Geographic Information Systems
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Module-10
Lecture-50
Vector Functions and Querying

Namaste, welcome you to NPTEL online certification course on geographic information systems. I am Chandan MC PhD student at Ranbir and Chitra Gupta school of infrastructure design and management, IIT Kharagpur. Today we are going to see how to use GIS as a software and in this particular hands on session we will be looking at vector functions and querying operation.

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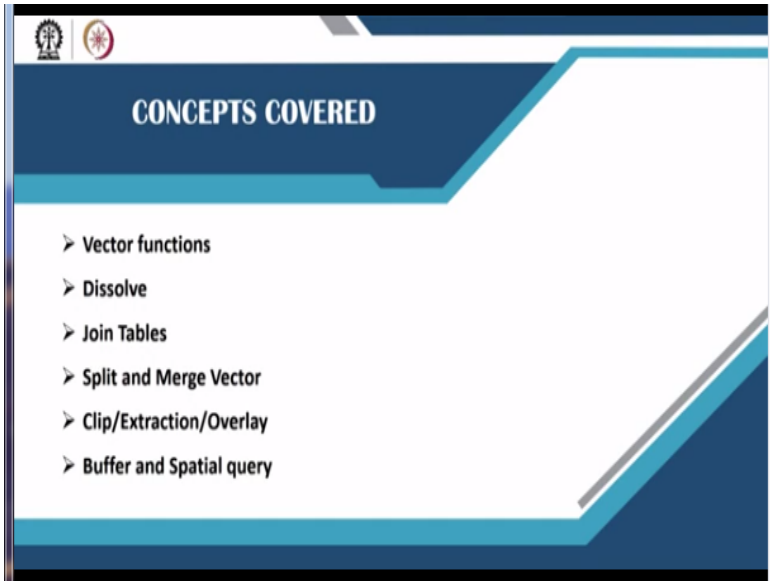

Today we will cover these concept, the first one is vector functions. The vector function dissolve, how to dissolve various polygons into one single polygon. Joining tables, as we all know if we have any kind of excel sheet with a lot of data, let us a population data. That excel sheet we can also bring into the QGIS and we can join that with the present vector layer, we can also split the vectors.

For example if there is a lake and if I have to split that lake into 2 equal parts, I can do that using split vector function. And if I have to merge 2 different vector layers into a single layer that also I can perform using vector function. And finally we will also see how to clip or extract or overlay, all these are same terms. So how to do this for a particular road segment and then finally we will see how to do a buffer analysis and a spatial query.

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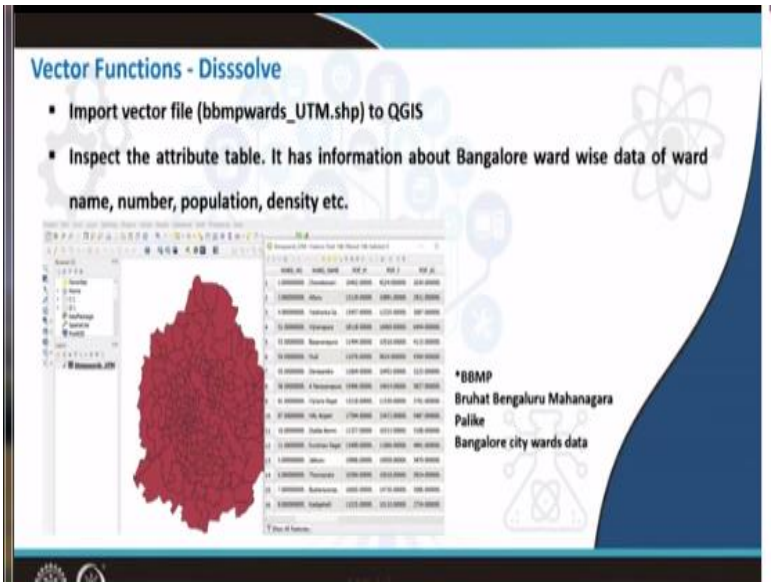

Now first of all we will look at the function dissolve for this particular dissolve function. **(Video Starts: 02:10)** we are going to use, I will now go to the QGIS interface. So here I will go to Layer and add layer add vector layer. So as you are all familiar of adding layers to QGIS interface, I will directly go to browse. So here we have provided you in the data search folder, if you go to vector you can see the shape file by name BBMP wards.

So this you can say open, then say add and then say close, BBMP wards is nothing but BBMP stands for Bruhat Bengaluru Mahanagara Palike, so these are the wards of Bangalore. Now let us see how to dissolve all these wards and how to see Bangalore as a single polygon. Now to perform this, before performing this I will just go to the attribute table, I will right click on attribute table or open attribute table.

