Geographic Information Systems
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Module-09
Lecture-49
Creating Vector Features

Hello all welcome to NPTEL online certification course on geographic information systems. I am Chandan MC, PhD student in Ranbir and Chitra Gupta school of infrastructure design and management IIT Kharagpur. In this module we are seeing GIS as a software and in this particular hands on session will try to understand how to create vector features.

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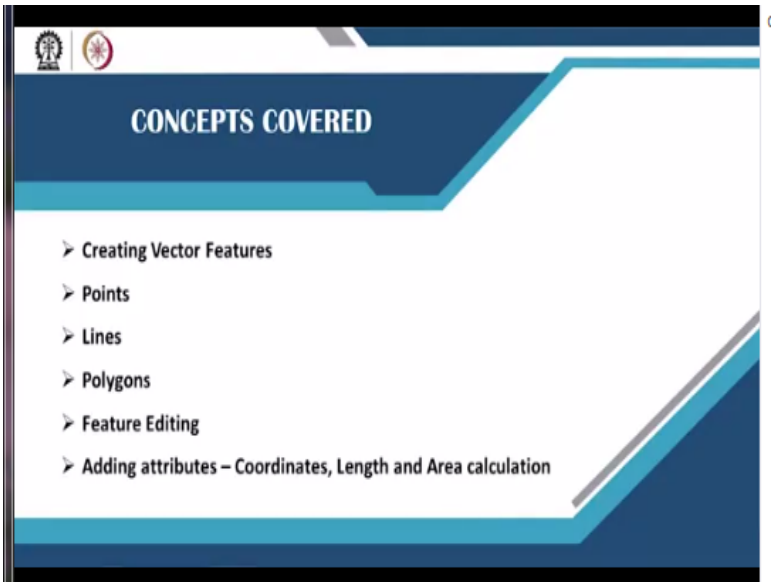

So in this session, we will be talking about creating various vector features such as points, lines, and polygons and editing it is features and adding attributes to the vector layer.

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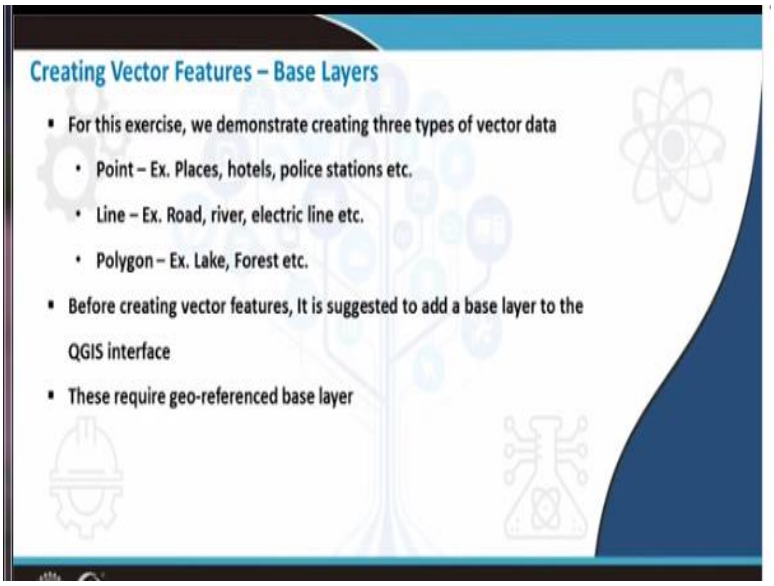

To create a vector layer, we need base layers**,** base layers as the one which has information on it on the prior hand. For example in this exercise, we demonstrate creating 3 types of vector data for example point like places, hotels, police stations or it may be hospitals etc. Line features such as road, river or electric line etc. and polygon feature such as lake or forest etc. Now, before creating these vector features, it is suggested to add a base layer to the QGIS interface.

As demonstrated by Prakash in the previous session, he was talking about adding base layers such as Google maps, or Bing maps or any kind of OpenStreetMaps. You can add those as well to create vector formats. In this particular session, we are taking geo referenced base layer that is the toposheet which we geo reference in the last session.

