



# Digitization of vector objects



## Objectives of the lecture

- The creation of new geographic objects in a GIS
- The importance of topology management for digitization

## After this lecture you should be able

- To create and populate new data layers, using simple and advanced drawing tools

An Introduction to Geographic Information Systems

Welcome to this lesson on the digitalization of vectorial object. You will see how to extract the geometric characteristics of an image or an analog card to integrate it into your database. As Fernand said, this course focuses on data editing, the digitalization of vectorial objects and especially the editing tools which are present in the QGIS software. We have seen in previous lessons how to acquire data by different methods, whether it is a terrestrial, airborne, or even satellite method. We have also seen how the images obtained, the data obtained could be geo-referenced and positioned in a geographical information system. The next step, often from images, consists in identifying objects, cutting them, drawing their outlines to integrate them with their characteristics, their attributes in a database. The objective of the lesson is to teach you how to create some new geographic objects in a GIS software, and to draw your attention on the importance of the topology management for the digitalization. At the end of the lesson you should be able to create new data layers, to feed them using the editing tools and the computer assisted drawing tools.

## Notes

## Summary

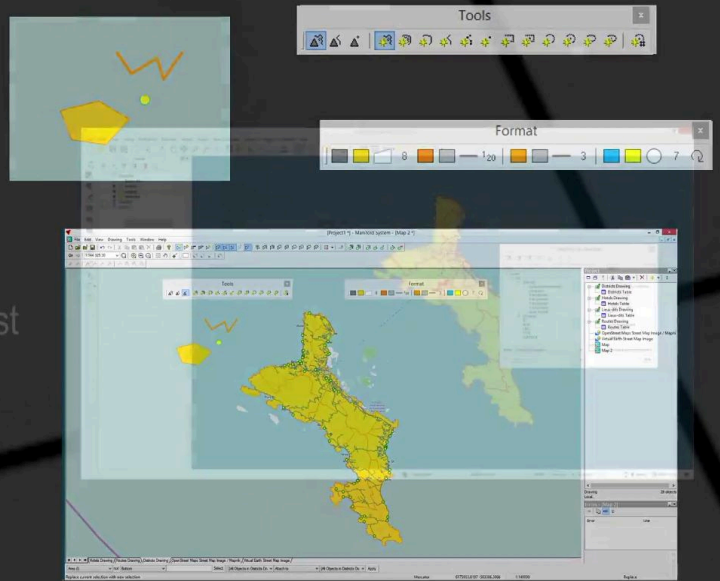


0m 22s

# General aspects

Important aspects of geodata edition

- Organization of objects into thematic layers
- Often, one single type of geometry – point, line, polygon – per layer
- For each layer, one «data model» (= list of attributes) shared by all its objects



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In this lesson we will discuss successively general elements related to the digitalization of vectorial objects. Then we will focus on the way these tools are presented in the QGIS software by first talking about simple editing tools and then about the snap management before moving on to advanced editing tools and finishing with the assisted drawing tools. Amongst the important aspects of geodata editing, we can start with the fact that the objects are organized in a thematic layer as here in the case of the Seychelles, which we now know well. A layer for hotels, a layer for roads, a layer for districts, etc, etc... Most often each thematic layer is associated to a specific type of geometry: either points, lines or polygons. Some softwares, such as Manifold in the illustration which is here on the right, allow to manage several types of geometry in the same layer. We see it here in the editing tools that allow to create lines, polygons, points, rectangles, circles. All this in a single layer. And in the toolbar that allows you to manage the object format of the layer with a section that is dedicated to polygons, a section that is dedicated to polylines and finally a section that is intended for the shaping of punctual objects.

Notes

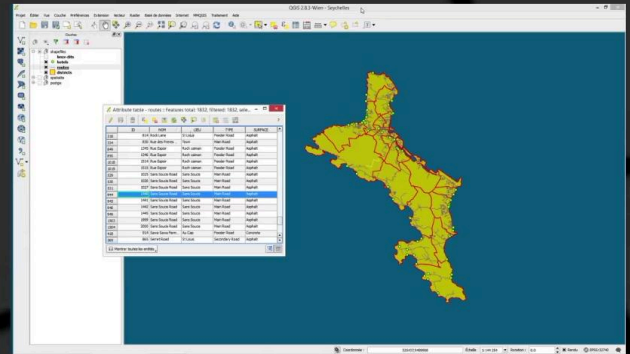
Summary



# General aspects

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Each thematic layer is ultimately associated with a data model or a list of attributes. This data model has to be shared by all these objects. This model appears, either when we interrogate a particular object and its characteristics, or when we edit the attribute table which is associated with the data layer itself.