So here you can see there is object ID 1234 and assembly constituency number, assembly constituency name, ward number, population and other attributes. Now if I want to dissolve a

particular polygon layer into one single polygon, I need to have a common attribute. So since this attribute has been taken from a different source, it does not have any one particular common attribute for all the rows. So what I am going to do is, first I will create a common attribute.

So to create this, as I already mentioned in our previous session if you want to create anything in a vector file. First you need to edit that is toggle editing mode, you have to click it and turn it on. Once you turn on the toggle editing mode, you can go to the attribute table or the open field calculator which opens the field calculator. And here, I will put the output field type has dissolve, so here **e** it can be the whole number, I am not changing anything.

In the expression tab, I am just giving as 111, any random number you can also give 1 for easy identification, I am just giving 111. So what happens is, this particular number will be assigned for all the rows here as a attribute table column. Let us see how it will add I will press on ok, once that is done, you can just scroll to the extreme right. Here you can see under the dissolve you have 111 for all the rows.

So now I have got a common field for dissolving all these wards into one particular polygon layer. So what I will do is, I will save this edits save and close the attribute table. Now to dissolve this, since BBMP wards is a vector layer, the function will be stored in vector. So go to the menu bar vector and here if you go to the geo-processing tools you can find dissolve, you can press on this it will open a new command box.

So in this the input layer is the BBMP wards that is nothing but it is in UTM coordinates, 32643 that is 43rd zone, dissolve fields. So here I need to give the field which we created just now by the name dissolve. So I will just scroll down and select this dissolve and then say ok, 1 element is selected under the dissolve field. Now it is asking dissolved map whether to save the map or whether to create it as a temporary layer, what I will do here is.

I will go to browse, save to file and I will save this as dissolved new file. So here I can give it as BBMP underscore dissolve and then say save. So now all our parameters are set now I can say run. Once the process has successfully completed, you can close this and now you can see entire

Bangalore is under a single polygon. That means we have dissolved all the ward information and we have created a new polygon or a new polygon vector layer which is having only the Bangalore, a boundary.

If you see the previous one, we have the ward information here, but here we have dissolved everything into one, so this is how we perform vector dissolved function. Now let us move to the next function that is called as join. This is very helpful when we have an external excel file which has details in terms of rows and columns. Now before showing you that, I will just go to project and select a new project and I will discard the old 1 if you want you can save that also.

So let us just examine the excel sheet which we are going to use now, I will go to datasets in vector I have by the name tabular data 2. So here in the tabular data 2 as we can see we have 4 different stations. And again I am referring to the raingauge stations HDKOTE, BEERUVALU, BAILKUPPAE and BETTADAPURA and we have other information such as Taluk to which these Raingauge stations belong the population of that particular place, type whether it is a town or village and that particular literacy of people.

So let us say now I need to add this information to an already existing shape file. So what I can do is, I will just go to the QGIS interface and here first I will add the vector layer. So you need to go to layer, add layer, add vector layer. So here I will go to browse and I will choose rainfall 4326 is nothing but the rainfall point data which is in lat long system. So I have chosen the rainfall 4326 dot shp add and close, now you can see 4 points has been added.

So if you want to know the details, you can right click and then say open attribute table. So here you can see there are 4 different places you can arrange it according to ID and this particular attribute has rainfall information latitude and longitude, whereas our excel we have the same 4 stations. But we have different attributes taluk, population type and literacy. Now let us try to add this into this particular attribute table.

To bring the CSV file I will add this as a vector layer by directly selecting under add vector and here I can choose tabular data 2, open, add and then say close. Now the tabular data has been

added, once again I will go back to the rainfall lat long file, right click, properties and I will select joins add join add new join. So here you can see now the join layer is automatically taking tabular data 2.

So the join field would be, you should now choose any one of the field which is common in both the shape file and the excel sheet . As I know, the join field has ID as the common attribute for both of the files. So I will select ID in join field and in target field also I will select ID. And here you have custom field name prefix that means in the new attribute table those attributes which are taken from the excel sheet.

It is going to put the attribute table or the column name with this extension. So I will just give table underscore, that means all the other things will be table underscore population table underscore, literacy table underscore area something like that. So then I will say ok, so here the new join has been added, then you can say apply, then press ok. Now our rainfall lat long file is ready to view as a added attributes.

So here when I open the attribute table you can see earlier it was only ID raingauge lat long, but after we added the tabular information from the CSV file. We can also see the table underscore raingauge name has come again, table underscore taluk, table underscore population, table underscore type, literacy. So, this is how we add various columns from an excel sheet to shape file layer, this is about the join function.

So next what we are doing to see is merging and splitting various layers. So now what we do is I will just clear this project and I will say discard. Next task is we will see how to split vector layer that is nothing but a polygon layer. So for this particular task I am going to add the previously created Hyderabad lake layer. So I can select Hyderabad lakes, that is a shape file open, add and then say close.