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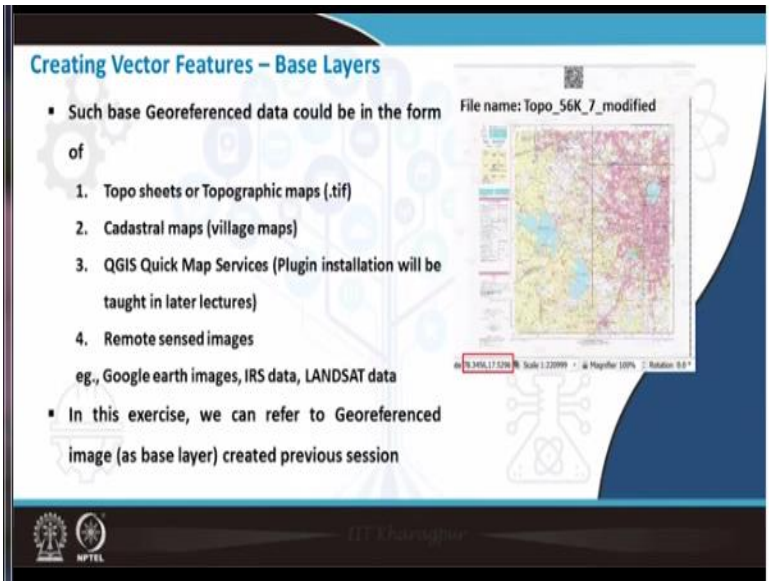

So the geo reference data can be in the form of a topographic map that is dot tif or it can be in the form of a cadastral map or a village map or it can be in the form of a quick map service that is nothing but the plugin that are already installed on the QGIS is shown in the previous lectures or it can be any kind of remotely sensed images meaning to say you can take satellite image or IRS data that is Indian remote sensing data or a LANDSAT data anything similar to that.

In this exercise, we are going to refer to the geo referenced image that we created in the last session. So I will directly go to the QGIS interface **(Video Starts: 02:55),** so this is the QGIS interface. Now I will add the geo referenced raster layer into this display section, going to menu tool bar layer, add layer and in add layer I will select add raster layer. So this raster layer will be our base layer, I will go to browse and here in the output I have Topo 56K 7 modified.

This is nothing but our geo referenced image in the previous session. So I will select this and then say open, add. So here to the left you can see the Topo 56K 7 modified has been added to the layer panel. Now I can close this dialogue box and as we can see the toposheet has already been loaded to the QGIS interface. Remember, this is a geo referenced image, how do we know you can observe at the coordinates that is one thing.

It is properly showing the coordinates or you can also go to the properties by right clicking on the file properties. In the information tab we can see the coordinate extends that is in terms of

latitude and longitude extends. Suppose, if this image was not a geo referenced, one, then this extends would have been 0 or - 1400 or any other random number. But since this is a geo referenced image that we did in the last exercise, it is showing the coordinate extents correctly.

So this is how we identify whether the image is geo referenced properly or not. Now let us start creating vector features, at first, we will start adding a point layer. To do that, you have to go to layer, create layer and in the second option you can select new shapefile layer. As soon as you create a new shapefile layer it will ask for file name. So here I am going to browse for the file name and I will go to the datasets folder and then in the output folder.

Here I will choose the output name as since we are working on Hyderabad image, I will give this as Hyderabad underscore places and then say save. So here you can see it is saving the shape file as Hyderabad underscore, places, dot shp. And the geometry type you can have any of these kind of geometry that is point, multi point, line or polygon. As of now we are collecting the point data, so I am keeping it as point.

Then if you come to the bottom section you can find layer CRS info that is nothing but coordinate reference system. So, here as our geo reference map is in latitude and longitude system it is correctly taking the default values that is 4326 WGS 84 nothing but lat long system, I will not change this. The next section is new field that means, here in the field list whatever appears is your attribute information.