Notes

Summary

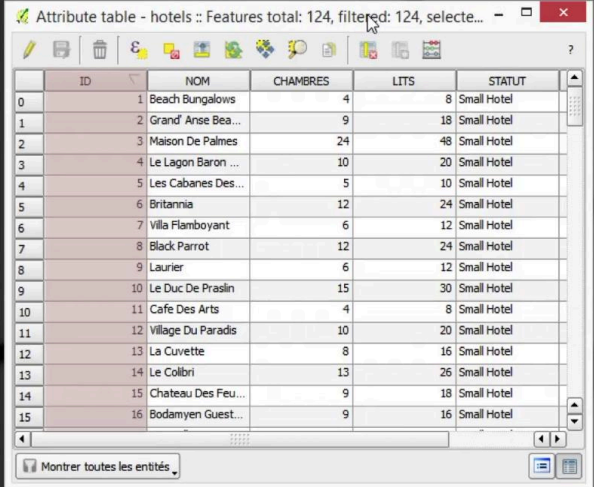




# General aspects

Important aspects of geodata edition

- Create, modify and delete these objects and/or their attributes
- Topology management  
e.g. common vertices for adjacent polygons
- Identifiers management – primary key  
each object in a layer must be identified unequivocally  
➡ often an identity field – ID



	ID	NOM	CHAMBRES	LITS	STATUT
0	1	Beach Bungalows	4	8	Small Hotel
1	2	Grand' Anse Bea...	9	18	Small Hotel
2	3	Maison De Palmes	24	48	Small Hotel
3	4	Le Lagon Baron ...	10	20	Small Hotel
4	5	Les Cabanes Des...	5	10	Small Hotel
5	6	Britannia	12	24	Small Hotel
6	7	Villa Flamboyant	6	12	Small Hotel
7	8	Black Parrot	12	24	Small Hotel
8	9	Laurier	6	12	Small Hotel
9	10	Le Duc De Praslin	15	30	Small Hotel
10	11	Cafe Des Arts	4	8	Small Hotel
11	12	Village Du Paradis	10	20	Small Hotel
12	13	La Cuvette	8	16	Small Hotel
13	14	Le Colibri	13	26	Small Hotel
14	15	Chateau Des Feu...	9	18	Small Hotel
15	16	Bodamyen Guest...	9	18	Small Hotel

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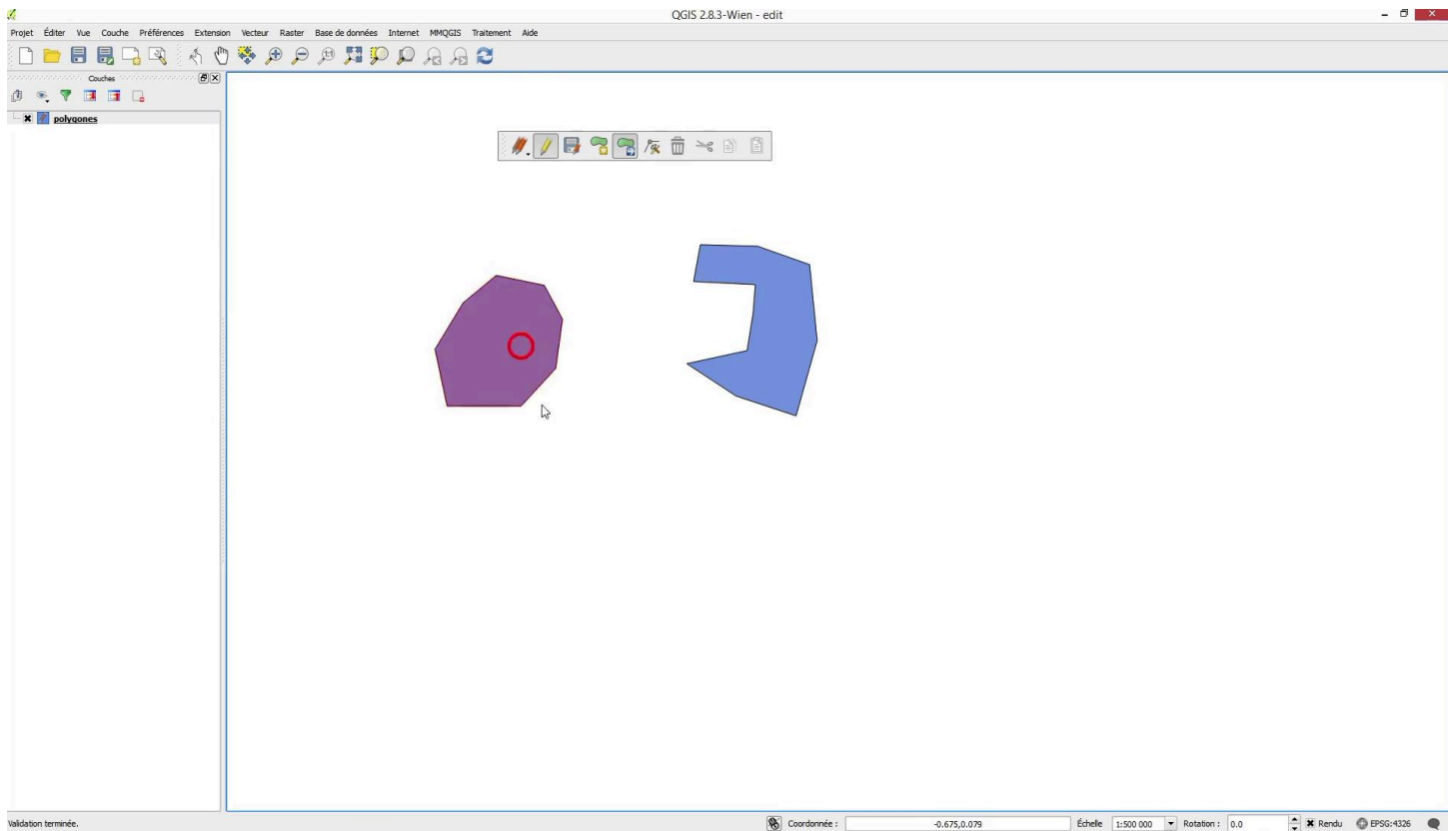
A fundamental element of data editing is obviously to be able to create, modify and delete the geographical objects and their attributes with here the illustration of the geometry modification, in this case the main axis of a road and the modification of the attributes, including here the type of road. The topology management is also an important aspect of data editing since we would like to be able to force the new points that we create to use points or existing segments, process called "snap" in english. This is particularly the case when we draw polygons like here and that we would like the points used by these polygons to correspond to existing points, to adjacent polygons. As we will see in the module dedicated to storage and especially in the course on databases, each object of a data layer has to be able to be unequivocally identified, which is often done via an identifier field called ID.

