Module-08
**Lecture-40**
Basic Editing

Hello and welcome to geographic information system we will in this module as I said, we would look at basic operations which taking of from the module 5. I did explain some of the operations and my TA Prakash did explain some very basic things about QGIS. But now I would take it forward explain each and every aspects of how do you actually edit, what are the different errors that may occur, how do you correct those errors and what are the different things that you have to look at when you are looking at the edit tool, basically.

So why I am very specific about the edit tool is that, when you start looking at your start your data you will be looking at each and every aspect of the editing of a vector layer because any incorrect attribute, incorrect geometry can lead to lot of issues. Now when you are looking at the entire GIS data, so, this editing of this attribute is extremely important. So we look at editing of the geometry section be important.

So we look at each and every aspect of why and how this is important and why and it is necessary and how do we do it ok. So that is this is more of a practice class, so in case if you guys are having a system in front of you, or if you are looking at in a system rather than your mobile phones, so you can parallelly start looking at it. So I would suggest you start looking at it. So it would be very useful in understanding the concepts that I have taught till now ok.

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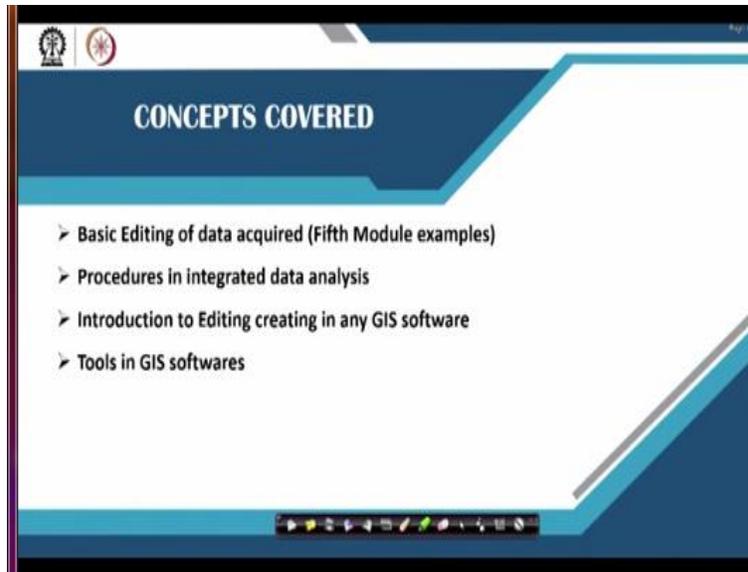
So in today's class will look at basic editing of the data that is acquired procedures and integrated data analysis have done many of those but I will again take it forward . So introduction to editing, creating any vector layers in any GIS software tools in a GIS software. Some of the different tools we have already discussed some, but some of the other tools that are required I will take it forward ok.

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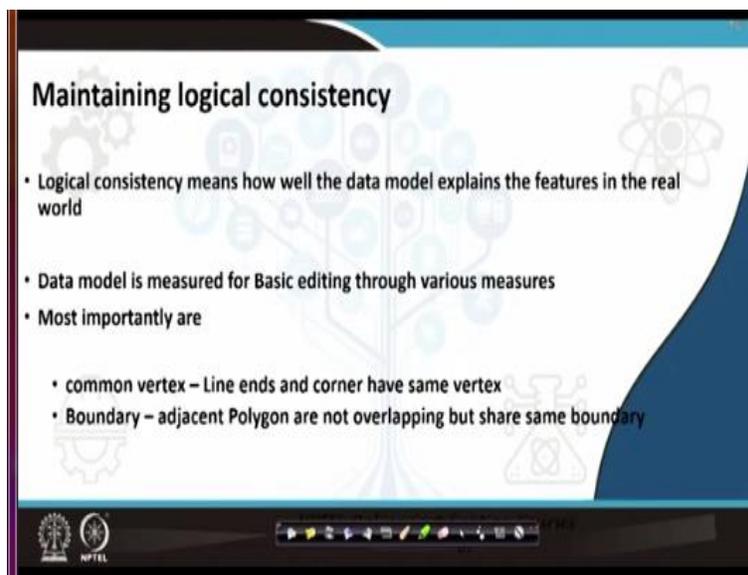
So before we start very important thing that we have to look yes how do we maintain a logical consistency in creating a vector database or any of the data models very important thing that you have to think ok. You can go to the field collect all the data extremely accurate, etc. and get it

here put it in the database, etc. that is fine, fair enough. But when you are looking at the database, your database has to have certain logical consistency.

Without logic consistency, your data or your database may not really sound existing in the real world. Because whenever you are actually creating data model, it is actually to mimic the real world, if you do not have a logical consistency in your data base then your data models not equivalent to real world and the very purpose of using a GIS system to represent the real world fails ok.

So the logical consistency is extremely important in terms of how well a data model can explain the real world features. So data model is measured for basic editing through various measures that is, if there are errors, if there are editing issues that come across whenever you are having a data model, that is the first thing that we look at. The most important errors that we look at is 2.

