Survey of Israel

המרכז למיפוי ישראל

Survey of Israel

Technologies Division

Project: Curves Handling

02.02.2022

Table of Contents

Introduction

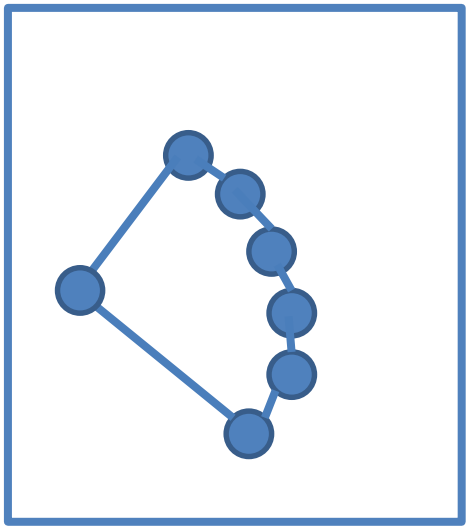
Mapi (Survey of Israel) is currently in the process to replace the data base of the Israeli BANKAL (kadaster dataset), which runs on the old engine (ArcStorm) with the newer more advanced program "ArcPro". This will enable Mapi to update her data structure, use advanced tools and gains ESRI support.

"Curve handling" project will try to change BANKAL data structure by replacing the "exploded vertices" with geometrical curve. The main objective for this transformation is to reduce the need of multi-vertices polygon objects to an three vertices curve object.

Curves - Introduction

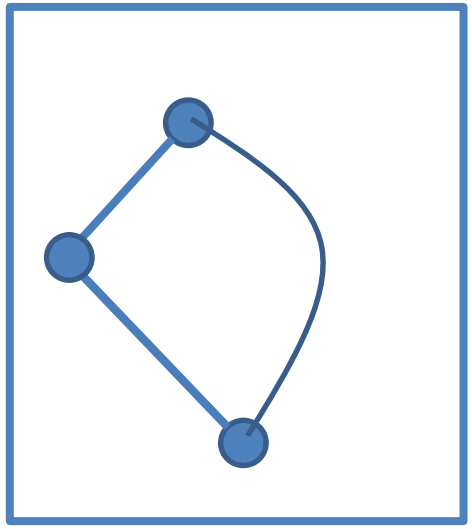
Today, curves represented as collection of points in proximity to each other (Fig. A). The objective is to convert the curves to three points geometry (Fig. B).

A - polygon



[[x1,y1],[x2,y2],[x3,y3],[x4,y4]…]

B - polygon



[[x1,y1],{'c':[x,y],[x,y]}]

Finish

Middle

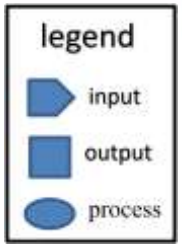
Process - General

The tool is construct from two parts:

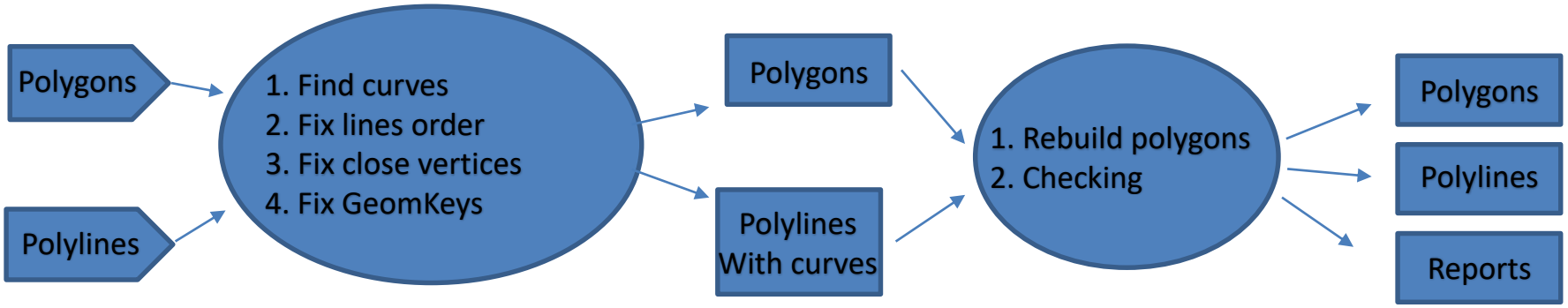
1) Fixing the curves
2) Fixing the precision after phase 1

Around 20% of the curves fixing will produce a hole or an over lap with sizes from 0.001 to 0.3 centimeters. To overcome this problem, another tool will close the holes and delete the overlap based on the source layer (parcel before fixing).