Now here you can see the 2 lakes which were digitized in the previous class. So I will just zoom to this particular lake that is Gopi Cheruku in Hyderabad. And if I want to split this into 2 halves, what I can do is I can right click on Hyderabad lakes, toggle editing, so the pencil has been

activated. And you can see in the editing toolbar, all these features has been activated. So now I will take this particular tool called split features.

I will click on this and wherever I want to split the lake into 2 halves, I will just start drawing, once that is drawn I can right click, so it is finished. Now you can see the lake has been split into 2 parts. If you want to save this, you can just right click and say toggle editing. So this will save the shape file edits. Now similar to the split function, we also have join function or we can also merge different layers merge different shape files.

Let us see how to merge, before that I will just create a new project I will say discard and this time I am going to layer add layer, add vector layer. So here let us add 2 vector layers that is industry which we have given in the vector folder. There are 2 industries that is industry 1 and industry 2 you can press and hold control to select multiple files I have selected industry 1 and industry 2 open add and then say close.

So here you can see these are point layer shape files one is in the red color and another one is in orange color. So, now let us say I want to add these 2 separate shape files into one single shape file to do that, what we can do is. We can go to vector and then we can go to data management tools. There is an option called merge vector layers, I will select this option in the input layers just go to the browse and select these 2 please make a note.

Here one important thing is if you are trying to merge any 2 vector layers, you have to check for the coordinate information system, both of them has to be in the same coordinate information system. If 1 is in lat long and other 1 is in UTM, then this operation will fail, it would not happen. So you have to make sure that both of these belong to the same coordinate reference system, once that is done press ok.

Then destination CRS since these files belong to Chennai, I will just give the destination also as 44 UTM zone 44 and it is asking whether to save the merged layer. So I will just right click browse and save to file here, in the outputs I will save this as industries underscore merged and

then say save. Now you can run the algorithm, so once you have run the algorithm you can close this window.

Now you can see all the layers have been merged together. If you want to see the difference, you can just turn off the merged layer. So you can see industry 1 and 2 in different color but once you have merged, it will look in the same color. This is how we perform vector merge operation, now the next task is to demonstrate clipping operation or it is also called as overlay operation, to do this, I will just clear the earlier project and take a new project.

Now, I will add 2 vector layers here, that is Mysore district shape file and corresponding Mysore roads. So here I have something called as DIST underscore roads that is nothing but district roads and one more shape file called DIST that is district. I will open this and then say add, and then close this. I will pull the district polygon shape file below and I will keep the district roads above it.

So that I can easily see, what are the roads that are coming within the boundary. So now the task is to clip this road files as per the district boundary. If you see clearly this is the district boundary and these are the roads. So I need these roads to be clipped exactly according to the district boundary. To do that we can go to vector and here in the geo-processing tools, you can go to clip and input layer will be the district roads and the overlay layer will be district that is nothing but the district polygon.

And if you want to save this layer, you can click on browse save to file. So here I will call this as district underscore or since this is Mysore district, I will name it as Mysore underscore roads and then say save, and then run. Now once the operation is completed I can close this clip tool and I will just for time being disabled the district roads which was earlier there. Now you can see the clipped roads within the district boundary this is how we can perform vector clip function.

Now the last task of this particular demonstration is spatial querying and buffer. So to do this, I will just clear this previous project. For this particular operation, I will add 2 more vector layers that is bus stop and industry. So I will just take industry 2 shape file and I will also take bus stop

1 shape file open, add and then say close. So now whatever features that are marked in red color are showing the bus stops.

And whatever features marked in orange color are showing the industries. These particular files belong to UTM zone 44 that is nothing but this we have taken Chennai. If you want to see where these points are you can just go to web that is the plug in quick map service and search QMS. Here we can add Google satellite or any other base image which you want.

Now here we can see this is the Chennai city and these are various points, bus stops and industries. Now the task is to identify those industries which are inside 500 meter buffer of the bus stops, I mean which are within the proximity to bus stops. So this kind of spatial query we can do, so to do that, what we can do is first we need to create a buffer. So for creating a buffer, you need to go to vector geo-processing tools and then say buffer.

So a new tab has been opened, so here I am going to create buffer for bus stops by how much distance, so here you can specify the distance I will give it as 500 meters. So our final aim is to find out the industries which are within the 500 meter buffer of the bus stops. So once you give the distance, you can just go down and you can select the buffered layer, where it can say go to browse save to file. Here I will save as bus stop underscore buffer and then say save and then say run.

So now we have created a buffer of 500 meters from the existing bus stop, I will just close the buffer toolbar and I will drop down this buffer to the bottom. So that we can easily see the other points. So now you can see for all bus stops it has created a 500 meter buffer. Now our task is to find out which industries fall within this 500 meter buffer from the bus stop. So to do that, what we can do is, we can use a tool called extract by location.