One is the common vertex, line ends and the corner have the same vertex ok, ends of a line and a corner of a line or a point that is ending the corner of a line have the same vertex or not if it is dangling then you will have that is a error ok. So then you have a boundary adjacent polygons are overlapping, but do they share the same boundary. So even if they are overlapping, so they should have the same boundary instead of 2 different polygons overlapping something like this.

You have 2 polygons and will be something like this. Instead it should be something or one on the other or have a single boundary or not even one on the other ok.

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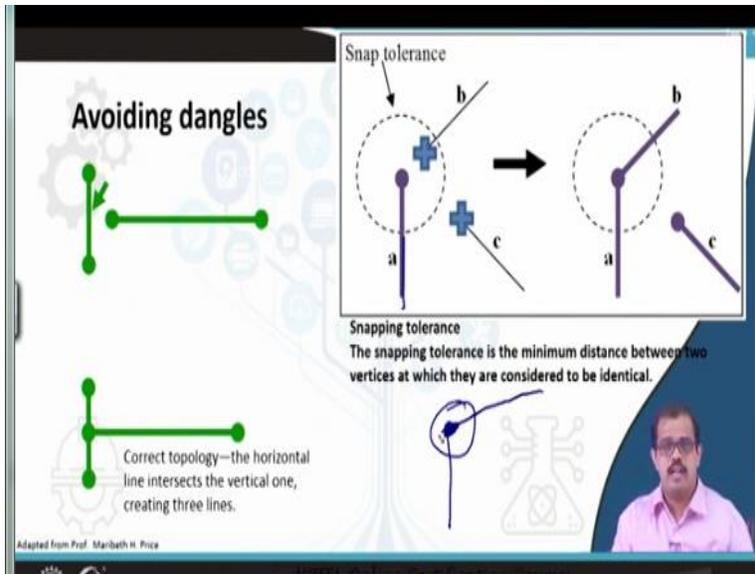
A very good example was again by surprise when you look at it avoiding dangle let us say that you have a road that is represented by this line segment. These are 2 intersections and there is another road which was supposed to be here where this is an intersection here is represented here. This is one of the errors that you find it in your data, so that logical consistency should be there.

So the first thing is go to the edit mode and correct this error, this particular point has to be brought into this particular point. That is you will correct the topology the horizontal line intersects the vertical one creating 3 different lines. So you will have 4 intersections 1, 2, 3, 4 then ok. So once you put in the data all geometry first look at data detailly without looking at data without looking at these errors, you will not be able to correct any data that is there or any information that is put out you cannot certify that is correct ok.

In order to look at validated data first thing is correct the errors in the database, look at the logical consistency in the database such errors has to be removed ok. Then there is something called a snap tolerance, when I say a snapping it means that minimum distance between the vertex at which they are considered to be identical ok. So when you are looking at this, there is a particular line segment a and there is a particular line segment b ok.

So you have the same node here, which means that these 2 are actually closer. So that means that when for example, when you are looking at snap it means to say that when you are drawing this particular line, digitizing this line when you use snap it correctly sits on this line instead of sitting it somewhere. If you are digitizing you may even stop the line till here ok

I mean you may stop your line till this point.

See if this is your original line that you have already digitized if there is one original line like this ok. Now you are digitizing another road which is actually supposed to join here. You may stop here, right. So instead if you use snap, what it does is, it looks at minimum tolerance and it will locate whether these both are same point, if it same point it will snap to this point, making it the same common intersection that is what is called snap tolerance.

Snap tolerance is normally looking at the which are the things there are identical ok. So that is also the work of the snap tool, we will see that in the further slides.

