



Data Query-1

Spatial Querying



Tutorial ID: IGET_GIS_009

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Data Query - 1

Objective: To get familiar with constructing spatial queries in Quantum GIS.

Software: Quantum GIS

Level: Beginner

Time required: 2 Hour

Prerequisites and Geospatial Skills:

- 1. Quantum GIS should be installed on the computer
- 2. Basic knowledge about the QGIS interface
- 3. Should have completed Exercise ID: IGET_QGIS_001, IGET_QGIS_007

Reading

1. Sutton, T., Dassau, O., & Sutton, M. (2009). <u>A gentle introduction to GIS</u>. Chief Directorate: Spatial Planning & Information, Eastern Cape.

Tutorial Data: Tutorial data can be downloaded from IGET GIS 009



Introduction

We have already seen attribute querying in previous tutorial. Now we will learn about spatial querying. Spatial query selects geographical features based on location and spatial relationships. It uses spatial logic or spatial relationships among the data-sets such as adjacency, intersect and containment within etc. In this tutorial we will focus on building spatial queries to retrieve the information in a useful form and export the results as new shape files.

Query No 1: Find out the road segments in Maharashtra where road cross over the river.

Solution: In order to solve this query, we need road and river vector data of Maharashtra state. The shape files named 'road_maha' and 'River_Maha' are corresponds to road and river network of Maharashtra in the supplied tutorial data.

- 1. Start the Quantum GIS Desktop application and Open all the shape files supplied to you in the Map canvas.
- 2. Go to Main menu bar \rightarrow Vector \rightarrow Spatial Query \rightarrow Spatial Query.



- 3. Spatial query window will open. This window contains four sections.
 - i. The source feature needs to be added in the first section i.e., 'Select source features from'. Source feature is the feature on which spatial query is to be carried out. In this query it will be Road dataset. So click on the arrow next to vector layer name to access dropdown list of vector files loaded to map canvas and choose 'road maha' from the list.





- In the second section 'Where the feature', here we have to select the spatial relationship / criteria which satisfies to carry out the query. To find where the road crosses over rivers, 'crosses' criteria is to be selected. Therefore select 'crosses' criteria from the scroll down list.
- iii. 'Reference feature of' is in third section, here we have to choose a vector layer which you would be using as your reference layer. In this case, it would be 'River_Maha' layer as reference feature.
- iv. In the fourth section 'And Use the result to', select Create new selection

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(i) V [∞] road_maha ▼
Selected geometries
Where the feature
Crosses
Reference features of
iii V [®] River_Maha
Selected geometries
And use the result to
Create new selection



Select source features from		Result feature I	ID's	
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X 1294 selected geometries		0 3		2
Where the feature		4 12		
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Reference features of		17 18		
√ [∞] River_Maha	-	21 24		
Selected geometries		27 29 30		
And use the result to		31 34		
Create new selection	•	36 37		-
	6	1294 of 2790 in	dentified	
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4. Once the required inputs filled out, Click '*Apply*'. Now you will be presented with the '*Spatial Query*' window.

5. The features satisfying the criteria will be marked in yellow color. If you see the map canvas the lines marked in yellow are roads segments which cross over rivers. By this query we can find out the road segments which pass over the rivers and also we could check whether bridges are existing on these road segments or not?







7. We can save the selected features as a separate layer and create a presentable map along with road network layer. Now save the layer into desired location.

Note 1: Before proceeding to the next query deselect all the selected features. Click on 'Deselect feature from All Layers' tool from Attribute toolbar.



Query No 2: Find out the river channels that are not flowing through Ahmadnagar District.

Solution: To answer the above query, we will use Maharashtra's Tehsil and River shape files, i.e, 'Maha_teshil.shp', 'river_maha.shp' respectively.

 Since we want rivers flowing outside Ahmadnagar, firstly we will select Ahmadnagar district from the Maharashtra state, this can be done by using attribute query and we will perform spatial query on the selected data from attribute query. Right click on 'maha_Tehsil' and select '*Filter...*'. You will be presented with 'Query Builder' window.





- 2. Select all the tehsils of Ahmadnagar district by using attribute query¹, i.e., double click on "**NAME_2**" from fields window and click on click on '=' in the 'Operators' section
- 3. Then to see all the values in *Name_2* field click on '*All*' in '*Values*' section in window and select **Ahmednagar** from values.
- 4. In short we need to create an expression "NAME_2" = 'Ahmednagar' and Click 'OK'.

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Provider specific filt "NAME_2" = 'Ahm	er expression – ednagar'					

5. This will select all the tehsils from Ahmednagar district.



¹ Please refer *Querying in QGIS-1, Attribute Querying* (Tutorial ID: *IGET_GIS_009*) for how to construct attribute query to get Ahmadnagar district.



6. Open spatial query window(Refer Query. 1), give source layer as 'River_maha' and reference feature as 'maha_Tehsil' and select 'Is disjoint' as spatial criteria under 'where the feature' section→ Click 'Apply'.