So we go to the processing menu bar, go to the tool box. So here you can just start typing the name that is extract by location. So here you can find this under vector selection, extract by location you can double click. Now extract features from, you need to find the industries. So I

will just put industries intersecting with that is buffered, so industries which are falling within the buffered ones, I am going to take only that as an output layer.

So the output layer I would just save to the file, so this is called as industry buffer and then say save. Now again I want to mention here that if you want to perform this kind of vector operation, you have to make sure that these 2 are in the same projection system that is EPSG 32644 and even the buffer layer is in EPSG 32644. Once you are thorough with this, you can just say run and now we have extracted those locations which are 500 meters from the bus stop.

So these are highlighted in some purple color, if you want to see it more clearly you can just right click go to properties. And here in the symbology tab, you can choose this marker and you can choose any other different color for that. So as of now, let us say I will create this as a plus mark and then say apply ok. So here you can see these are the points which are falling sorry within the 500 meter buffer from the bus stop.

For example, there is a bus stop here and these are the 5 different industries which are present within the 500 meter from the bus stop, so this is how we perform the vector functions **(Video Ends: 26:58).**

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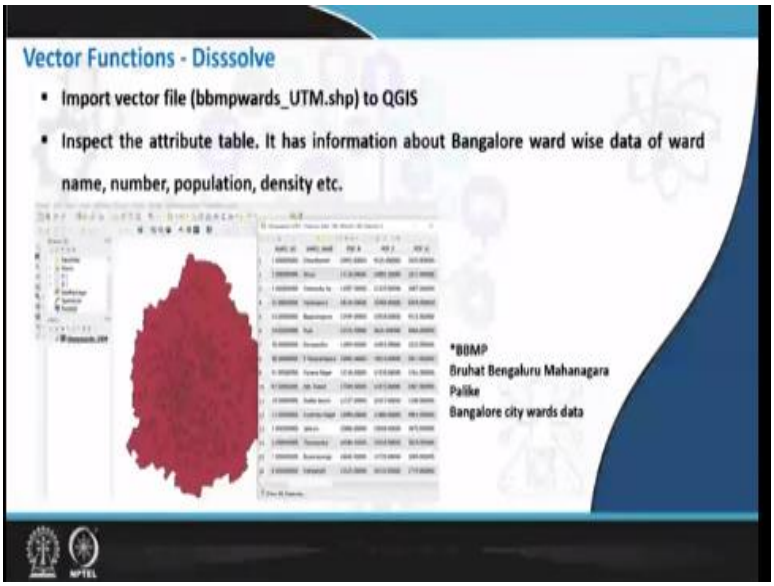

And to summaries today's class we have seen various vector functions such as we started from the BBMP wards. And we also saw how to dissolve this particular BBMP wards.

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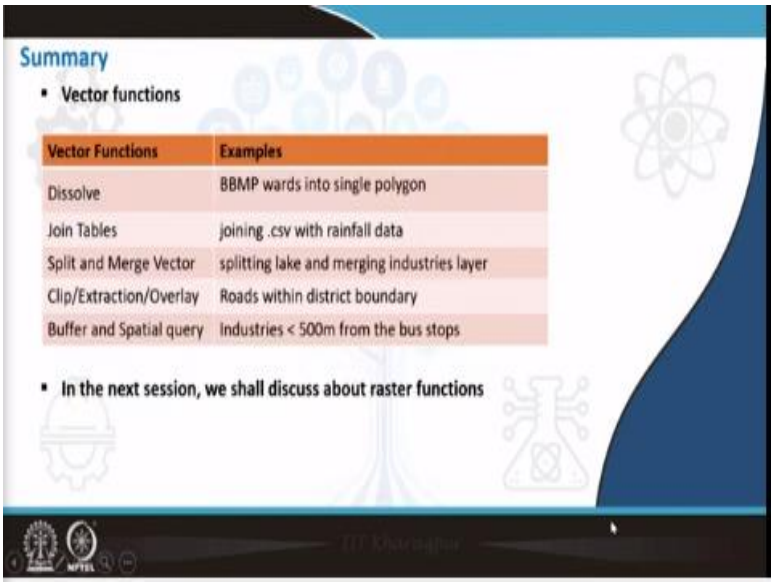

And finally, we saw how to join the tables, how we join from a CSV data that is nothing but you can open in an excel sheet. And how we will integrate this data into the rainfall data and we saw how to split a lake into 2 parts. And we saw how to merge if we have 2 different industry layers and then we also saw clipping or extraction of the road layers. And finally, we also saw buffer and spatial query what are the industries which are falling within 500 meters of the bus stop. So in the next class we will see various raster functions till then thank you very much.