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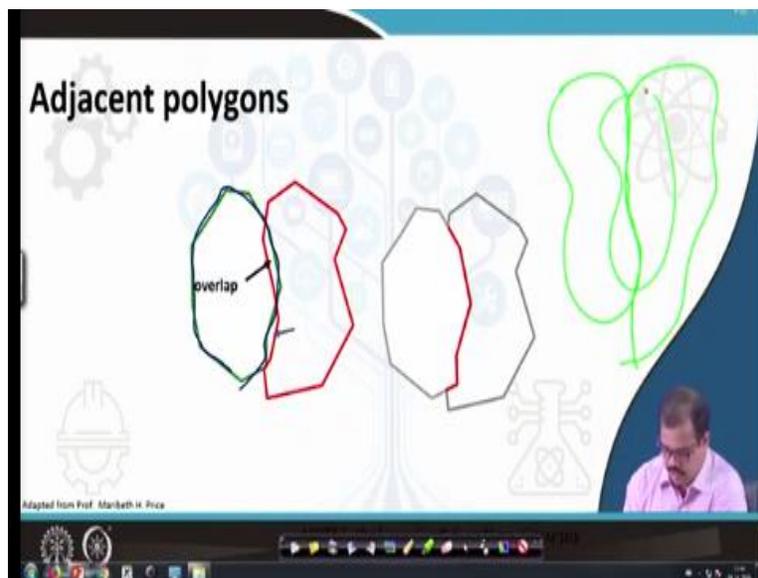
So other problem as I said is adjacent polygons, so if you see here, this is 1 polygon ok if we look at this polygon, this is 1 polygon. Now there is another if I draw the same polygon I have 1 polygon like this, now there is another polygon which is representing the other land. So what normally when we digitize happens is something like this ok, this cannot be something like this, let me erase this, let me do it in different form.
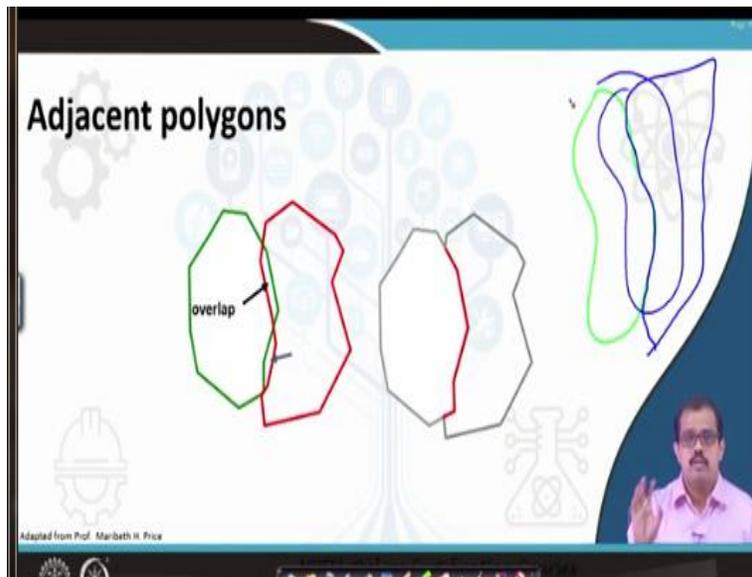
So this is 1 polygon let me take a different color, so if the same polygon follows the same structure ok fine. So these are 2 different polygons, representing 2 different quantities on the earth surface, but having the same boundary. Now because of your digitization maybe various issues, you may have both of them in the different maps or different reference things. So you get this like this, but they should have a common line here ok common boundary that is one of the issues when you are looking at logical consistency which has to be corrected, we look this also how do we corrected in our further slides ok.
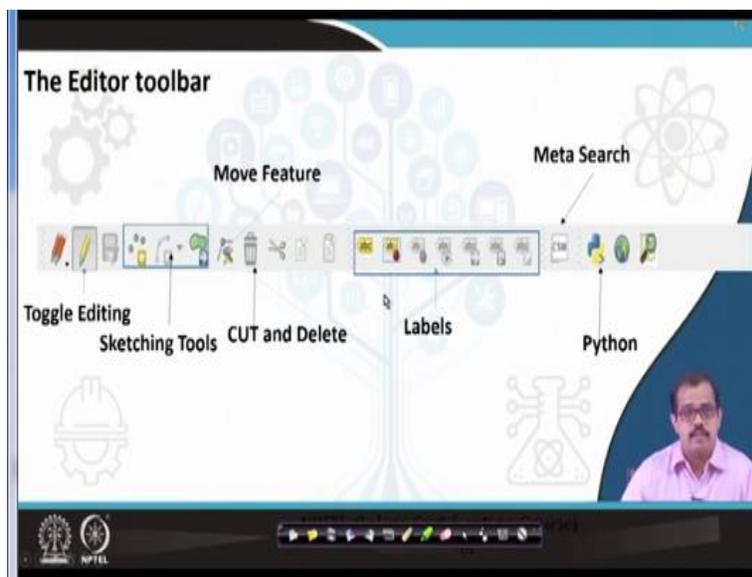
So first let me introduce you to the editor toolbar and from now onwards I stick on to I am not going it with any other software because QGIS is easily accessible to many. Those who do not have any GIS software can easily download QGIS, whereas other proprietary software if you guys have an access to it, your institution provides access, many of the software also has student access for certain time, you can always download it.

But if you guys do not have an access to the full version, the proprietary version, I would suggest you to download a free and open source software like QGIS. But most of these menus remain same, so you do not need to worry most of the representation also a same and always it would remain same ok. So when you look at this is the editor toolbar ok, and these are some of the tools that I have added by myself my analysis, so do not worry much about this is a Google earth tool.

And this is the map tool that is your OpenStreetMap tool through I access the open street maps and you can I mean OpenStreetMap is a wealth of data that is already there. So you can even extract all the entire set of data that is already there are on OpenStreetMap and utilize it for your analysis. So when you look at the editor tool bar they it has different sections.

For example, the first section here, where you can see a single yellow pencil ok. So that is nothing but a toggle editing, if it is off unclick, then it means your data, whatever your data is there you cannot edit it. You cannot do any changes for that even if there is error in it is boundary, it is line or there is a point that is the extra point that you have added. But if you click on it and it is an edit mode, you can use it to edit your polygon features ok.

