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User guide for *FluvialCorridor* toolbox

Spatial disaggregation of spatial units

Toolset name : *DISAGGREGATION PROCESSES*

Tool's name : *Segmentation*

How to cite : Roux, C., Piégay, H., 2013. Segmentation guideline for the *FluvialCorridor* toolbox, a new ArcGIS toolbox package for exploring multiscale riverscape at a network scale. Sedalp (Sediment Management in Alpin Basins) and CNRS (UMR5600).

FluvialCorridor **package for ArcGIS**

Version V01 - 2014

CNRS - UMR5600 Environnement Ville Société
Alpine Space Program - Sedalp

For each use of the *FluvialCorridor* GIS package leading to a publication, a report, a talk presentation or any other document, please refer to the following paper :

Roux, C., Alber, A., Bertrand, M., Vaudor, L., Piégay, H., submitted. "FluvialCorridor" : A new ArcGIS package for multiscale riverscape exploration. Geomorphology.

I. Concept and methods

Prior to assess metrics to characterize a fluvial system, fluvial units have to be disaggregated. This step enables to discretize a continuum with a constant length in order to provide a higher resolution for characterizing fluvial units. The constant length must be set precisely to ensure spatial trends or relationships between several variables to be correctly detected either at a network scale or at a local scale.
Spatial disaggregation can be run both for linear (e.g. hydrographic network, centerline) and polygon feature (valley bottom, active channel).