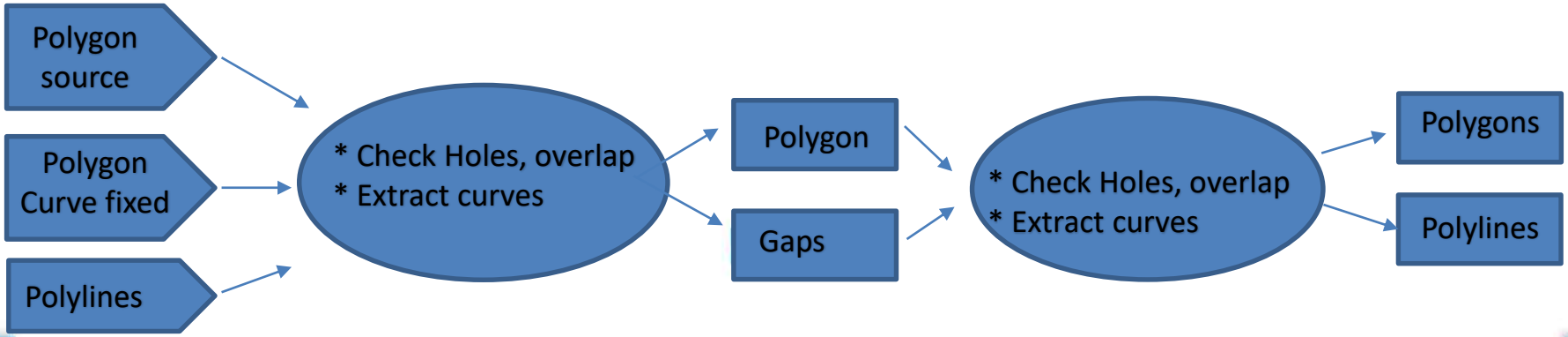
Process - Model



1 - Fix Curves process



2 - Fix precision process

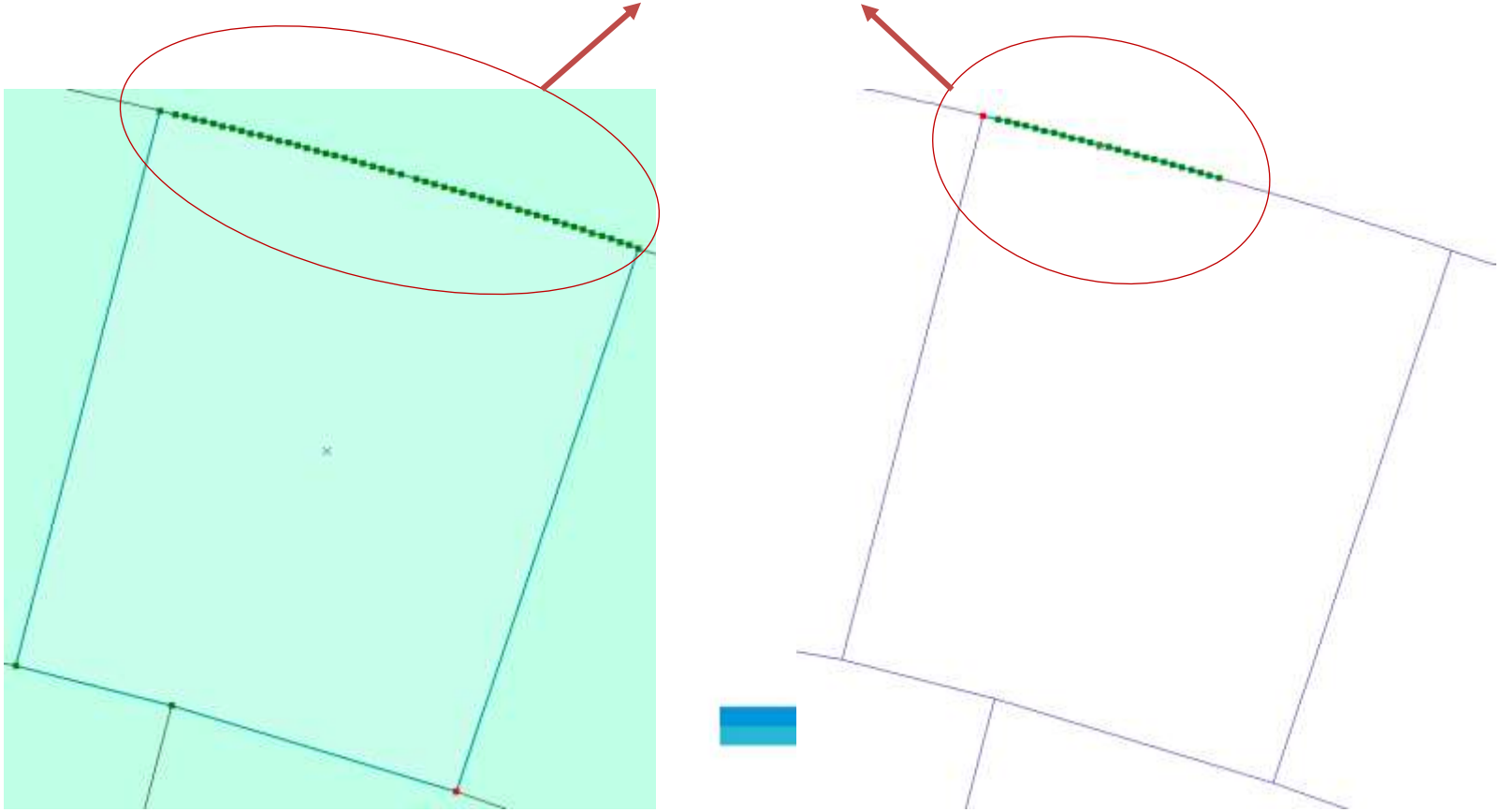


Input - Old BANKAL dataset

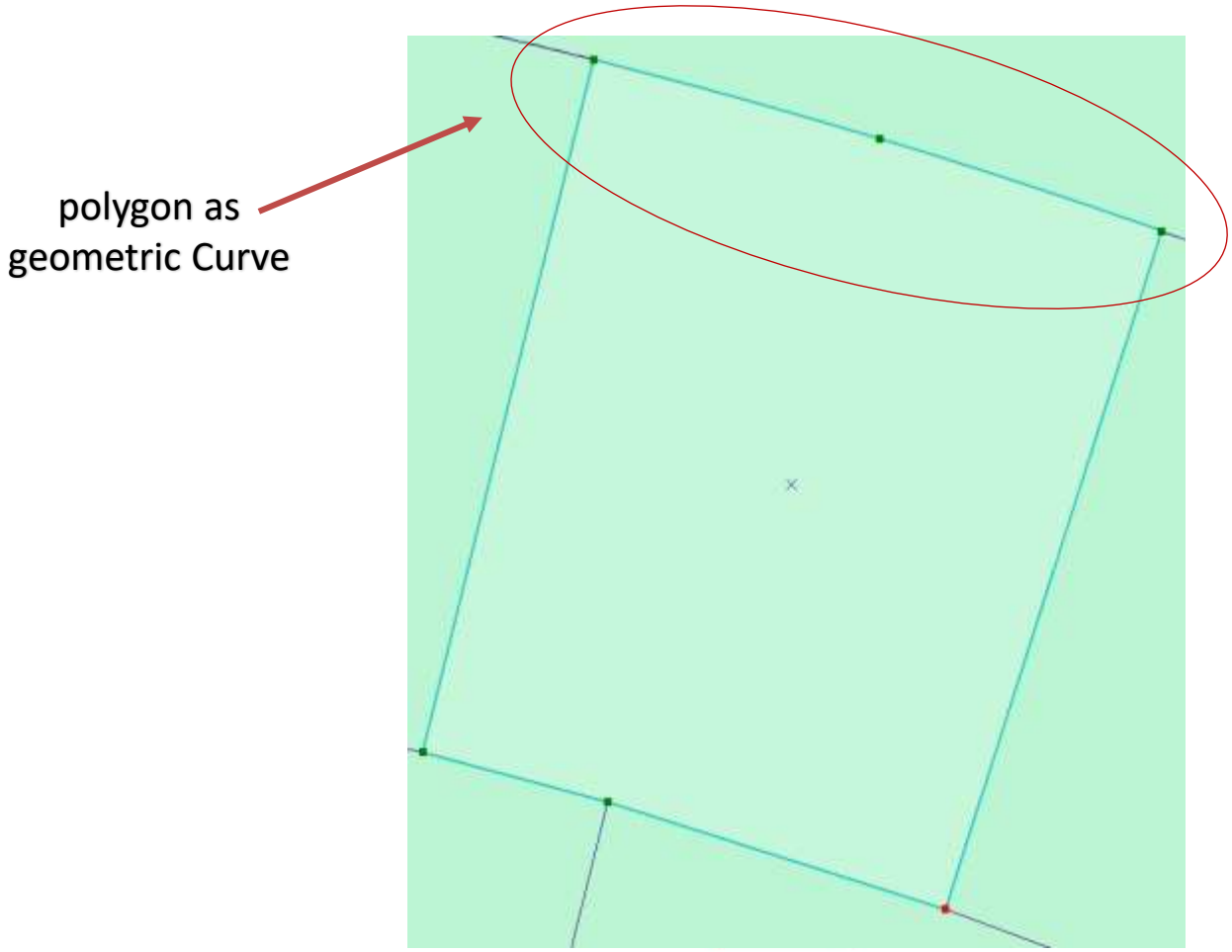
Polygon

Polyline

Object as collection of vertices



Out put - New Bankal



Tool preprocessing

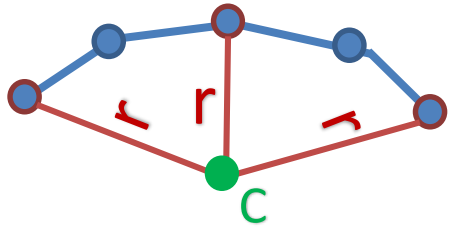
Before implement the tool ability to insert the curves to the parcel from the line segments, preprocesses of the polygon and lines array need to be either fixed or monitored, the stages are as follows:

1) Finding either line segment is a curve
2) Finding the order of curves relative to parcels
3) Fix parcel vertices that doesn't keep continuing form
4) Check the accuracy needed to match between the two layer

Fix Curves

Find either line segment is a curve

To find if a set of vertices are curve, three points on the line were chosen, and if they sit on the same radius, the line segment were considered a curve.