Then you have sketching tools, these are tools which are used to for certain issues, for example, this is a move feature that is being use, I have not mentioned it here, it is a move feature and there are different sketching features is the add feature here . Then you have save, once you have edited it you can even save, then you have cut and delete features, you can cut a particular feature and make it if there is a line and you want to represent those lines in different ways.

So you can cut that feature and make it a 2 feature, so this is cut and this is delete, in case you want to delete a particular feature, maybe an error that has occurred. So you can cut it and delete

that part, copy paste also is there as normal, then you have labels to label that particular feature particular vector, You can label it as necessary and as supposedly you need ok, then you have a meta search.

So this is very good thing in your most of the GIS softwares you can understand what do you mean by that particular layer, what are the information about that layer, then the most important part is Python. So most of the software and access to Python programming, so once you have this you can start coding you have your Python either in any of the environments that can be installed. So once you have installed you can start even looking at all of the take just a modules and use it for your analysis the way you need, so that is about the editor toolbar ok.

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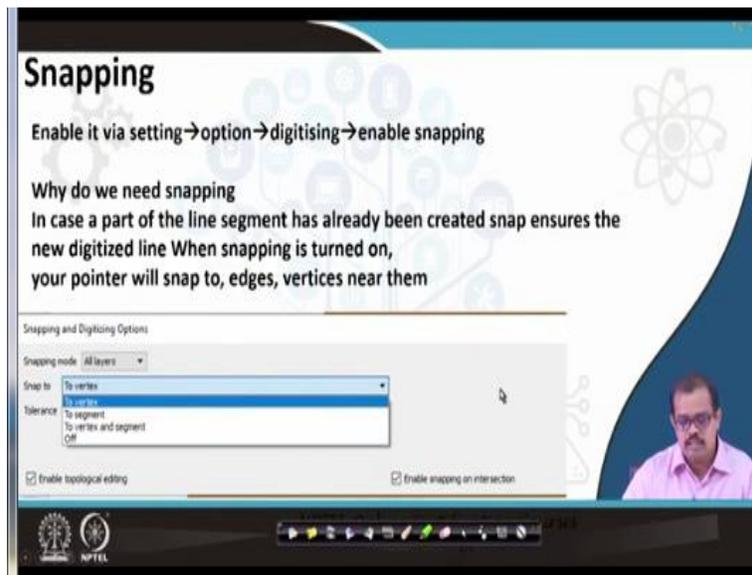
So then as I said snapping, snapping is extremely important but in QGIS snapping does not come as it is. If you look at RGIS snapping is just a drop down menu maybe from your where the editing is there you can just start snapping from there itself. But in when you look at QGIS you have to enable it via settings, option, digitizing and enable snapping.

So once you have enable snapping you get menu in here just below you are in your QGIS window or editing window, digitizing window, ok. So if someone ask me why do you need snapping I have already previously explained, in case a part of a line segment has already been created ok, where I know the what is a starting point and ending point and has been created snap

ensures the new digitized line which you are actually digitizing when snapping a turned on your pointer will snap to adjust or vertex near it.

So it will just go and set it instead of sitting at centimeters away or based on the units measurement away from that particular point, so it will snap to that point. So which means it will give you an extremely accurate, snapping can be done to an vertex, can be done to a segment, can be done to both vertex and segment the way you need ok.

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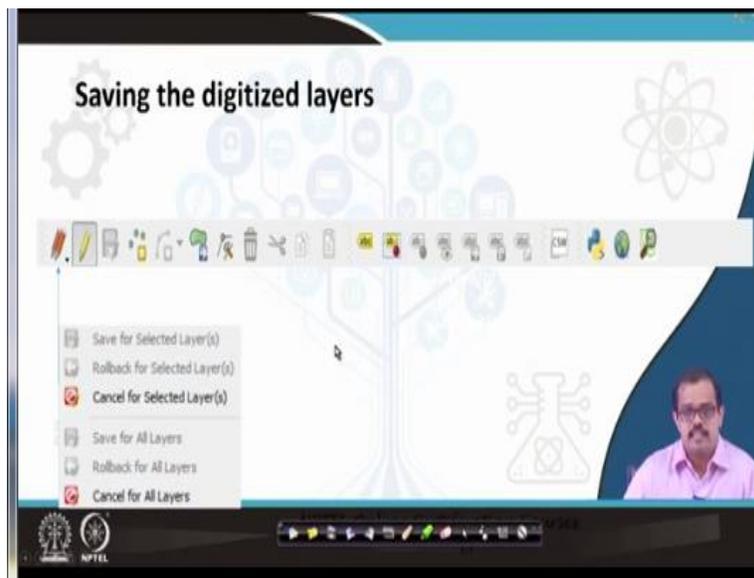
So that is how a snapping works then the saving part, saving part is how do you save a digitize layer you can save a selected layer. You can even roll back, in case there are some errors, you can for all layers you can save if you have multiple layers you are trying to edit in the same overlaying all the layers you want to correct some of the issues that may have occurred. So you can do it and save all layers together or save a particular layer only and that is how you can save a digitized layer ok.