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	Selected geometries				
	Where the feature				
	Is disjoint 🔻				
	Reference features of				
	🏳 Maha_Tehsil 🔹				
	Selected geometries				
	And use the result to				
	Create new selection				
	Close Apply				

7. Now you will be presented with the '*Spatial Query*' window. You will find the number of feature selected along with feature ID's. At the same time the river channels which are not flowing through Ahmadnagar would be highlighted in yellow color in map canvas.

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1 the	Create new selection	22 23
	Selected features	3234 of 3437 identified Zoom to item
		Log messages
St Coords		Close Apply



8. Save the selection as separate layer and create a map. Close the 'Spatial Query' window.

Note 2: Before proceeding to the next query, click on 'Clear' \rightarrow 'OK' in the Query builder 'Maha_Tehsil'. It unselects the Ahmadnagar districts and returns the whole tehsil of Maharashtra and click on 'Deselect feature from All Layers' tool from Attribute toolbar.

Query No 3: Find out the public places that are within Greater Mumbai.

Solution: To solve this query we need 'Maha_Tehsil' layer and 'public_places_maha' layer. In this query you have to follow the same steps as in query 2.

F	Provider specific filter expression	_
	"NAME_2" = 'Greater Bombay'	

Use spatial criteria '*Within*' instead of '*Is disjoint'*. The Result would be look like below.

	🚀 Spatial Query	8 2
	Select source features from	Result feature ID's
	° public_place_maha ▼	Result query 💌
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	Maha_Tehsil	21 22 23
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Query No 4: Find out the schools in Maharashtra that could be affected by floods? Let assume the flood zone is at about 3 km from the river bank.

Solution: To answer this task we need school and river data of Maharashtra. 'School_col_Maha.shp' contains the school location and 'River_Maha.shp' contains River network of Maharashtra.

1. To find out Rivers that could be affecting the schools in case floods, firstly we have to create a flood zone around the rivers with 3 Km by using *Buffer* function. To create a buffer around the river, Menu bar \rightarrow Vector \rightarrow Geoprocessing tools \rightarrow Buffer (s).



2. The 'Buffer(s)' window will open. Select Input vector layer as 'River_Maha'.

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Input vector layer	
Maha_Tehsil	•
Maha Tehsil Diver Maha	
School_Butter School_col_Maha public_place_maha waterbodies_Maha	
O Buffer distance field	
ID_0	•
Dissolve buffer results	
Output shapefile	
	Browse
0%	OK Close



3. Specify 'Buffer Distance' as '**3000**' i.e 3km (Since our working unit is meter in UTM projection)

🔏 Buffer(s)	
Input vector layer	
River_Maha 💌	
Use only selected features	
Segments to approximate 5	
Buffer distance 3000	
O Buffer distance field	
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Dissolve buffer results	
Output shapefile	
En/get_Portal1/Prach/UTM_data/River_buffer.shp Browse	4
0% OK Close	

4. Save the output shapefile in desired location in local drive with a proper name. This can be done with the help of browse button. Once the inputs are given properly click on 'OK'. If you asked to add the output layer to map canvas click on yes. The output will look as follows. Close the 'Buffer(s)' window after the buffer done.





5. Since we are interested in finding the schools that could be affected by floods, we will run a spatial query with the 'within' criteria to solve our problem. In 'Spatial query' So the source layer will be 'School_col_Maha'; fuction as 'within' and reference feature as 'River_buffer'

	🜠 Spatial Query 5	
	Select source features from	Result query
	■ 50 selected geometries	
	Where the feature	10 33
CAMP LOPP LESS AND RESIDENT	Within	34 47
	Reference features of	50 51
	River_Maha_Buffer	63
	Selected geometries	64 65 66
	And use the result to	67 69
THE REAL PROPERTY AND THE READ THE REAL PROP	Create new selection	73
	Selected features	50 of 153 identified 2 zoom to item Log messages
		Close Apply

 Unfortunately, there are 50 schools that could be affected in case of floods. Create a separate layer and make a meaningful map with the help of extracted layer and school data.

Query No 5: Find out the tehsils in Pune which contains water bodies such as lakes and Dams?

Solution: We will need 'Maha_Tehsil' and 'waterbodies_maha' layer to solve this query.

1. Select the Pune District by using attribute query (See *Query No: 2* for help).





2. Open the 'Spatial query' window and give source layer as 'Maha_Tehsil', function as 'contains' and reference layer as 'waterbodies_maha' and click Apply.



3. This will select all the tehsils in Pune which contains the water bodies. Create a separate layer and make a meaningful map.

Exercises:

- 1. Find out the river channels flowing in Akole district.
- 2. Find out the road network that intersects the water bodies within Ratnagiri district.

Hint: First find out water bodies that that are within Ratnagiri district. Save it as separate layer and then find out road network that intersects these water bodies.