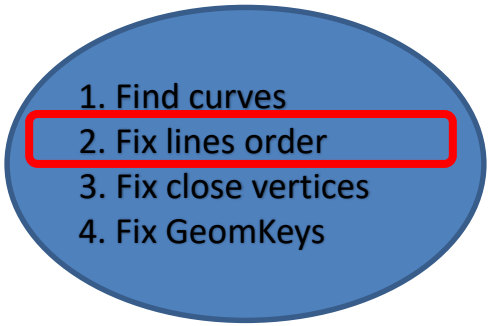


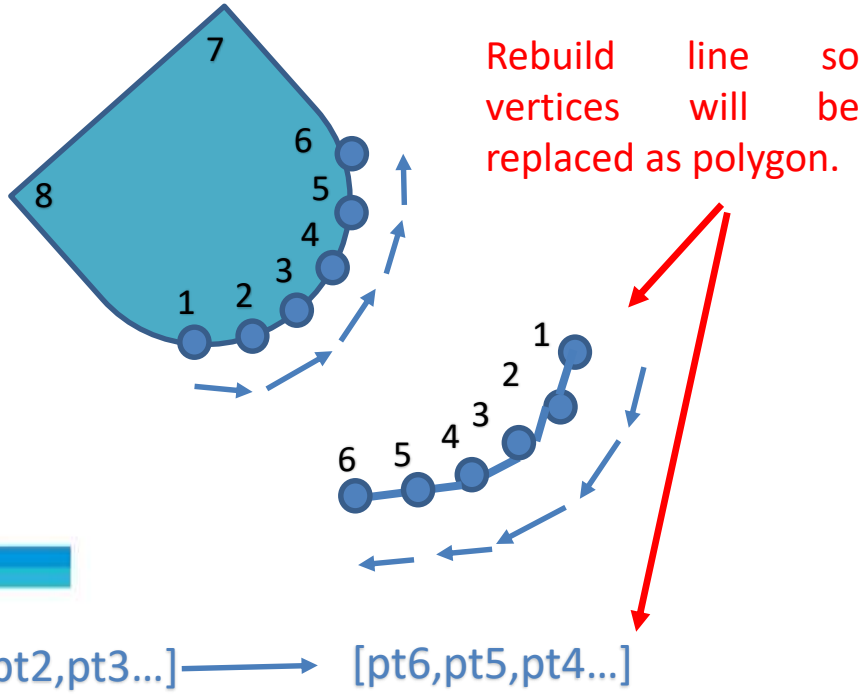
1. Find curves
2. Fix lines order
3. Fix close vertices
4. Fix GeomKeys

```
def IsOnCircle(x1, y1, a, b, r):
    if round((x1 - a)*(x1 - a) + (y1 - b) * (y1 - b), 1) == round(r*r, 1):
        return True
    else:
        return False
```

Fix Curves
curves relative to parcels

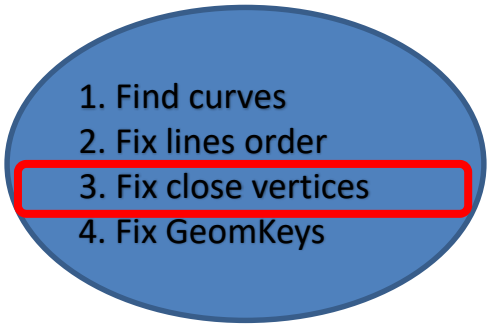
After inserted the line attribute with curve parameters, the segments containing curves were lined with there matching polygon.

