4.21.06 Digitizing

Concept of Digitizing

The concept of digitizing refers to the capture of data from analogue maps into a digital format. The procedure includes, first, geographic data capture (e.g. the 'actual' extension of a road). Then, second, is attributive data capture (e.g. the name, width, classification or pavement of the road) which is mostly covered in other procedures. Needless to say, these different procedures very much depend on one another, and a coherent and carefully planned approach to the issues would be a good idea. Since current data often only occurs in analogue formats, constructing the GIS database will involve a lot of digitizing to input the data. Maintaining and updating the database will also involve digitizing.

It should be noted that digitizing during the construction phase of a GIS consumes much time and resources. When the LGU is confronted with a large number of analogue datasets to be digitized, it should consider two alternatives. First is to outsource the digitizing project to a professional company, and the second is to ensure that its personnel have proper training, equipment and enough time for the upcoming task of digitizing.

Table Digitizing

Through the set-up of a digitizing table to the GIS Software, digitizing is carried out straight from the paper map. Before starting to use the digitizer, the following steps must be followed.

1. Set up the digitizing tablet and install the driver software.
2. Configure the digitizer puck buttons.
3. Ensure the quality of the paper map.
4. Establish control points on the paper map.
5. Register the paper map.

Table digitizing can be good if there are several large maps that can not be scanned in a normal scanner. However, the equipment is rather expensive and therefore the screen digitizing provides an option that is as good as table digitizing.

Screen Digitizing

Screen digitizing is carried out after a scanned map (or photograph) has been georeferenced (this corresponds to Steps 4 and 5 in the table digitizing set-up). In the ArcGIS software environment this kind of digitizing is referred to as *creating new features* while editing a layer. The layer is edited by *digitizing* the features on the underlying map or photograph.

What Are We Digitizing?

The most available data is analogue maps. Also, some aerial or satellite photographs can be acquired from some institutions.

- Old maps are digitized when the paper itself is “worn and torn” or the paper has shrunk in length but not in width (or the other way round). There is scarce (if any) documentation of the construction and the data of the map. The features range from measured to sketched (or even invented) and their topicality is very old;
- New maps are digitized on high-quality paper, good documentation and only on-ground-measured or photogrammetric measured features;
- Aerial photos are digitized, from which interpretation is done manually and separate different features;
- Satellite photos are digitized where simple remote sensing is done at the same time.

The features often constitute polygons or polylines. Point objects also occur, but very seldom.

Things to Consider When Digitizing

Detail Level/Zooming

Line features should be digitized along the middle of the source line. By using the zooming tool, one can verify that the digitized line follows closely to the middle.

The zooming level is a factor in how accurate digitizing is done. The type and extension of the feature that being digitized should decide the zooming level to be used. However, in order to be efficient one should keep a zooming rate that allows work without having to zoom in or out every ten seconds. In-zooming should be used where the digitizing feature has a complicated extension or border on other features. Large extent in-zooming should only be used when digitizing small features that are accurately represented on the source data, such as the demarcation marks of a piece of lot.

Snapping

Snapping is a valuable tool that helps the operator to avoid common digitizing errors. When using snapping, the new node of a line or polygon will be the same as an already existing node, provided that the cursor is within the snapping distance. Thus, polygons are closed if one clicks within the snapping distance of the polygon’s starting point, and, a new polygon adjacent to an existing polygon will have the same extension and nodes. However, it is important to be aware of the snapping settings and always check the digitized features afterwards to detect possible errors.

The snapping settings enable one to choose to what feature the snapping will be carried out. In ArcGIS choose the layer(s) that contain(s) those features and if snapping will be carried out to these features' vertices, endpoints or edges. The 'edge' setting helps to snap the digitized feature, even if there is no node (vertex) in the proximity. This setting will be useful when a new polygon is digitized along an adjacent existing polygon.

Polygon snapping – A good example of a digitizing task where snapping should be used is in the digitizing of thematic maps (e.g. land coverage.) For example, the forest areas are first digitized as a certain feature class. Thereafter, the agricultural land areas are digitized as another feature class. The snapping settings should now be set to be carried out on vertex and edge to the forest feature class. Whenever an agricultural area is adjacent to a forest area, the operator will snap the agricultural circumference line along the forest circumference line. When it is time to move on with a new feature class, e.g. water bodies, the snapping settings will be set to include the agricultural feature class and so on.

However, if two polygons share a large extension of a circumference line, a better alternative to snapping could be to copy the first digitized polygon to the new feature class. Thereafter the new polygon is cut and the part that should not constitute the new feature class circumference is deleted. Then, digitizing (with appropriate snapping) is carried out on the rest of the polygon.

(Poly)line snapping – An example of snapping polylines is the digitizing of roads. Each road that intersects with another road is properly connected with the use of snapping.

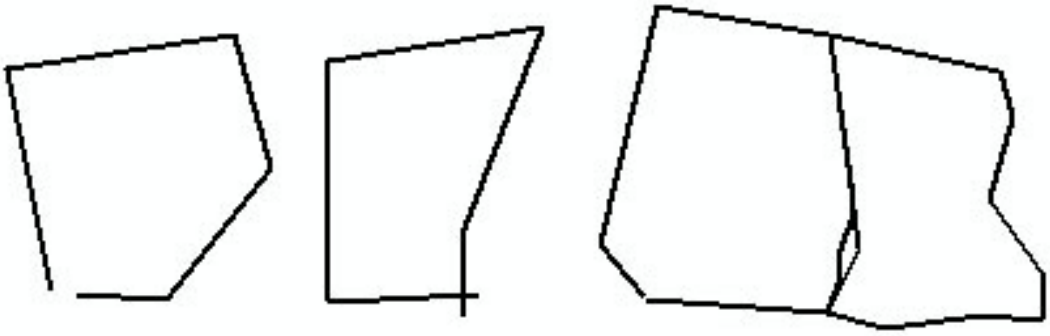
End Points

For some polygon features the operator should not digitize the circumference line. Instead, the points to select are the marked corners. Examples of this include the lots on a cadastral map. The actual border consists of the straight line between two demarcation marks.

Common Digitizing Errors

Polygon Digitizing

There are some common errors that can easily be removed by using the software's digitizing help tools. Errors like open polygons, surplus and deficits should not be a problem nowadays, since most software automatically finish the polygons in the starting point. "Loop polygons" can, however, still occur.



Open polygon due to line deficit (left), polygon with line surplus (center) and two polygons with a possible loop polygon (right).

Polyline Digitizing

The risks with polyline digitizing are that surplus and deficits can occur. These errors are avoided by using the snapping tool.

The Accuracy of Digitized Features – An Important Part of the Metadata

In any GIS it is important to keep track of the quality, topicality and type of data capture.

The digitizing effort will never be better than the analogue source. For example, a barangay boundary identified as a one-millimeter thin line on an analogue map with the scale 1:10 000, already comes with an inaccuracy of 10(!) meters when the line is digitized. That is, providing that the georeferencing of the map was perfectly accomplished and that the boundary itself is perfectly presented in the analogue map, one still cannot apply a more accurate value than 10 meters on the digitized boundary. This is due to the uncertainty of having digitized the exact location on the 1 mm thin line.

This serves as an example of how important it is to be aware of the sources of errors in the whole process of converting data. Thus, it is recommended that a dataset's metadata contains information about the original data (such as how it was measured, original scale, and its topicality) and how this was captured into digital format (e.g. through screen digitizing of a scanned georeferenced copy of the original map).