Notes

Summary



3m 55s



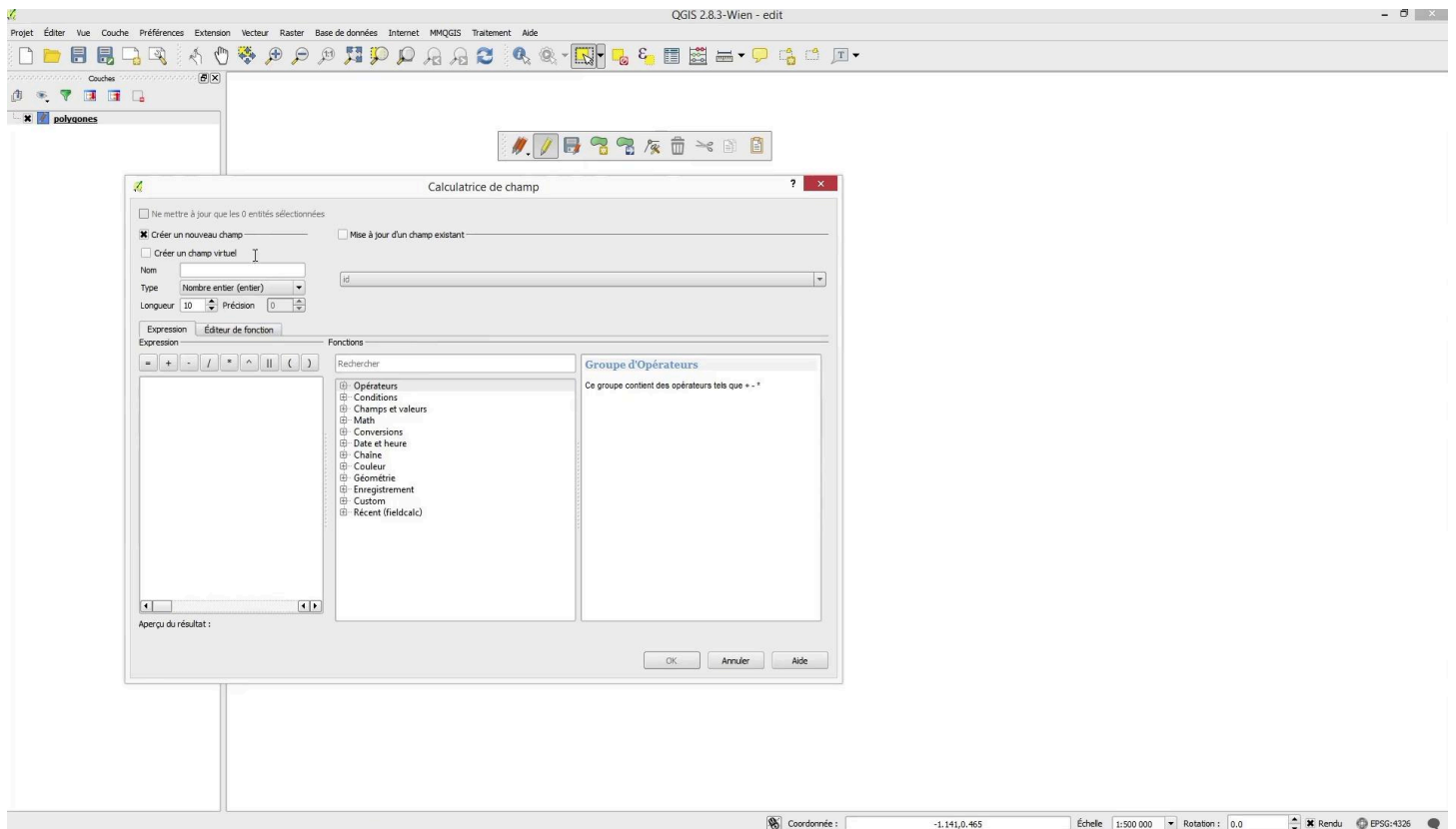
And this field should be able to be managed when we do data editing. So we will start by watching how the simple editing tools work in the QGIS software. So we have a project in which we create a new layer of shapefile type, a polygon layer in which we define an attribute, the name, that we add to the attributes already present. We see that the identifier is already present by default. We call this layer "polygon" and we save it somewhere. Then we activate the toolbar entitled "scanning". This toolbar includes a number of tools particularly this one which allows to put the layer in editing mode and then to select the drawing tool and to draw a geometric shape by successively clicking and to finish drawing by right-clicking. Once the drawing is complete, as we have seen we can document the attributes of the object. For now the identifier remains nil and we simply give a name, A for the first shape, B for the second. Amongst the other tools in the toolbar, the registering tool or the more general tool that enables to register several layers simultaneously or to go back on editions that have been made in one or more layers.