Now, suppose for example, the ID is the default field list, so if you save this as it is then you are shapefile will contain ID as 1, 2, 3, 4, 5, 6 like that. Now let us say I need some more fields additional fields in the attribute table. So I need place name, so I am just entering here in name, place, name and this is text data, length will be 80 or if you want less you can also do that. Then just click on add to field list, so now second column has been added that is place name.

Next I will again go to the name I will create one more column in the attribute table that is address. So address is also text data I will just keep it as it is length is 80 and I will say add to field list. So now as you can see in the field list, there are 3 columns that has been created. The

first one is ID, second one is place name and the third one is address, now I will say ok. So now you can see Hyderabad places has been added to the layer panel, which is sitting on top of the raster.

Now to see the attribute table I will right click and then say open attribute table. So here in the last step we created 3 attributes that is ID, place name and address. Those 3 columns are there, but there is no data at all. This is because we have not yet created any kind of or we have not digitized any kind of data, so I will close the attribute table. To add points on top of the geo referenced map, first we need to zoom in to a particular location.

Suppose let us say I want to digitize a point in Hussain Sagar lake. I will take the zoom in panel and I will go to the particular location Hussain Sagar and zoom. So this is the lake, so here what I will do is, I will right click on Hyderabad places and then say toggle editing. So this toggle editing tool helps us to start editing with the features. So always when you want to add any kind of a new vector information you have to keep this mode on that is toggle editing.

As soon as you press toggle editing you can see there is a pencil mark that has been appeared on the Hyderabad places, so you can also find this here in the toolbar. Now toggle editing has been started meaning to say it is in editing mode. So next to the pencil there is one more tab which is called as add point feature, I will select this to add point features. And as soon as you bring it on top of the map you can see a cross here as been showing on the map.

Now what I will do is I know there is a Buddha statue inside the Hussain Sagar lake. So I will just click here and as soon as I click I am getting 3 fields that is ID, place name and address ID I will give as 1, place name I will give it as Buddha statue and address I will give it as Hussain Sagar. Once you fill all the details that is the feature attributes just press on ok, now our first point has been placed.

If the point is not visible, then what you can do is you can select Hyderabad places, right click, properties, you can go to symbology there is simple marker, you can choose any color you want.

So here I am choosing a color which is pink and once the color is chosen, I can also select the size. So here by default it is giving size 2, I will make it 2.5 and then press apply and then say ok.

Now you can see the point clearly marked here which is the Buddha statue inside Hussain Sagar. Now let us continue marking points, the second point would be Hyderabad railway station which is in Nampally. So, you can just zoom into the area, where there is the railway station, so once you zoom approximately to the area, you can find the railway station here, this is the termination of the rail.

So here I am going to add one more point just click on Hyderabad places and again select add points or add point feature at the end of the rail road just put a point. So this ID number will be 2, place name will be Hyderabad railway station, and address I will give as Nampally. Once all the details are entered just press ok, now you can see here our second point has been created, now I will zoom out and I will add one more point.

So here I know that there is a temple which is famously called as Chilkur Balaji temple. So I will add this as point number 3, place name I will give it as Balaji temple, address Chilkur ok. So now our third point has been saved, similarly I will add 1 more point now you can see these points has been highlighted in pink color. I will add 1 more point near to Shamshabad maybe this market ID is 4, place name I will give market and address I will give as Shamshabad and then press on ok.

Now you can see there is a point created here as well, if I zoom out now I can find all these 4 points that has been created. Now once you create required points then to save whatever you have created you have to right click and then again select toggle editing. Once you press that you will be asked whether you want to save the changes of the layer for Hyderabad places, you can just say yes or save.

Now you can see the pencil mark has gone that means it is no more in the editable mode. Now this, whatever information we gave all that has been saved. To view the information, you can right click and go to open attribute table. Now in the attribute table you can see the 4 places

which we digitized has been seen on the attribute table in this fashion. So the first one is you can sort it according to ID.