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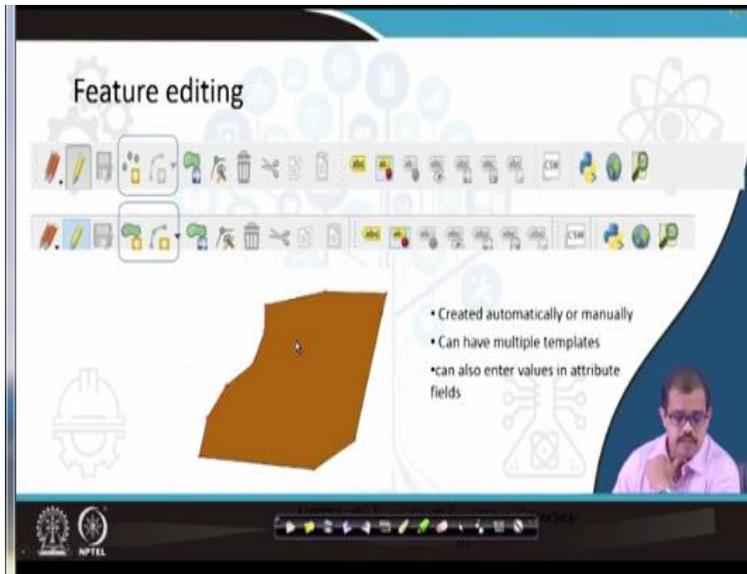
Then as the feature editing see for example, I have created a feature, this is one of the administrative boundaries that I have extracted from an Google earth map. So now it can be created manually or can have multiple templates. For example feature editing it is a polygon editing this is a point editing that I have. So there is 2 things when you click here and say you want to do the feature is polygon add feature is polygon then the polygon editing will come up.

If it is add feature is point then the point editing will come up, so this is about the feature editing. So once you have turned this on, it means it will give you all the values that you can edit ok, this is about the feature editing ok. So you can have multiple templates you can add, you can change, all of these issues if there are errors correct these errors ok.

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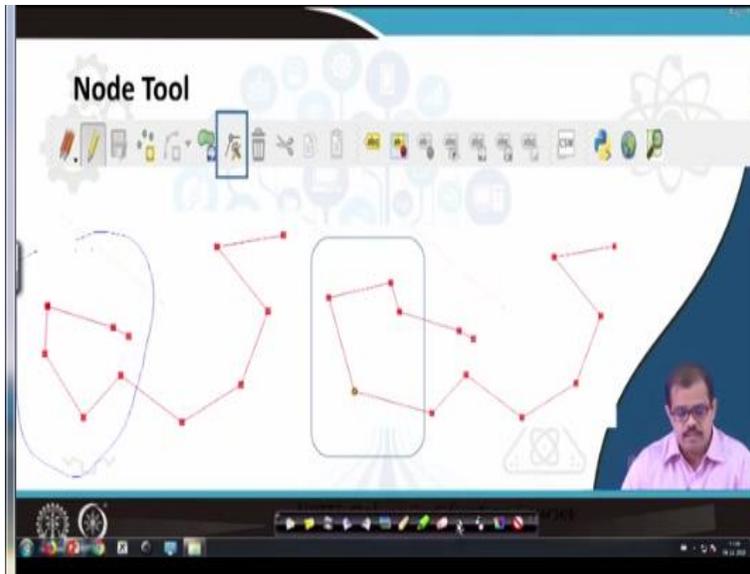
There is another tool called as node tool, this will be very useful in turns for you to correct whatever the errors that may have happened in your when you are digitizing. For example, this is your node ok, please be very I mean when you look at this particular node look at this part ok. When I look at it see this particular node, I have missed 1 node in between this node which has to be and the segment has to be something like this.

So now double once you have activated this particular node ok, this the node tool here, so now what you will do is that, you will double click on this node ok. Once the node is activated, you can click here and then come back here ok, that is what I have done here fine. So what it does it creates another node here and brings the line segment to that point that is why a node tool has been used. So that you can add nodes, delete nodes and create if there is error you can correct those errors in your digitized layers ok.

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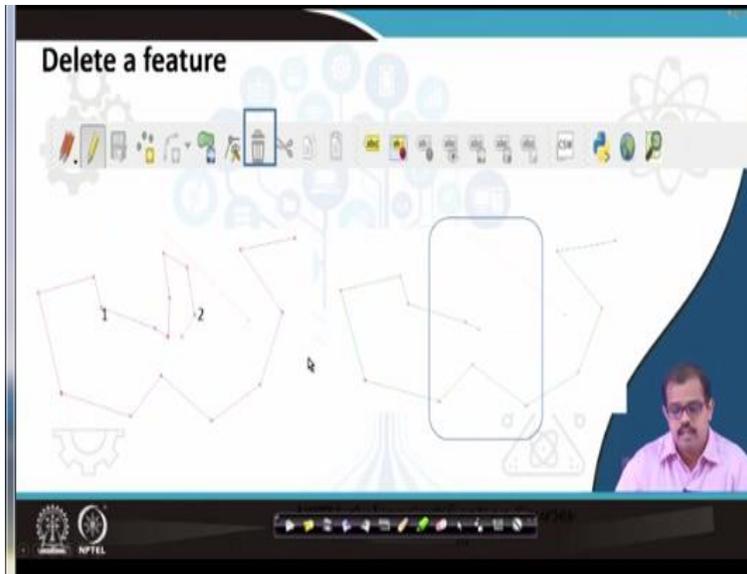
So and then a move of feature, this is also extremely good aspect in terms of any of the GIS software. For example this is one of the features that you have, ok and for example, if this feature by mistake when you are digitizing may have sat across in your database something like this ok connecting this particular vertex here. So what you will do with this move features you will click on this vertex and you will move this particular feature here, wherever it is supposed to be.