Notes

Summary



5m 02s



The shifting tool, a tool which is then used to edit a geometry and to modify its points either individually or by moving the segments as a whole. A double-click to create a new point and simply select a point and delete to remove points. We can save these changes. And for the rest of the tools another toolbar called "attribute" which contains selection tools is needed. We will be able here to activate the object selection tool by click, we select an object and we see that the little trash enables to delete objects. This operation can be canceled by returning to the previous situation. We re-select this object and now we have a tool that allows to cut. This stores the object in the clipboard and we can paste it again to make it come back. We can also copy an object, we deselect it, we can paste it. And then the new object that has been pasted can be moved. And in this way we can clone an object. In the preferences, under "option", we can change the symbology used for edited objects. So to extend the edition to all the objects of a layer and use a semi-transparent circle rather than a red cross for the the summits of these objects. Then also in the attribute table we can now look at the identifier of the objects.

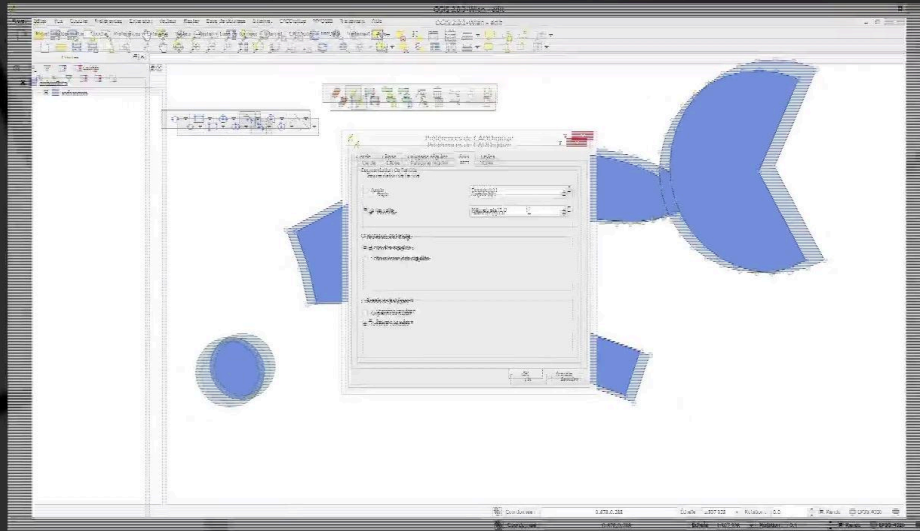
Notes

Summary



6m 45s

# Basic edition in QGIS



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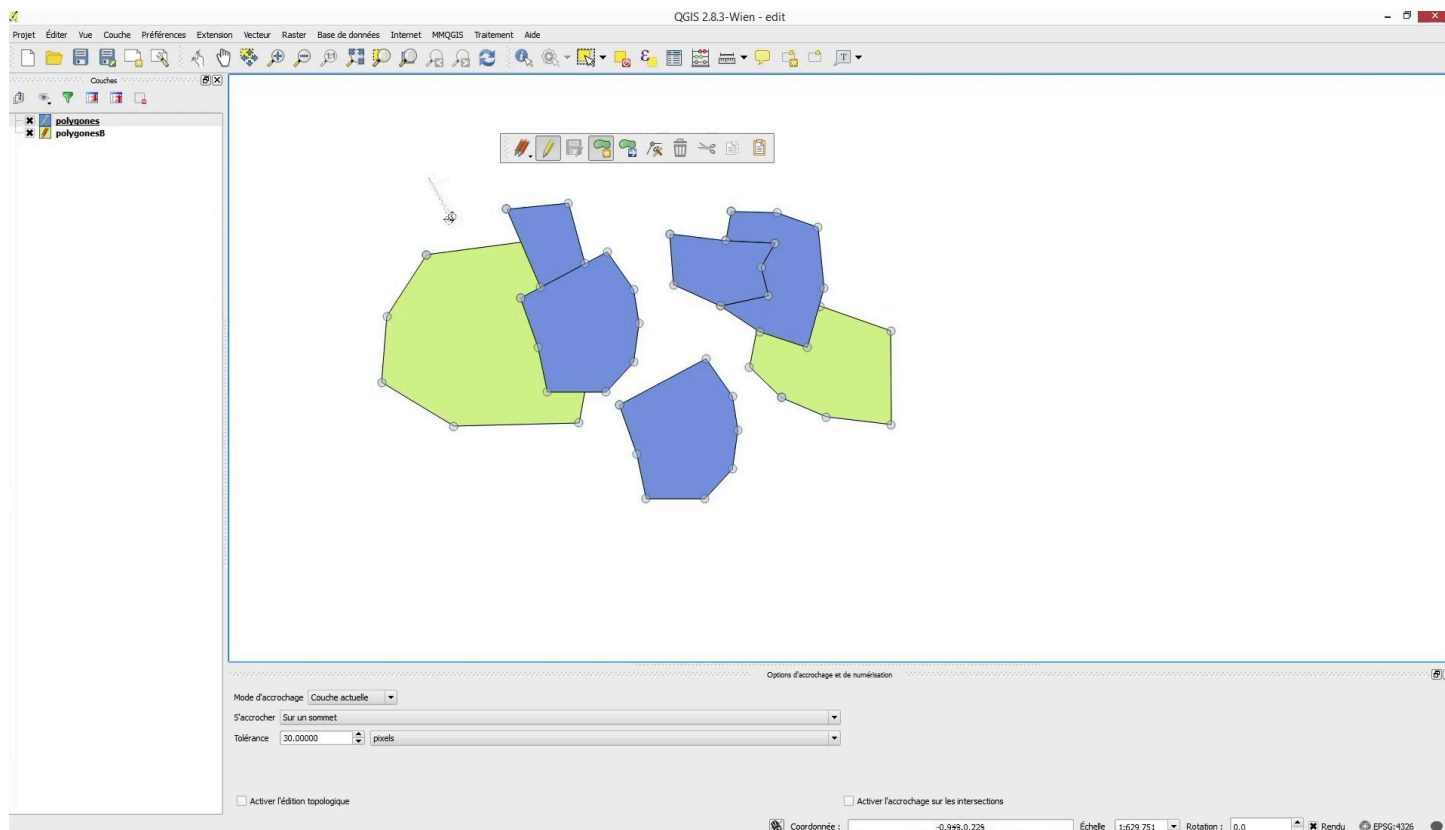
By changing the definition of this section, and by adding this identifier variable that will automatically assign an identifier to the objects as they are created. Finally in the extensions we can add objects. There are many extensions linked to drawings especially CAD Digitize which is used to draw circles, ellipses and arcs of circles. We install this extension which is manifested by the appearance of a