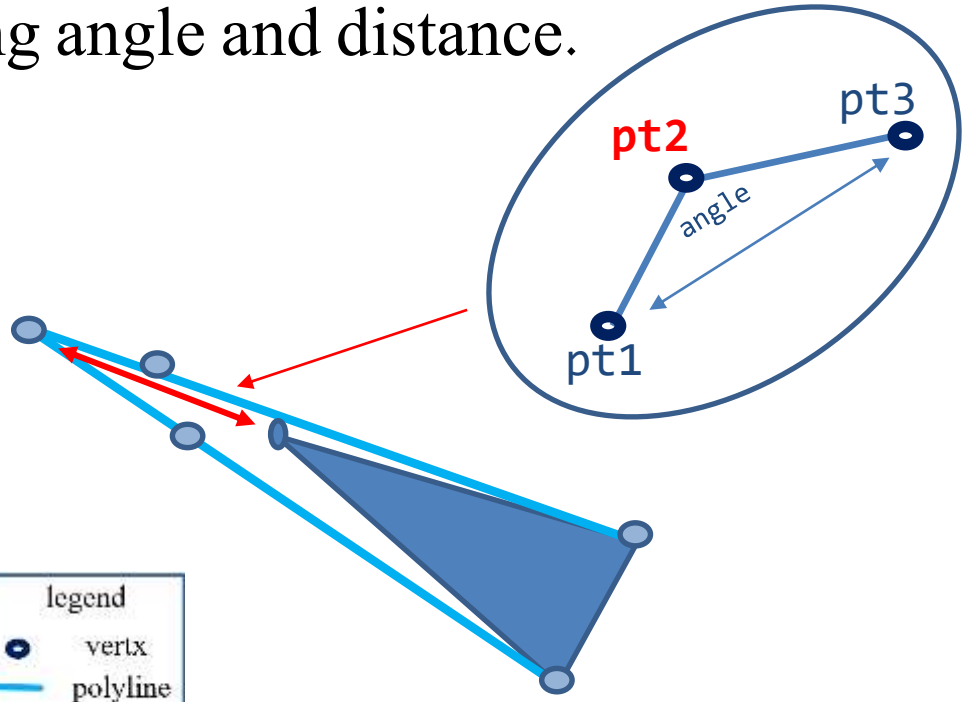




Fix Curves
Parcel keep continuing form

The Bankal dataset contain unclosed vertices which ranges between 0.001 to 0.5 meters, those changes interfere the use of x,y coordinates as primary keys (connecting lines and polygon). Fixed by checking angle and distance.

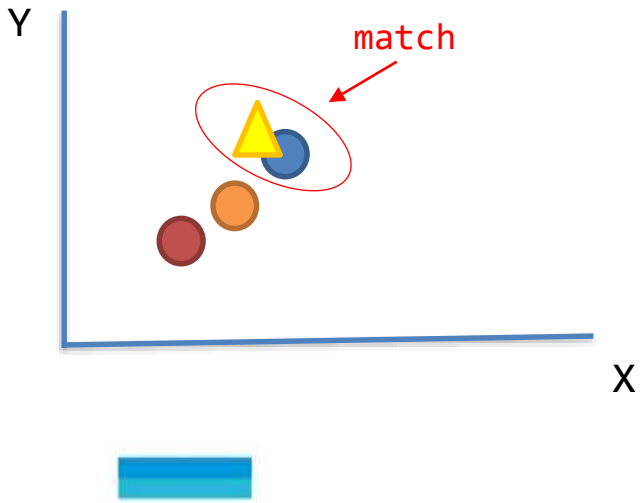


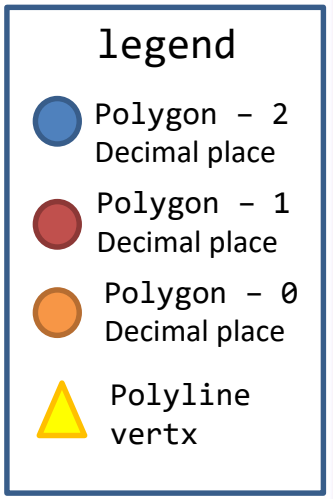


Fix Curves
Check accuracy

Points will be submit to few attempts of rebuilding geometry with different accuracy levels. That will determine the accuracy needed for X and Y axis.

1. Find curves
2. Fix lines order
3. Fix close vertices
4. Fix GeomKeys





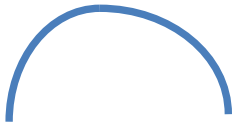
Default: precision_X,precision_Y = 2,2 (Decimal place)

Fix Curves

After the data preparation completed, the tool will try two different options (not considering the already two attempts finding XY accuracy). The reason for those attempts are the different between curves and their placement on the polygon array. Next slide will explain some of the different cases studied.