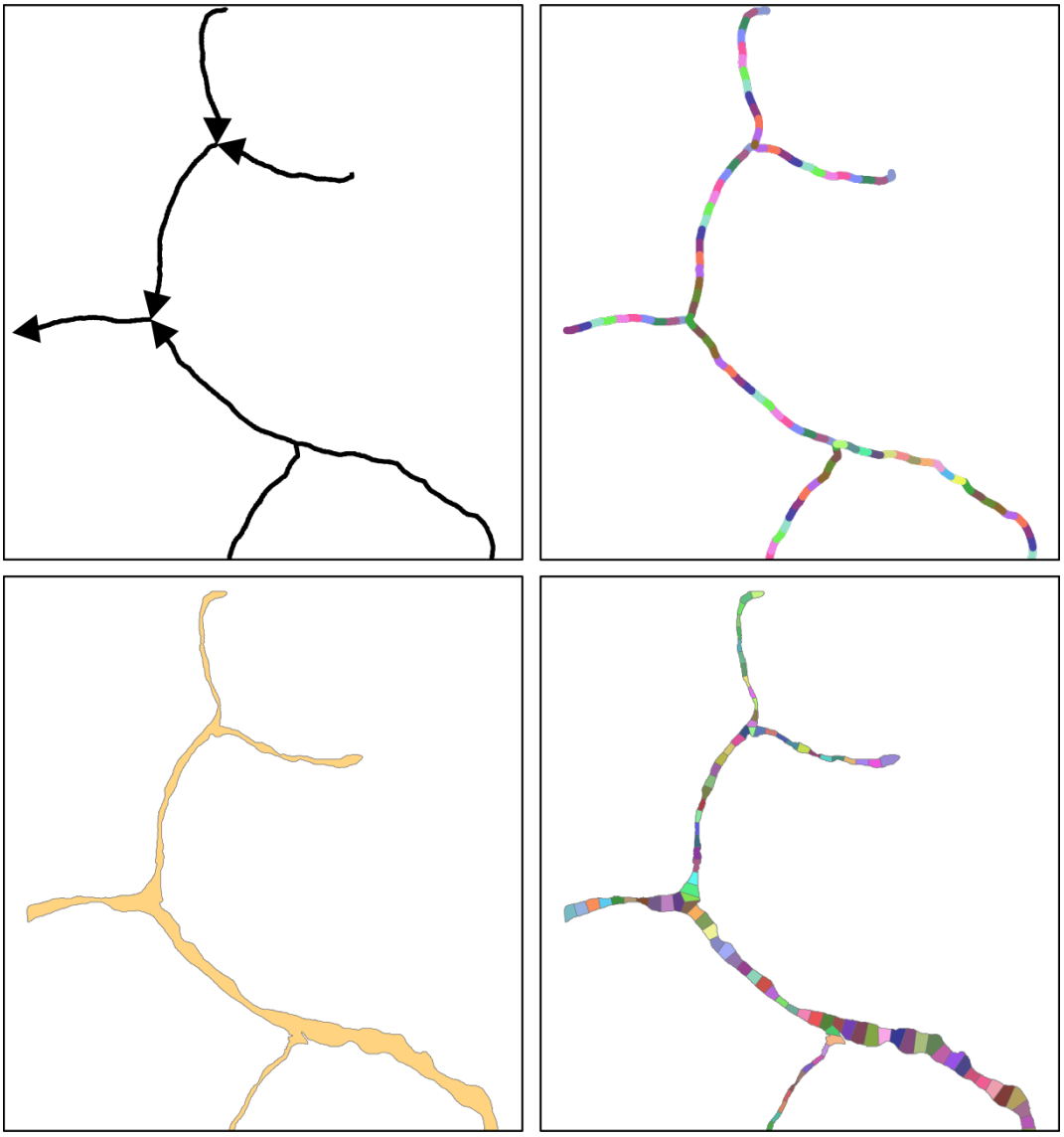

Figure 1 Continuums segmented with the *Segmentation* tool of the *FluvialCorridor* toolbox (Le Guil river, French southern Alps).

Implementation of the segmentation method has been done with a GIS (ArcGIS 10.0) on two vector layers. The first one is a centerline network whereas the second one is polygon representing a valley bottom. In the second case, another layer is required (related centerline).

General algorithmic framework

The algorithmic scheme developed for the *Segmentation* tool is presented in the Fig. 2.

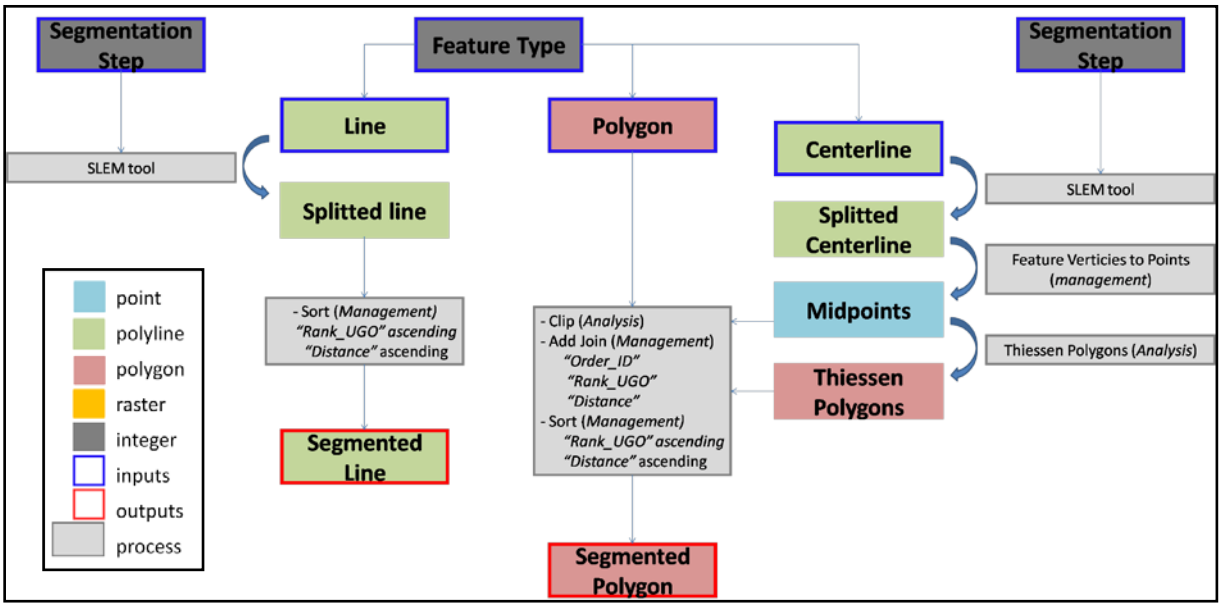

Figure 2 General algorithmic framework for the *Segmentation* tool.