That is why use a move feature aspect in any of the GIS software, then you have delete feature you can delete a feature for example as I said, I want to digitize it newly I do not want to move it or put it in inaccurate position. So I want to delete it or if there is some error I want to delete it. So I just click on this feature and it will show which are the vertex has to be deleted and from that vertex this feature error can be deleted ok, **(Video Starts: 17:24)** the next thing is attributes.

So how do you open an attribute for example, I have all these layers here, ok. If you are able to see these are the this first layer, second layer, this is a third layer. This is a polygon layer and this is a line layer and this is a point layer yes yeah. So when we have these layers if you want to look at this, just right click on this and you can see open attribute most of the GIS software have the same way.

Right click on that and you can see open attribute table ok, once you have opened the attribute table it looks something like this ok this is an attribute table. So if you look at, it says that I have

imported from OSM map. So you have OSM ID, OSM type is a way, it admin level is 1 boundary is administrative boundary it is a government of name is Bhuj collectors and barrier is wall, these are attribute information that is there ok.

Now for example if it had certain I mean, it also has I do not know it is not showing it here, it also has x and y location ok, maybe I have not completed the entire attribute table. So if I have completed the entire activity table, it is x and y location, so you can even calculate what is the area of this particular attribute ok. So just by using different operations here, so this is how attribute table can be accessed. So now if in this attribute table, let us say if I want to edit this attribute table you have to click on this **(Video Ends: 19:05)**
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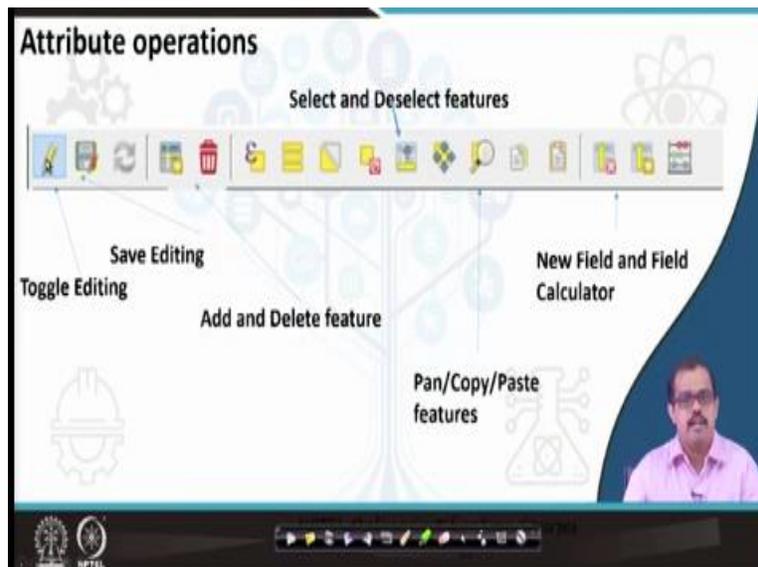
So it gives you a editing of attribute table. So, you can add, delete, any row, any columns, you can add correct any data that is incorrectly save and do such operations once you have toggled edited it. So you should be extremely careful, then you have save editing, where once you have edited it if you in case you want to save it, so you can toggle it.

So it saves whatever editing there has been done in the last few hours or minutes. So this is add or delete features it means to say that it is if you want to add a feature in this context, so you can add it. There is select and deselect features that is there here ok, there is pan, copy and paste, this

is for panning for the entire database. This is copying and this is pasting features ok, the next tool that we are looking at here is new field and field calculator.

When I am looking at this new field and new field calculator, for example you have a lot of attributes in your entire sheet, let us say entire database. Now with those attributes if you want to compute certain things or compute certain issues or compute certain outputs, so you can add a new attribute, new field, ok. For example, let us say that I have 5 or 6 polygon features with these polygon features I want to calculate the area of a polygon ok.

So I will add a new column that is called area, with that column I will start with another field calculator, I will calculate the area it is just like this dollar area like you do in your excel sheet. So it basically calculates the area of this polygon, only thing is that it can calculate the geometrical shape of based on the geometrical shape, it can calculate the value, so using that geometrical shape, it will provide me the area of that entire column.