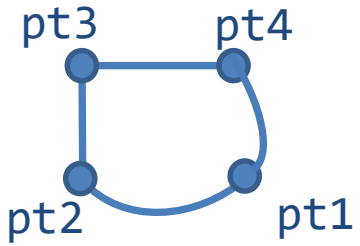
Challenges Completed

- Double curves



- Snake Curves

- Curves in the beginning and end of the polygon array

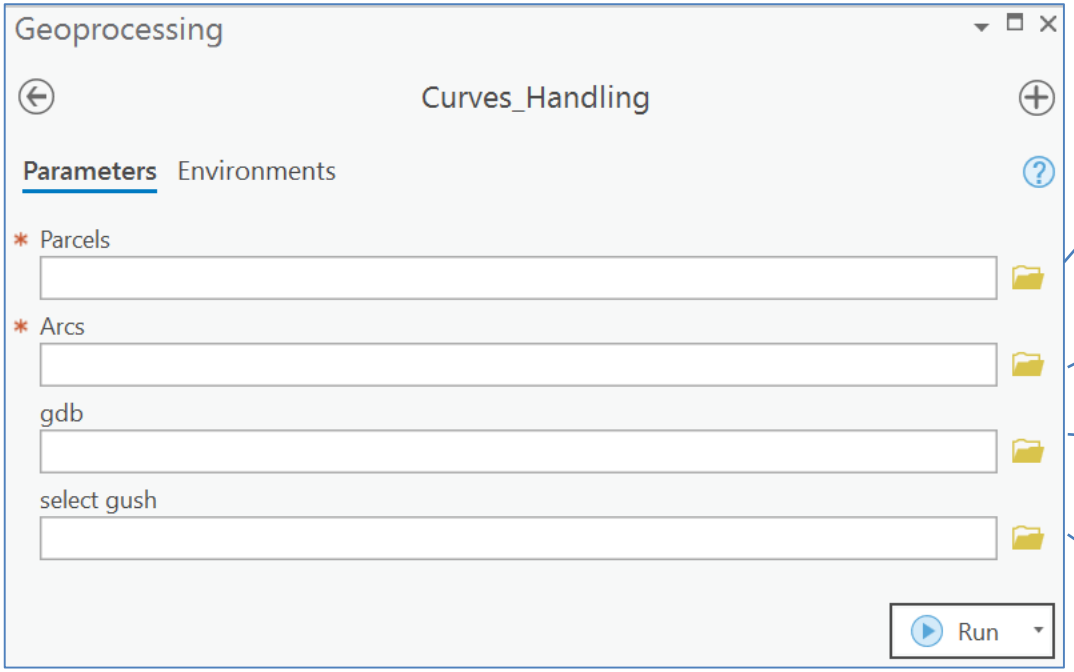


- Accuracy problems

Challenges to solve

1) There is still 8% curves that still without solution.
2) 20% of curves solved will produce small holes and overlaps that will be take care in another operation.
3) Parcels with holes are not treated at the moment, and will be addressed later.