As presented into the Figure 2, *Segmentation* tool has been developed both for linear and polygon feature.

a. Linear features

For linear features (line or polyline), the process involved is quite simple. It is based on the *SLEM* script (for *Split Line Each Meters*). This script enables to split line or polyline with a constant user defined length (*Segmentation Step*). Each resulting segment is attributed with a "*Rank_UGO*" and "*Distance*" field. The "*Distance*" field is the distance (in meters) between the upstream extremity of the segment and the next upstream confluence within the network. The "*Rank_UGO*" field is a unique id of the UGO (i.e. line) each segment belong to. Once the feature has been segmented, it is sorted according the "*Rank_ID*" values. This is the final output for linear features.

b. Polygon features

For polygon features, segmentation is based on a Thiessen polygonization. In that cases, one feature more is needed : the centerline of the input polygon. This centerline is segmented thanks to the *SLEM* tool and then each segment is converted into its midpoint. These points receive the "*Rank_UGO*" and "*Distance*" information. A Thiessen polygonization is applied on these points and the resulting set of polygon is then intersected with the input polygon (Fig. 3). "*Rank_UGO*" and "*Distance*" information are finally joined to the intersected polygon feature thanks to the set of midpoints. This is the final output for polygon features.

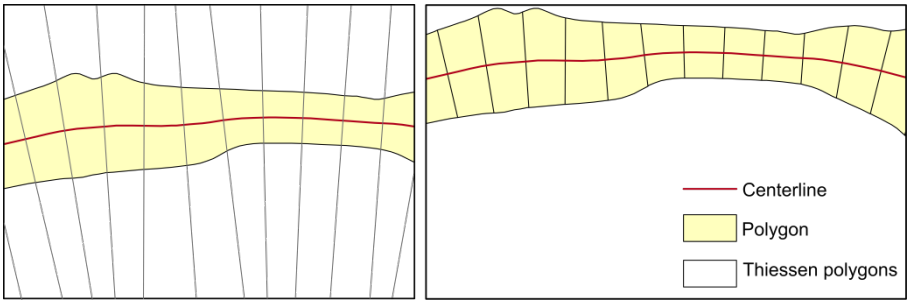

Figure 3 Intersection of Thiessen polygons and input polygon to create segmented polygon

Note : Prior use of *Sequencing* tool

To ensure a perfect segmentation and especially the assignment of the "*Distance*" field from upstream to downstream, all linear features provided must be correctly oriented. Therefore, a prior use of the *Sequencing* tool is an essential condition for an optimal result of the *Segmentation* tool."*Order_ID*" and "*Rank_UGO*" created during the *Sequencing* tool or automatically reported into the output table and the "*Distance*" field is added.
Segmentation tool can also be used on features aggregated (spatial disaggregation and aggregation framework). In that case, each homogeneous reach created during the aggregation process (see *Hubert Test*) will be segmented.

II. Screen user interface

II.1. Startup screen

Into the screen user, several fields have to be filled (Fig. 4). Be careful that a green mark in front of a field is not a guaranty that this field is not optional. Into *Segmentation*, if a field is available, that means that it **must be filled**.