The first one is Buddha statue, Hussain Sagar, Hyderabad railway station Nampally, Balaji temple Chilkur and market Shamshabad. Now the next task is if you wish to add some coordinates to these particular places we can do so. So for doing that first we need to go to the top left corner there is toggle editing mode. As I already mentioned, if you want to add any kind of information to vector shapefile, the editing mode has to be on.

So that is why in this case I am choosing toggle editing again, I have turned it on. And then if you come to the top toolbar, you can find open field calculator. So I will press on this, once you open the field calculator one more dialogue box is opened that is the field calculator dialogue box. Here you can select the option create a new field and the output field name, it would be the first one is latitude and the output field type would be decimal.

Since we are referring to the lat long system it would be in decimal degrees. So I am taking decimal output field length can be 10 or even lesser and precision you can keep it as 3 or less whatever you like. And in the expression tab this is the expression tab whatever formula you need to give, you can put it here you can either type the formula or some ready formulas are already available in the QGIS interface.

So that also we can make use of, so here what I am going to do is I need the latitude. So I am typing y latitude are represented by y, so I am typing dollar symbol and then y, so dollar symbol y stands for absolute latitude. So here in the geometry I have this dollar y either you can search like this or if you want to see, you can just go to from the drop down menu select geometry.

In the geometry, if you come down to the last you have something called as dollar y. So double click on this once you double click, automatically it will be put to the expression tab onto the left. Now you can see output preview here that is 17.423 which is correct this is the latitude, so I will just press ok. As soon as you press ok you can see the latitude has been added to the attribute table and all the 4 places has got it is unique latitude values.

Similarly let us now try to add longitude I will go back to the open field calculator tab. Here I will create one more tab that is called as longitude and field type would be decimal or real number output length and precision I am not changing. Here you can either type dollar x for longitude or if you do not know what is the exact formula you can also search here under the geometry. If you go down you will get dollar x that is nothing but your longitude.

Here as soon as you double click on dollar x you can see the output preview it is 78.47, I will just press ok. Now you can see the longitude has also been bought into the attribute table this is how we create attributes for a particular vector layer. Once this is done you can again go back to toggle editing mode and press on the pencil mark and again it will ask for do you want to save the changes you should say save.

Now all the changes that has been saved can be seen in the attribute table and you can close it. So the point layer has been created, now let us see how to create line features such as roads or rivers or something like that. So to create line layer, layer, create layer, new shapefile layer and here in the file name I will go to the browse and file name I will give it as Hyderabad underscore roads then say save.

Now in the geometry type, since we have given roads it should be line and I will add 2 more attributes. The first one is road name I will not change any other things and I will just say add 2 fields list, second one is road type add to field list. Now road name and road type has been added to the field list that is nothing but that attribute column. Once that is done, I will click on ok, so now we can start adding roads but before that I have to right click and say toggle editing.

Because we are now adding features, once you press toggle editing, again in the toolbar you can see add line feature has come, so I can take this. And I will zoom to the places, where I want to add a road I know there is Tankbund road which is marked in pink color Hussain Sagar lake. So I will start adding that as a road feature, you can left click to digitize once you have digitized the road, you can right click to end it.

As soon as you end digitizing the road it will ask for ID, ID number is 1, road name I will give as Tankbund road and road type this is a major district road, so I will give it as MDR. So now the color of the digitized road and color of the existing map is matching, so the roads are not highlighted. To view it properly I will click on roads right click properties and in the symbology I will change this from color red to any other color which is more visible.

So here I will select some yellowish shade to the road or you can directly selected from recent colors and you can also change the width. I will keep it as 0.35 and then say apply and then say ok, now you can see in yellow color the road has been digitized this is the Tankbund road. Similarly I will now add some other roads, so I can add this feature here starting from here. So once digitize, you can just right click and ID will be number 2 and road name I will put it as Golconda road.

Since this is also a major district road I will keep it as MDR ok, now the road has been created. Now one more road I will create may be this particular stretch from starting from Gachibauli. I can start from here and I will just end it here, I will say road number 3 road name Gachibauli road and road type I will give it as national highway that is NH and then press ok. So you can see this stretch of the road has been digitized.