new toolbar. This toolbar offers a number of drawing tools in particular the ability to draw a circle from 2 points. The possibility to draw a rectangle again from 3 points this time. The drawing of an ellipse with its center and 2 points of reference. And finally the drawing of an arc of a circle from a starting point. We can see that in the options of these tools it is possible, in particular for the arcs, to change the interval between the points on the arc of a circle, so to modify the density of points with which the arc of a circle is drawn.

Notes

Summary







We take the same QGIS project as before and activate under the "preferences" menu the snap options in which we see that we can select the layers on which the snap will be done. We will keep the current layer for now since there is only one. The object type, the summit, a segment, or both. So we will snap on the existing summits and define a snap tolerance in pixel in map unit. Here, we set a tolerance of 30 pixels. And we see that when we draw a new object, the new points that we create are forced within a radius of 30 pixels on the existing points, which allows to draw an object that is adjacent to an existing polygon. If we force the snap on the segments, we can create objects that come and stand along existing objects segments. By activating the points of an object we see that if we move them, they move independently. On the contrary, if the topological edition becomes active the points shared between several objects will be moved simultaneously for the two objects so as to maintain a coherent topology. By now adding a second polygon layer, we can show how the snap works on several layers. So here, when we have only one activated layer which is in fact the polygons B layer, the green one, we see that this is the only one that reacts when we draw a new object.