Tool interface



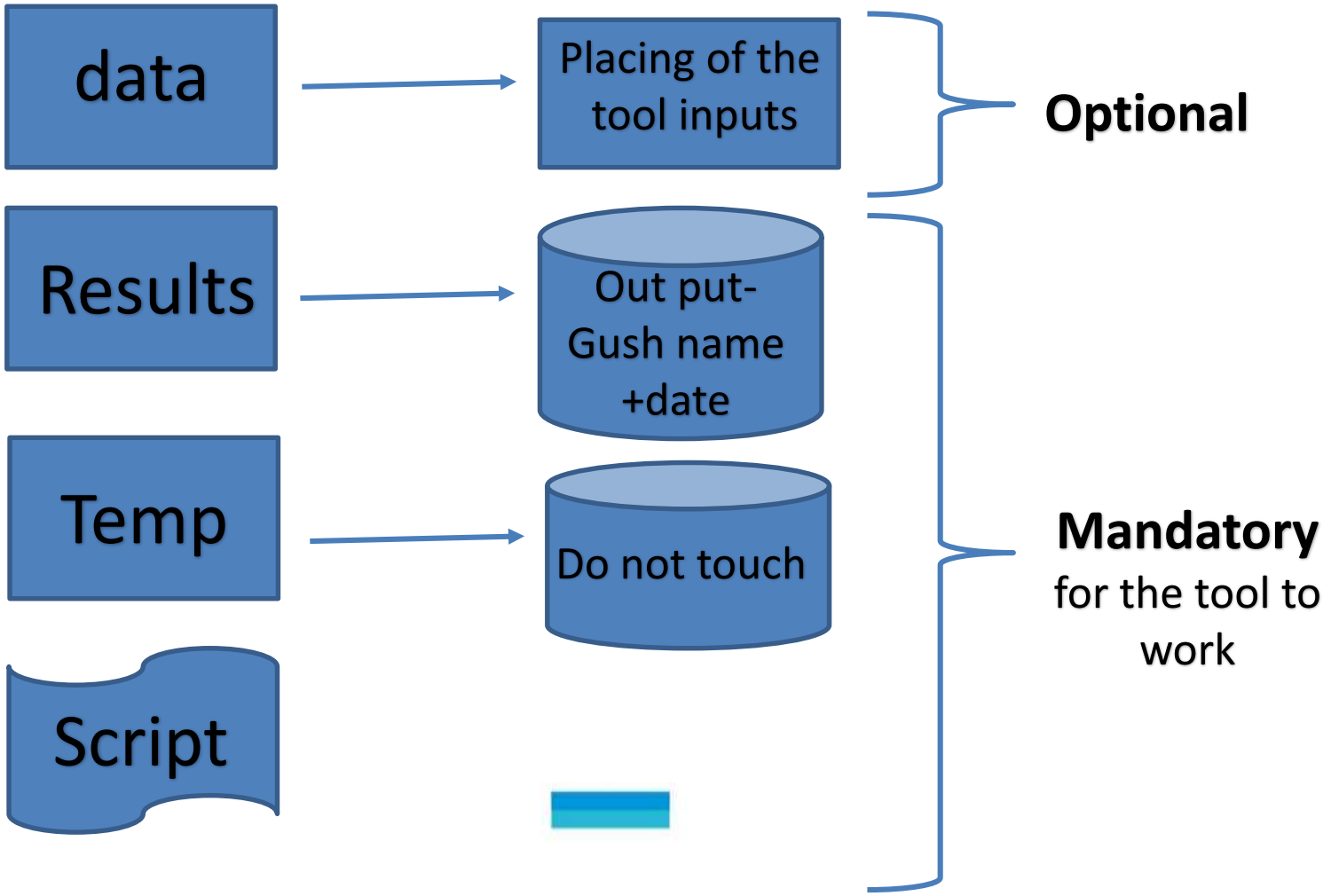
Bankal parcels (polygon)
Require

Bankal arcs (polyline)
Require

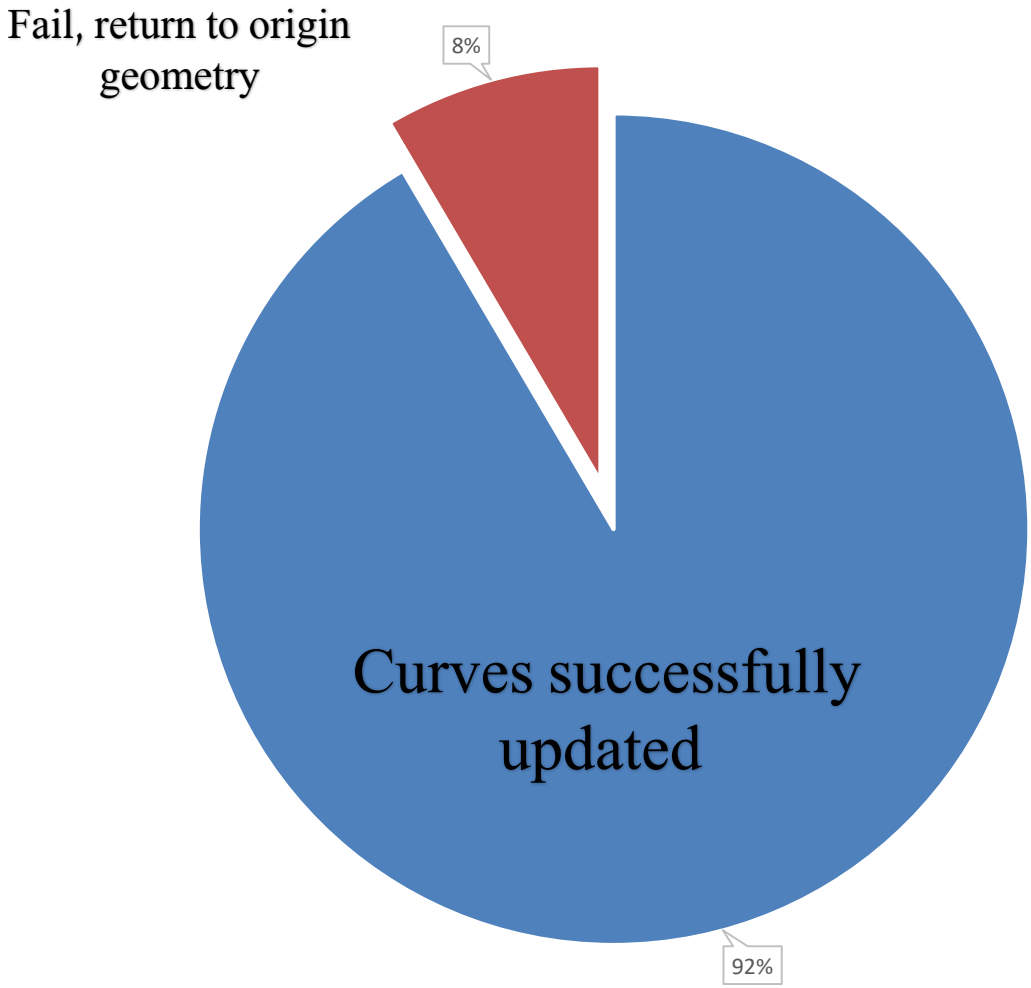
GDB (results of previous run, in case rerun is needed)
optional