So all the 5 with just 1 stroke, so that is why you need a new field and a new field calculator in this attribute operation. So this gives you the entire attribute data editing in your database. So in case you want to edit your data, most of the operations on any of the databases is through attribute data editing. So this is extremely important in terms of you understanding and most importantly I would suggest if in case you have already installed QGIS, please go through this field calculator.

Field calculator is extremely very good tool for any kind of analysis that you want to make in the GIS platform. So it can provide you lot of inputs and lot of extensive reporting and field data computations ok.

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The next thing is using QGIS as a processing toolbox, so nowadays it is I mean R has a statistical software and also an image processing toolbox has actually come up in a very larger context. R has extreme computational capability in terms of analyzing, in terms of statistical analysis and also now in geometric analysis as over a period of time.

Now in last 2, 3 years, there has been huge number of research papers say which is employing statistical software R as in both statistical and also as image processing package. So when you want to in case you want to integrate R with QGIS, where to form much more extensive a strong tool in terms of statistics and in terms of image processing capability.

So you can also enable R in this particular package, so if you just go into processing options in your QGIS. So you can click on that as R script and you can activate it, once you have activated it you can even use a 64 bit version in case your windows is a 64 bit or your unix or linux is in a 64 bit version. So click on this, so that R is linked, once the R is linked you have the entire tool box of R that will come into your QGIS.

Once this is done any kind of statistical analysis can be done and even the scripting in R can be done using this particular package. Now with the newer version, you also have the w x Python and R integrated. So with this, the entire package of extensive good GIS software has been quite easily available in case you guys are looking at it ok.

So R scripts and GIS integration, R scripts is processing spatial data, processing framework for QGIS plugin that is for R scripts needs to be enabled in the processing menu bar provide us menu. After R is enabled you can run the scripts from the processing tool box as I have shown here, ok.

Now there is another feature of integrating the spatial database that is through spatialite. So again this can be enabled in you can search it as plugin and enable the spatialite features. spatialite is a spatial database management system on SQlite ok, it is extremely light weight and portable ok.

Raster tools include rasterlites, so you have both vector processing tools and a raster processing tools. If you look at it, when you look at it, you have all of the tools that the spatialite can handle starting from geometry to the vector layers to spatial indexing and also spatial index and also to your raster indexing. So all of these can run and it can handle SQL in extremely efficient way SQL queries.

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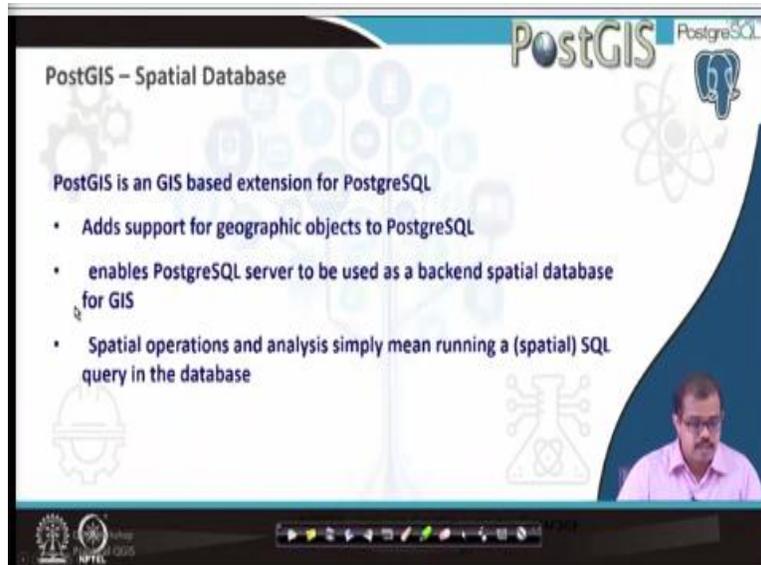
Then you have PostGIS, which is norm of the day. Most of the spatial databases run on PostGIS today and when you are looking at this QGIS is quite very efficient in handling PostGIS . As a a spatial database and PostGIS database management can handle the entire database management of the QGIS. PostGIS is a GIS based extension for PostgreSQL ok PostgreSQL, add support for geographic objects to PostgreSQL which means that PostGIS is one which gives you the geometric aspects or the geographical aspects to the main database system ok.

That has nothing but PostgreSQL, enables PostgreSQL server to be used as a back end server spatial database for GIS ok. So a without PostGIS it is not possible to use Postgres only for your as a GIS tool as a GIS database. But it has to be connected to PostGIS. So that PostGIS has provides the geometric output or a geographical nature whereas PostgreSQL provides you the database.

So spatial operations analysis simply means running an SQL query in the database, so that is through the SQL operation itself.

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When you look at the entire PostGIS functions, you have function that is starting from any of those functions and covered by within and maximum distance longest line. So all of these are PostGIS functions that you can see, so if you just open your that functions tab in PostGIS if you go into PostGIS and look at the open tab you can look at all of these functions.

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Then the next thing is pgAdmin, this is a GUI base for database administration tool. So when you are looking at previous versions of QGIS maybe even before 1.80, so most of them were in

terms of coding. So but now we have a GIS base for database into administration, so if you look at this is a pgAdmin tool, where you can see this is this has been adapted from Terra GIS.