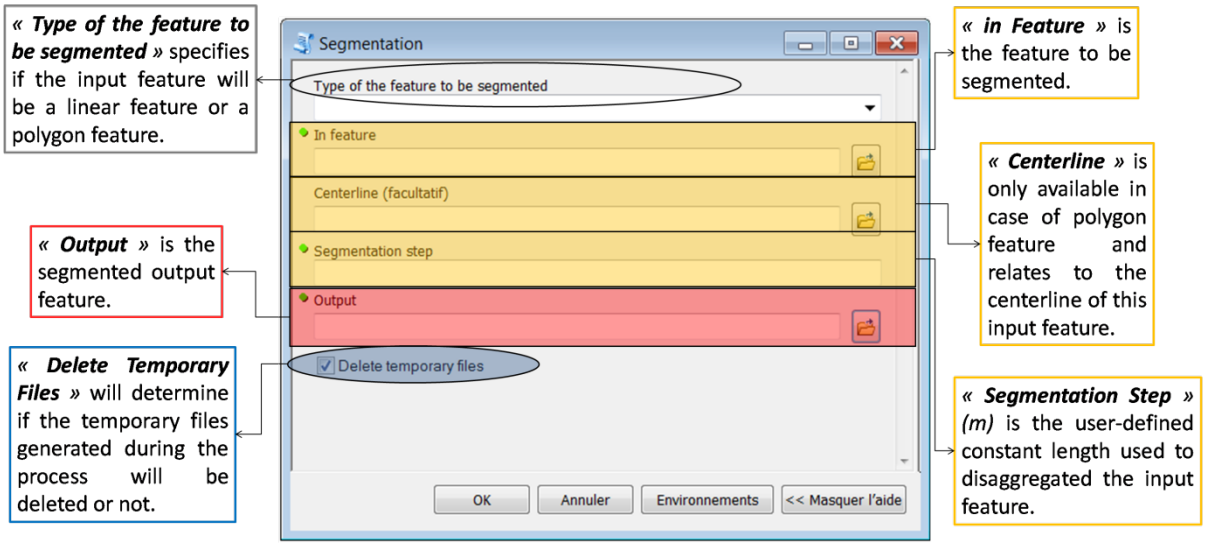

Figure 4 Screen user interface of *Segmentation* tool

Firstly, user starts by choose what kind of feature he wants to segment (i.e. linear or polygon feature) thanks to the "*Type of the feature to be segmented*". This feature is then asked and, for the polygon feature, the related centerline. The constant user defined length has to be filled into the field "*Segmentation Step*". Then, user has to provide the path name of the output segmented shapefile.

Note : Multi-part input polygon

Segmentation of multipart polygon features is not possible with the *Segmentation* tool. If an input polygon has subparts, a warning message will appear within the screen user interface (Fig. 5). This checking process is ensure as soon as user provides the input polygon and freezes the screen user interface during a few seconds during which one it is recommended to not fill other fields.

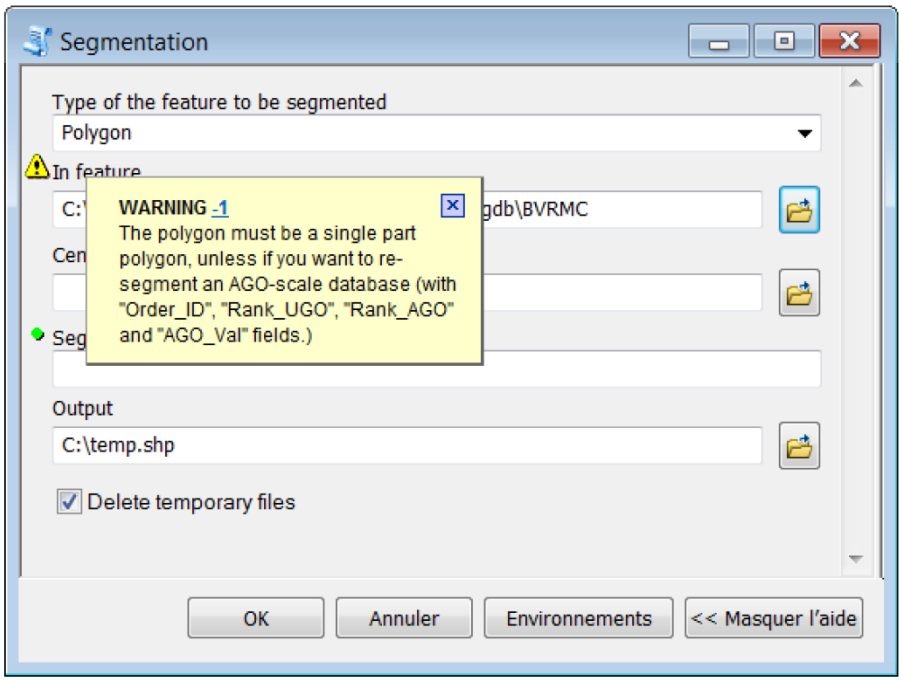

Figure 5 Warning message involved by a multi-part polygon input.

II.2. Management of temporary files

III. Temporary files created during the compilation are managed thanks to the ArcGIS default geodatabase (*%ScratchWorkspace%*). If the user does not modify this geodatabase in the general environment proprieties, its path must looks like C:\Documents and Settings\<user>\My Documents\ArcGIS\Default.gdb. With the box "*Delete Temporary Files*", the user has the choice to keep or erase temporary files.

ANNEX 1

List of temporary files created during the *Segmentation* tool

Name	Description
SplitLine	Output of the SLEM script : split input lines but unsorted.
CenterlineMTS	Centerline converted into *Multi Part to Single Part.*
SplitCenterline	Segmented centerline.
SplitCenterlineToPoint	Segments of the segmented centerline converted into midpoint.
ThiessenPolyCenterline	Set of Thiessen polygons created from *SplitCenterlineToPoint.*
Segmentation_TEMP	Intersection of the Thiessen polygons and the input polygon.

Temporary files created during the segmentation of a linear feature.

Temporary files created during the segmentation of a polygon feature.