Now I have digitized 3 different roads. what I will do is, I will try to stop editing that is again I will click on toggle editing, do you want to save changes, yes save, so the changes have been saved. Now if I want to visualize these things in attribute table, I can go to the Hyderabad roads right click open attribute table. Here I can see all the 3 roads has been created, I can sort it according to the ID 1, 2 and 3 Tankbund road, Golconda road, Gachibauli road to 2 are MDR and one is national highway.

So now let us see how to add some more attributes to this particular vector file. So let us say that I need to calculate the road length, so once again for any kind of calculation, there is this field calculator which is available. So you can make use of this open field calculator just like we open to create the latitude and longitude in the previous exercise. So here output field name would be road length and I will give it as decimal number.

And here I will give the expression as length or dollar length, if you do not know you can just type in the search. So when you give length in the search under the geometry you can see there is dollar length, I will just double click. So once your double click the output preview it is showing, so just click on ok. So now you can see road length has been added to the attribute table . The first one the Tankbund road which we digitized is 2263 all the units are in meter.

So this is roughly around 2.2 kilometers, Golconda road 1.3 and Gachibauli road 1.3 kilometers. Once you are done with the attribute edition, you can click on the pencil mark and then say save. So all our attributes has been saved, I can now close this attribute table we have added point and line the last task is to add polygon. Suppose let us say I need to digitize the lakes of Hyderabad, so how do I do it, it is similar to addition of places or point layer and line.

I will once again go to layer, create layer and create new shapefile layer. So here I will browse and give Hyderabad underscore lakes and then say save. So in the geometry type you should be careful you have to choose it as polygon and I am not changing the lat long system that is CRS. Here I will give it as lake name, I will not change anything else add to fill list, I will just give address, area I will show you how to calculate address, add to field list and then say ok.

So now onto the layer panel you can see Hyderabad lakes has been created, I will just go to toggle editing to add lakes. So here I will just zoom to one of the small lakes this is called as Bon Cheruvu. So I will go to the toolbar and take this add polygon feature and start digitizing this lake Bon Cheruvu. So you can see a polygon with the transparency has been started to add.

So once you approximately or exactly delineate whatever feature you like to save, then you can right click, ID is 1, lake name is Bon Cheruvu. And you can give the address I have given it as Bapuji Nagar then say ok, so now our lake has been digitized. Similarly, quickly I will show you how to digitize one more lake, so may be, so here there is 1 more lake in Serilingampally I will again go to add feature and I will start digitizing this particular lake.

So the more you zoom to the map the higher the accuracy you get. So here I am just roughly digitizing, ID is 2, lake name is Gopi Cheruvu and address is Serilingampally. Once that is done just say ok, now you can see the polygon has been created. Now let us quickly see, how to add the or how to calculate the area for this particular lake. Once again I am going to the field calculator output field name, here I will type lake area and this is also again decimal number.

So here in search I will just give area, under the geometry you can find dollar area just double click on that. So the area which is coming now here as in terms of meter square, if you want to convert it into kilometer square just you can divided by 10,000. So that will give you area in terms of kilometer square just press ok. Now you can see the lake area has come to the attribute table, lake area of Bon Cheruvu is 20.14 kilometer and lake area of Gopi Cheruvu is 20.076 kilometer.

Once you calculate all the lake area, you can just click on this pencil mark and just save the edits then close attribute table. This is how we create point line and polygon features as vectors with the help of a base map **(Video Ends: 31:18).**

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To summaries today's class we have seen creating various vector features using base map. Our base map was Hyderabad topographic sheet which was already geo referenced. And we also saw feature editing adding points and we also saw how to add the descriptions or the column heads in

the attribute table and adding coordinates, this particular coordinate edition is possible only for points, length calculation for roads and area calculation for polygons or the lakes which we saw. In the next session, we shall discuss about snapping and other topology thank you very much.