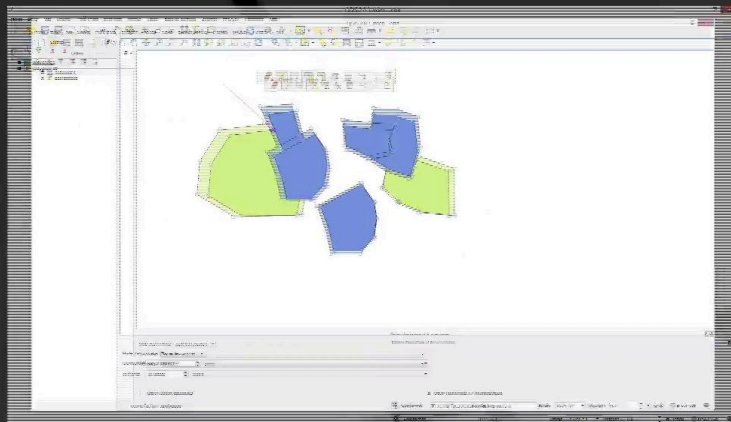
Notes

Summary



10m 21s

# Snapping in QGIS



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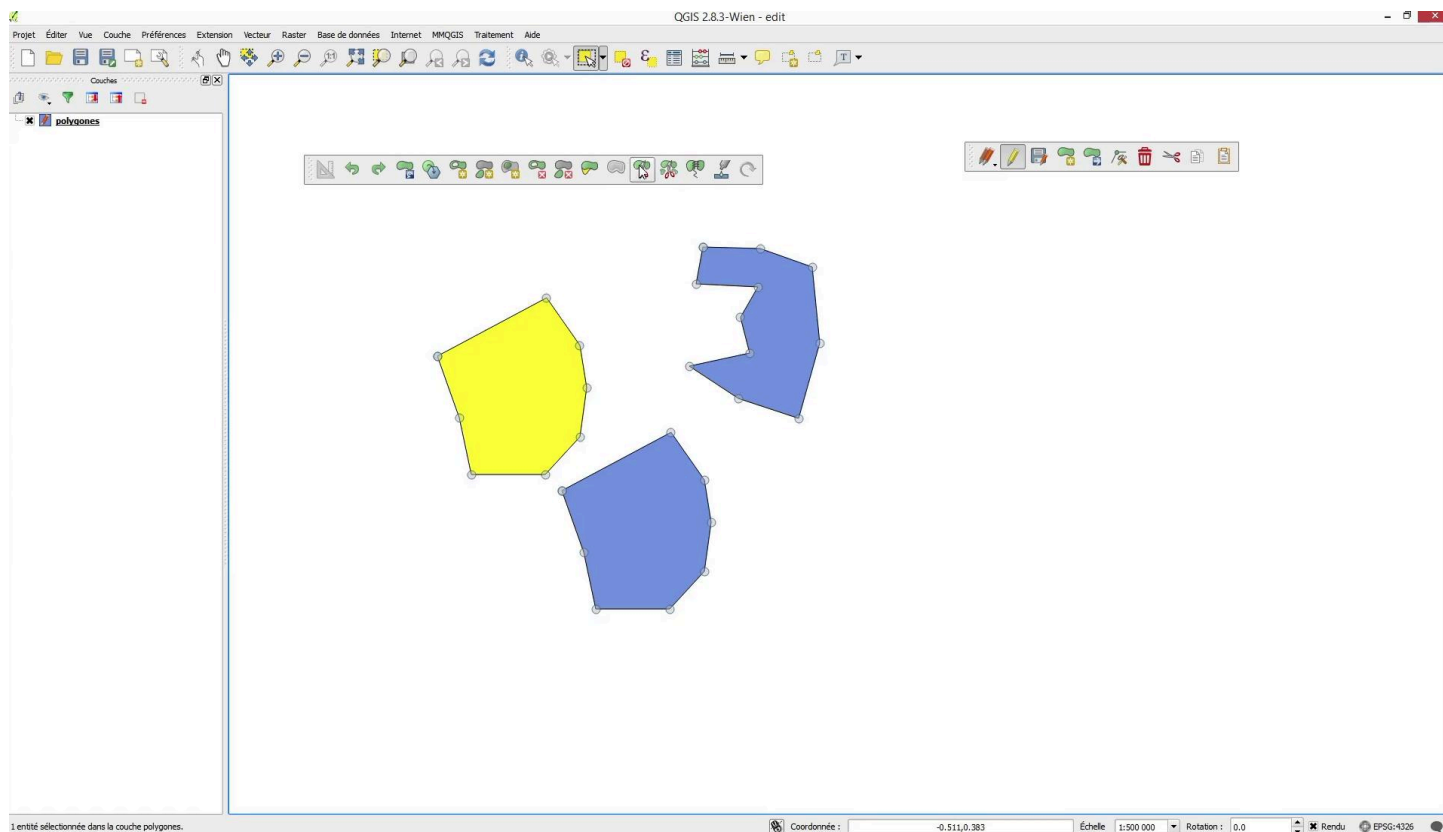
Here we have only one activated layer, it is the blue polygons layer. If we now activate all the layers, we see that all the summits of the polygons of the two layers are active for the snap. We can also manage the snap in different ways on the different layers by managing the type of object on which the snap takes place by managing the snap tolerance. We see that this table below the map enables to manage the snap on the different layers present in the map in a rather flexible manner. When the snap is activated on the intersections and all the layers are active, we can see that we can select both the summits and the intersections between polygons as anchor points.