So this particular screen, if you look at it, there are 3 difference servers that are running that is snuggle, there is Tara GIS and other server. So out of which particular Tera GIS server is running at the database which has a GIS data, map bender, then you have certain schemas and application and you have 4 GIS running ok. So when you look at this, what are the datas that are public earth, it has conversions, it has functions, it has trigger functions.

So these are different public, so you can make it public it can be made as private, so that is based on the owner, it you can it gives you the entire description of what it basically is whether it has been inherited as a table or it inherits any table from any other this one what is a primary key in this particular table. And it gives you the entire property in case you are looking at how it has to be done, how it has to be coded, this how it is coded.

Then you have statistics, depends and referenced by so all of these are with the pgAdmin. So one who wants to look at administration of the database as a tool. So pgAdmin can be very useful in terms of administration.

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So again this was one of the things that was also explained by Tera GIS that is a QGIS and Python interface . Python is growing as an extensively a very good coding tool. So now QGIS also has come up with a Python console, wherein which can handle effectively most of the Python packages and commands. So when you look at this, there are 3 options one is the Python console which is shown here.

So it is just typing the comments and extracting the tools then you have processing toolbox. This is the entire toolbox you have refer to toolbox that is for image analysis that is for geo algorithms. Then you have GRASS GIS is extensively very good software for raster analysis. In fact, I would say that it is GRASS GISone of the best software for raster analysis as QGIS is for the vector analysis ok.

And you have entire package of GDL see when you look at difference passive, very basic difference between an open source software **a**nd the software that is licensed or proprietary. In the very basic both of them run on most of the GIS software run on GDL or OGR, GDL is a raster processing package and OGR is a retro processing package when you look at this 2 packages.

The way this the proprietary software is that they define different tools or they build different tools for usages and you have a very intuitive and very nice GUI or which is present in this particular I mean interfaces. Otherwise I do not see much difference from an open source QGIS software within ArcGIS engine, though they have a lot of services. They have a back end support though which is much faster and much easier.

So that is all is the difference in ArcGIS and QGIS. But when you look at it, the same tool boxes can be accessed with this using Python console. Then you have you can connect it to saga also has a huge collection of algorithms and can connected Arc scripts etc. So these are different things that you can explore when in case you want to be an advanced GIS user using QGIS. So then you have tools such as WinPython and Plugin-Builder, plugin-Builder is one such tool wherein you can start building plugins for a particular applications.

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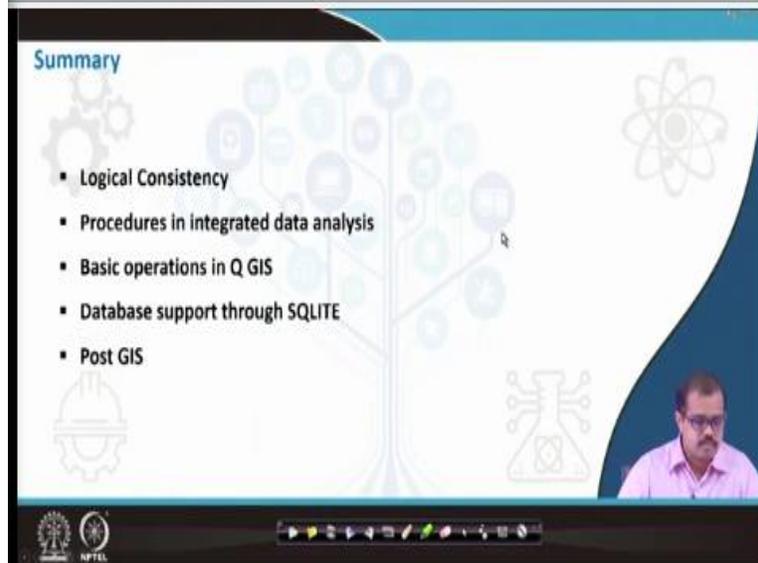
So in summary, we looked at what is logical consistency mean, how do you may have to maintain a logical consistency, then procedures in integrated data analysis we looked at for a different procedures, how do we look at procedural inputs to GIS. Then basic operations in QGIS how we will do it, then you will looked at SQLITE PostGIS then pgAdmin etc.

So finally we ended with PostGIS and pgAdmin. So these are different aspects and also I would like students to explore with Python console and R as an input to GIS. Once we start the lab probably once we show you the basic of how QGIS works, probably you can start learning by yourself how you can attach Python and arc and make it a powerful tool in terms of applications for your varied applications that you may have.

So until next class, I will meet you the next class with advanced analysis, advanced data modeling analysis. So that would be the probably the last class of a theory that I would take up the last module of theory, the rest would be more on practicals. And finally to the course would end with more of what do you mean by I mean various standards, how are standards maintained.

And is there any standards that we have to maintain when you are creating data and sharing data. So we would end the course with that, but in the next class I would take up the advanced tools or advanced tools or spatial analysis tools in GIS ok, so until then have a nice time, thank you very much.