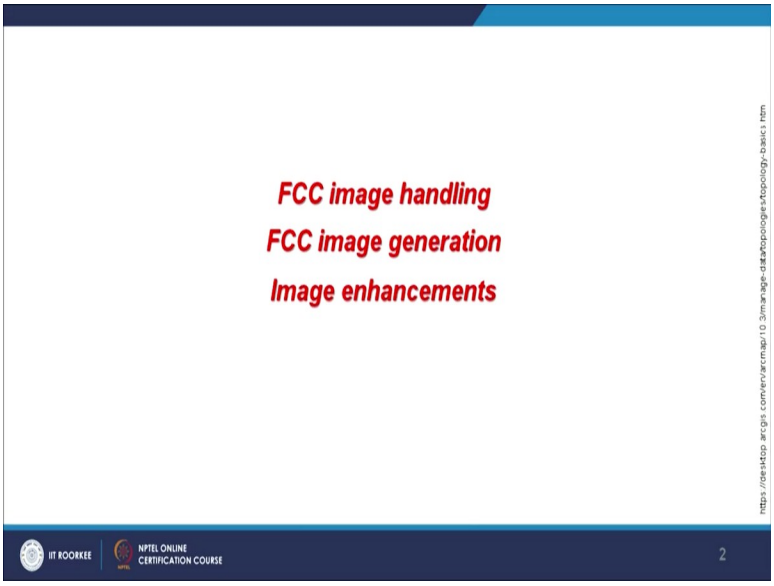

And what basically meaning also of false colour images and then we will also discuss briefly about the image enhancement. So, before I directly go for demonstration on the software, let me first explain about this false colour composite or in short, we say FCC. The reason here is that why it is called false because for infrared channel, we are assigning red colour. Now why this

compulsion? As you know that any coloured image is made from three colour components which also we called primary colours.

And which follow the edited colour scheme. And these three components are red, green and blue. Now for blue part of EM spectrum and green part of spectrum, we are having satellite images. They can go as it is in this colour composite. But we would like to have one more addition for another component that is for red component, an infrared band of multispectral satellite image. Now this infrared band, as you know though it is called red but we cannot see from our own eyes though instruments can record in that part of EM spectrum.

So which colour to assign to this infrared channel so then only left option for us is because green and blue has already gone. So now only option left for us is to assign red colour. And when we assign this kind of combination that infrared channel having red colour and blue and green are two bands of a multispectral remote sensing then false colour composite is made.

But false colour why because a healthy vegetation is having very high reflectance in infrared channel. And since we are assigning red colour to infrared channel and therefore vegetation in false colour composite will appear as red. And you know that vegetation is not red. Vegetation should appear green and therefore, this is why we called as false colour composite.

Now there can be a question, cannot we generate a true colour image? Yes, if we are having you know that kind of number of more bands then near true colour image can be generated but exactly you know the real colour image cannot be generated by the satellite images inputs. So, the problem is that we are assigning infrared channel red colour and therefore it is called false colour composite.

In a standard false colour composite, that image will always have vegetation in red colour. So let us now start our demonstration.

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So, what we are going to do on this GIS software? We will try to add one image here and then see what really happens to that image. And then we will see that how this is created. So, if I take

an image here which like I am taking this Mosco spot image and I had this image. So, once the image is added in our view, as you can see that though I was mentioning that vegetation should appear in red colour but here it is appearing in blue colour.

Because the system is automatically assuming that the first channel is you know because this is colour composite. So definitely there are three bands which are being used to create this colour composite. So here, the system is assuming that the first channel is bearing the infrared band whereas we know that it is not. So that is why it is appearing here blue. So, if we change this 1 to 3 and blue to 1 and when we apply this one, now it is a standard false colour composite.

So, whenever you display any image, you have to be little careful that which band is being assigned to which channel. The infrared band must be assigned red colour then only you can create a false colour composite. Otherwise, it would not be possible to create a false colour composite. Similarly, this was the readymade sort of false colour composite but if I want to create false colour composite then what I have to do here that I can take any dataset like here.

If I take this dataset of LISS 3 and as you know that there are four bands been display. If I bring all bands together and let see what happens. So also, this part I have already discussed that is the creating pyramids. So, it will make display faster. So whenever first time, any image or grid raster is displayed in the system, it will always ask for to create a pyramid. So, I am going to accept that for all 4 band.

And as I was mentioning that this colour composite made from 3 band. Now here, what we are seeing? We are seeing all bands individually. So, this is band 5 but you are seeing, this is band 2 and this is band 3 and this is band 4. Visually you may not find much difference but they are definitely having differences in it. Now in their pixel values. Now what we will try? We will try to create false colour composite using this one.

So again, we can go for search and see that colour composite. Because we have to search that tool and many times, it is difficult to remember where it is? So, the best way is to just search the tool within the toolbox and then you can just click and those things will come to us. Now what

we are going to do? We will add all those images which we wanted to have here. So, I am going to add all these images, one by one, to create a colour composite

And we will add 4 channels but at a time, only 3 channels will be used. So, we can check that which one is giving the best result. So likewise, I will add the next one and then next. All four have been added. And now we have to provide where it will be stored. So let me accept whatever location it is showing and it might take some time to create a false colour composite.

Because it has to combine all 4 bands and then you get a false colour composite easily. Remember that the first band is band 5 then band 2 then band 3 then band 4 likewise. So, once it is added then we will be seen how whether it is following the standard false colour composite scheme or not. If not, we can change the assignment or we can assign different colours to different channels; the appropriate one and can get a standard false colour composite easily.