Notes

Summary



12m 21s



QGIS offers some advanced editing tools which we activate by displaying the tool bar of the same name. A toolbar entitled "advanced scan". So, this toolbar includes a wide variety of tools, starting with a tool that allow to pivot geographical entities. It includes buttons to cancel and restore the changes. A second tool that allows to simplify entities by defining the level of simplification sought. A tool which allows to add a ring in an existing polygon, so by drawing a hole in the Emmental. The corresponding tool that allows to delete a ring simply by clicking on it. Then a tool that allows to add a part to a polygon which becomes a multipart so you have to select the object first, activate the tool, draw the new part and then we see that our object is now composed of two elements. With this object still being selected, we can create a ring which is not a hole in the Emmental but which is a new object. So we cut, we intersect an existing polygon with a new polygon. We can see that the lower polygon has a hole which we can also delete obviously. Then we have a tool which allows to remodel entities by adding elements, growths and cutting tools.

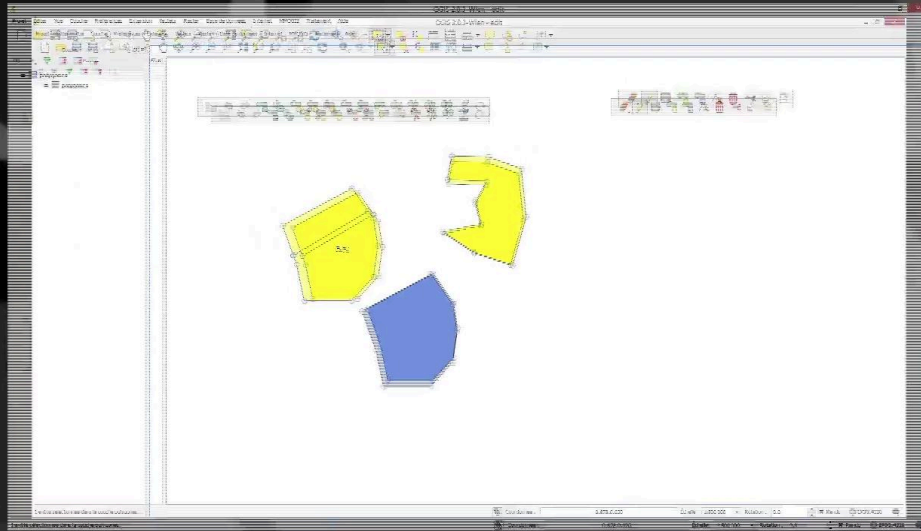
Notes

Summary



13m 14s

# Advanced edition in QGIS



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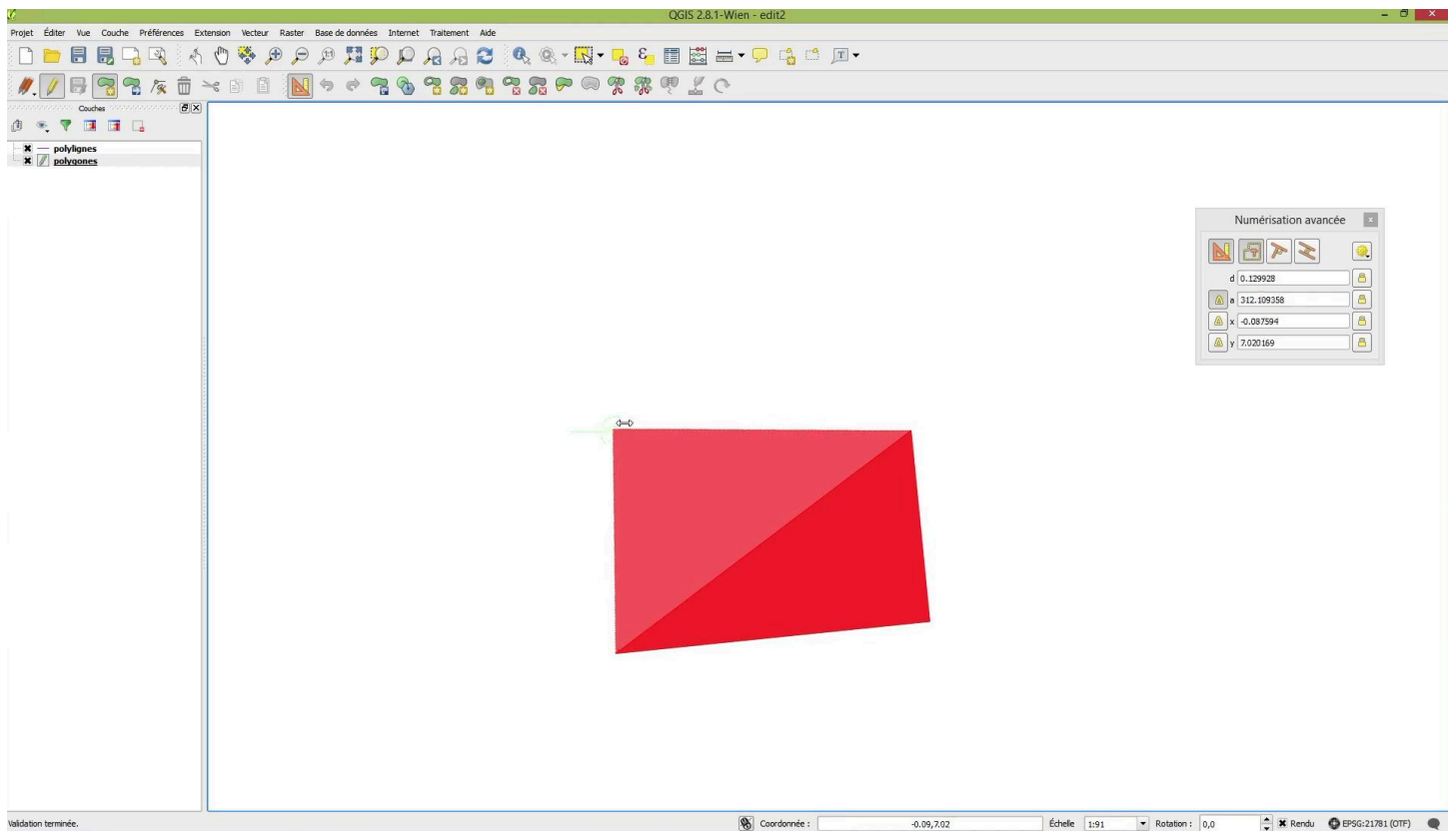
We select an object and we can cut it here by a line in 2 objects which will be independent from one another. So we can select alternatively one or the other or both. We can also cut an object to create parts again with a line and unlike the previous case, here the two objects remain linked so if one is selected, the other is also automatically selected. Then we have tools which allow to merge some objects. So we select 2 objects and we can merge them.