Selecting specific gush's
optional

Tool **structure**



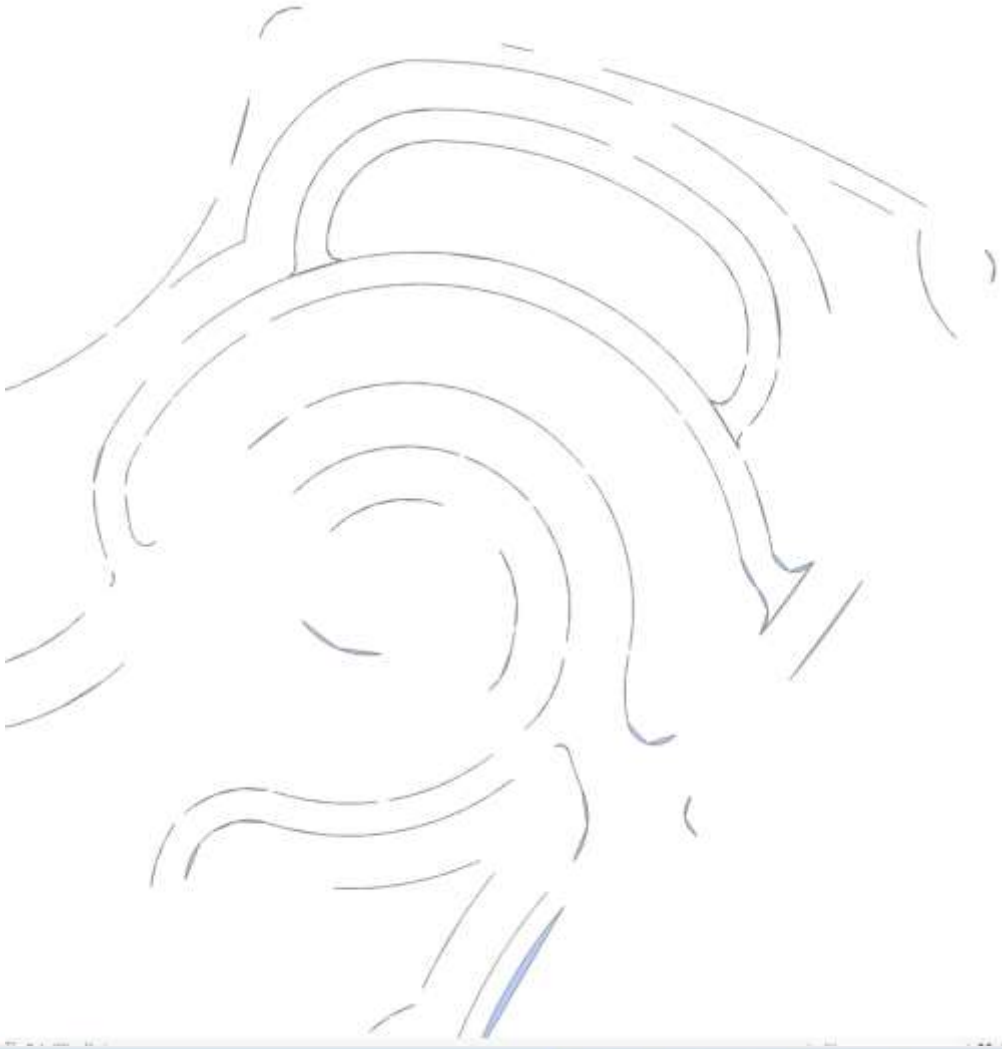
Results – converted curves



Results – vertices deleted

Around **75%** of the over all vertices deleted, with a By-product of 20% holes/overlaps with the size from: 0.001 to 0.3.

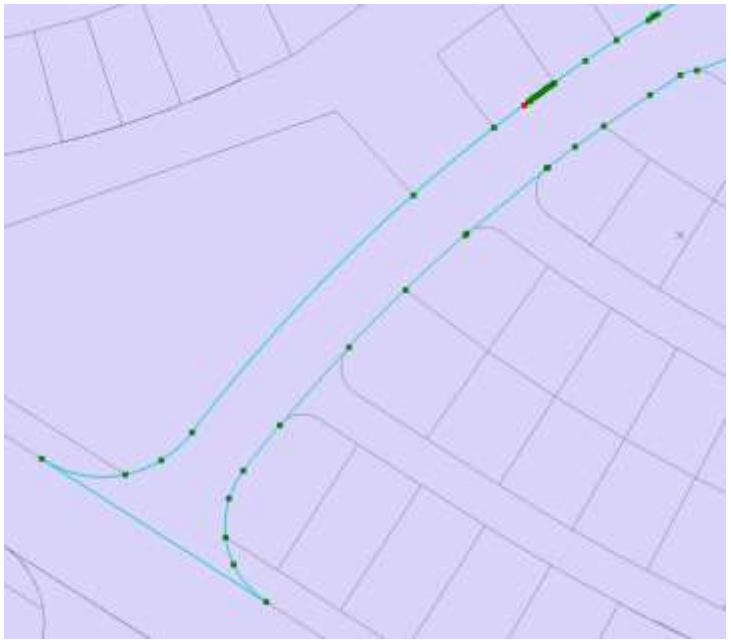
Results – successfully carves insertion



Results – vertices deleted

Before

After



What next?

Now, the tool should run over the PARCELS and ARCS dataset for a week (approximately on 10 computers). in the meanwhile I will complete the fixing of the holes and over laps. In this pace we can finish within a week.

end