Now it has been added this one. So let me go here and check why it is not coming properly because how I can say it is not coming properly because the water body generally should appear as a black, very dark. Here it is appearing green. So, it seems that it has not you know correctly got the band. So, what I will try? I will try this one and change to this one; 4,3,2. Let me apply this one. So, this is now band combination which is giving us quite good result.

We can also add the remaining band here in this composite but that may not bear any good results. So, this is how a false colour composite can be generated quite easily with your input bands which you are having. So again, I will just you know recap this thing that in order to create a one standard false colour composite, you need one infrared band, you need one blue band and you need Green band.

So blue and green will go to blue and green red channels. Whereas the infrared one will go to red channel as it has been done like this here. So, when we do like this then we get a perfect or standard colour composite. Why we are saying standard colour composite because once it is standard colour composite then interpretation on standard colour composite can be done quite easily by many people.

Because lot of interpretation keys are based on standard false colour composite. So therefore, it is always good to create standard colour composite rather than combining bands arbitrarily to different colour channels. Now this image which is being displayed, if I say now this is completely unstressed or no enhancements are there. As you can also see here that there are no enhancements. Let me shift this image little bit and then open again that one.

So, both things can be seen clearly. Now here you see that stretch type because now we are discussing how to improve the quality of our image for our image interpretation or any further processing. So currently, it is no stretch. Now, there are various stretching or enhancement techniques which are available here. Like here of course the custom design, we can do our own custom stretching. If we are having full knowledge of the distribution of images pixels and frequency then standard deviation then histogram equalization, minimum maximum; this is also called linear stretch.

And this histogram will be being put in nonlinear stretch. And then percentage clip and some ESRI has also made their own and sigmoid also. So, there are various stretching schemes are available for us. But before going for any stretch, the first requirement is to study the distribution of pixel values in this range of pixels. Also study some statistics about image. For example, minimum, maximum value or maximum value of pixel, what is the mean value and standard deviation.

And secondary when you studying this histogram, you would find that it is not just one peak is there but roughly 2 peaks are there. What I am trying to say, it is not in Gaussian distribution or bell shaped. So, for that, we must be very careful about making some stretches. Manually also, I can do this stretch that I say that any value which is found from this should be made to the maximum. If I do it, this is going to be the distribution of my histogram.

So, for each channel, I can do like this. And I can do manual stretching or I can do the standard stretching techniques which are available. So, if I am doing this custom one, as you can see this is custom one. When I apply whatever I have decided, this is how it looks. So, it is not very good

custom one which I have done. That means you have to keep trying. Once you are satisfied with that. I made just based on the distribution of the histogram, my selection for the maximum value may not be good.

So, I have to work on minimum also. So, I should have taken minimum like this. For each band again here, minimum like this and also for blue. Some changes have occurred but may not be very good. Whereas if I choose some already available like histogram, minimum maximum. Minimum maximum is a linear stretch. So, as we have already seen that here the minimum value and maximum value for each band is different.

Does not matter if I go for minimum maximum. So minimum maximum of each band would be stretched to full scale that is 0 to 255 because each image here is 8-bit image. So, the values can vary between 0 to 255; total number is 256. So, if I go and apply a minimum maximum then this is what I get. So minimum maximum again is not good. So, if I go for histogram equalization, it should create maximum contrast and also may be very good results. As you can see the results were quite good.

But however, it is drinking too much blue colour which may not be good enough. So, in another one, I can try standard deviation. This fits well quite well. So, what I am trying to say that for each image, there has to be different image enhancement technique because the distribution of pixel values is completely different from one image to another. Now if you mosaic 2 images then before mosaicking, you should not do any enhancement.

Once there you have mosaicked the images then for entire mosaic image, you should do enhancement. Rather than individually first doing on 2 parts, enhancement, later on if you mosaic them, you may not be able to remove the seam or the line between two adjacent images. So, you have to be very careful about choosing these things. So, what we have seen here that we can create a false colour composite.

Once we add or load false colour composite, what happens? That the red band is assigned to the blue, blue to the red so we have to correct it. And secondly that if you want to create your own

false colour composite, you can do it without any problem. Only you keep adding these things, use appropriate tool to create a false colour composite. Once you are satisfied with all this announcement then you can go and save that image as separate file.

Like for example I go and I say, I want to save it. I can provide the name; I can provide the format and just save it and it will save wherever you want. So, in that way, next time you do not have to create again a false colour composite. False colour composite will be displayed as soon as you would add in your view. So, this is about the image handling. One more time, you would require image handling when you want to use the images top of your digital elevation model for which you have to georeferenced digital elevation model and your satellite image very accurately.

And then you can drape over that and can create a 3D perspective view. In ArcGIS, for which you have to use an extension which is call Arc scene and then using that extension, you can create a 3D perspective implying 2 main datasets; both are raster. One is digital elevation model; another one is satellite image. Both has to be perfectly you know belong to same Geographic co-ordinate system and should have a very good geo-referencing.

If that is done then definitely, you can create a 3D perspective view of your study area. Similarly, this 3D perspective view has been created on Google Earth, as you can also see there. So, with this, I end this demonstration with a suggestion or request that whichever the software you are using, please download some satellite images from net. There are various sources like you know, if you just type in Google; Landsat Data download or something, you will get Earth Explorer; very famous portal or Geowig or many other such portals are there.

And from where, you can get the data. And various portals, I have already discussed or in future also if reference comes, we will discuss that part. So, once you have downloaded the data. try on your software to create a false colour composite and also try various enhancement techniques to develop a full, not only theoretical background but a practical experience too. So, with this, thank you very much.

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