Notes

Summary



15m 27s



We can see that by selecting them we have an object that now is composed of 3 parts. We therefore have a project with 2 layers a polygon layer and a polyline layer. The polygon layer is put into editing mode, we select the drawing tool which actually enables to activate the advanced scanning tools. This series of tools includes an activation button of the DAO tool itself and a button that allows to switch between the drawing mode and the construction method, whose use we will see later, and then snap options that replace the standard options of QGIS. Here to start my drawing I chose to take a point at the coordinates 0 0 then I set it with the small padlock. I selected this point as a starting point of my drawing then I decide to draw a line that leads me to the point of coordinates X10 Y=1, a point which appears there, that I also set. I continue drawing by saying that I have to have a right angle here and a distance of 6 meters which gives me the third point of my polygon. I would like to draw my last point so that we are at coordinate 0 with a right angle. So I set the coordinate 0, I go into construction mode to set a construction point.

Notes

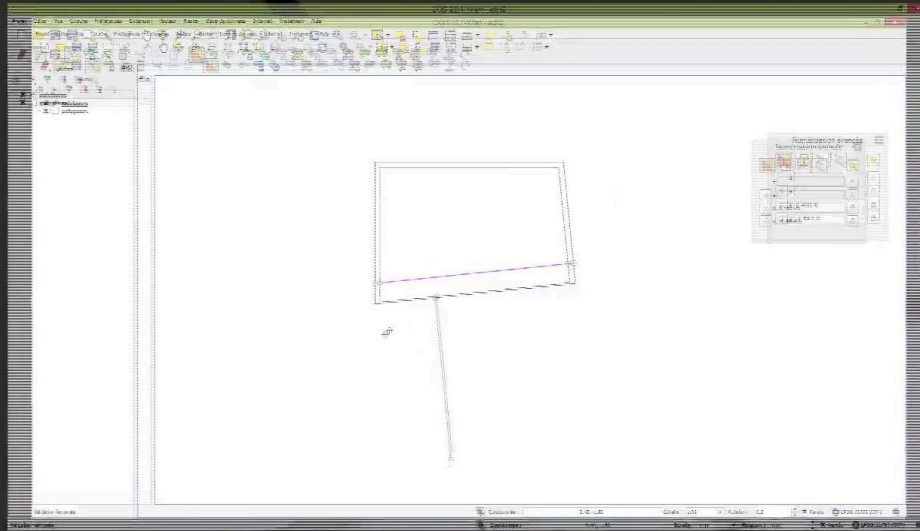
Summary



16m 10s



# CAD tools in QGIS



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And for this construction point, I will now define an 90 degrees angle, the nil coordinate. And these 2 parameters for the construction point give me the targeted point. I then have to go back to the drawing mode to materialize this point which will be positioned where I want to have it. Here we will select a starting point as a construction point to locate a point which is located along the edge of this polygon at a distance of 3 meters. And here we want to actually draw what could be a pipe coming out of a building at a right angles at a distance of 3 meters. So here we set a right angle and a distance... let's say that this pipe is 8 meters long, so a distance of 8 meters as its point of arrival. And it is done. Another example, I wish to draw a line parallel to this facade at a distance of 1 meter. So I take again as a construction point the angle of the object, a distance of 1 meter, which gives me the starting point of my new line. I switch to the drawing mode to materialize this starting point and again in construction mode I select the parallel tool which allows me to select the line I want to use as a guide then to position my point at the intersection this time again in drawing mode to materialize the second point of my line parallel to the side of the polygon.

Notes

Summary



17m 54s