Topologically Constrained Douglas-Peucker Line Simplification

Constrained simplification of arbitrary polylines in the context of arbitrary planar geometries. Download and try it on Windows, Linux or Mac.

how to use

Open a terminal (command line) from the directory containing an executable (constdp[.exe] for 64bit, constdp_32bit[.exe] for 32bit systems). Simplification options are made available through the use of a TOML file (config.toml). Execute `constdp` with the following command :

```
./constdp -c ./config.toml
```

If a `-c` option is not provided at the terminal e.g. `./constdp`, it assumes `./config.toml` as the default configuration file. Change `config.toml` to configure your simplification.

config file

```
# input file is required
Input                 = "/path/to/input.[wkt]"
# output is optional, defaults to ./out.txt
Output                = ""
# this is optional
Constraints           = "/path/to/file.[wkt]"
# type of simplification, options : DP, SED
SimplificationType    = "DP"
# simplification threshold (in metric units as input geometric coordinates)
Threshold             = 0.0
# minimum distance from planar contraints - provide value if `DistRelation = true`
MinDist               = 0.0
# relax distance for non-planar intersections - provide value if `NonPlanarSelf = true`
RelaxDist             = 0.0
# are polylines independent or a feature class ?
# if false planar and non-planar intersections between polylines are not observed
IsFeatureClass        = false
# observe planar self-intersection
PlanarSelf            = false
# observe non-planar self-intersection
NonPlanarSelf         = false
# avoid introducing new self-intersections as a result of simplification
AvoidNewSelfIntersects = false
# observe geometric relation (intersect / disjoint) to planar objects serving as constraints
GeomRelation          = false
# observe distance relation (minimum distance) to planar objects serving as constraints
DistRelation          = false
# observe homotopic (sidedness) relation to planar objects serving as constraints
SideRelation          = false
```

data

Input in `config.toml` should point to a text file containing WKT strings or `toml` arrays.

wkt input

```
LINESTRING (30 10, 10 30, 40 40)
# linestring with 3d coordinates (x, y, time)
LINESTRING (30 10 1, 10 30 2, 40 40 3)
```

See sample input and constraints WKT text files : Input, Constraints.

toml input

```
1=[[30, 10], [10, 30], [40, 40]]
2=[[30,  8], [10, 15], [40, 25]]
#lines with 3d e.g.: (x, y, time)
3=[[30.1, 8.2, 2.4], [10.4, 15.9, 5.6], [40.8, 25.0, 9.8]]
```

Note that the `toml` input uses an `id=array`, contents of the array must be of the same type (all coordinates as integers or floats). A point is `[x , y]` or `[x, y, z]`. A polyline is a string of points `[[x,y],[x,y],...]`. A polygon is a string of of polylines:
`[string 1, string 2, ...] ==` `[[[x,y],[x,y],...], [[x,y],[x,y],...], ...]`;
the fist is a shell (outer boundary) and subsequent strings are interior holes (for polygon with holes).
For example,
WKT string:

```
POLYGON ((35 10, 45 45, 15 40, 10 20, 35 10),(20 30, 35 35, 30 20, 20 30))
```

TOML arrays:

```
1=[[[35, 10],[45, 45],[15, 40],[10, 20],[35, 10]], [[20, 30],[35, 35],[30, 20],[20, 30]]]
```

See sample input and constraints `toml` text files : Input, Constraints. Since constraints can be of the form `point, polylines, or polygon` its `toml` is of the format:

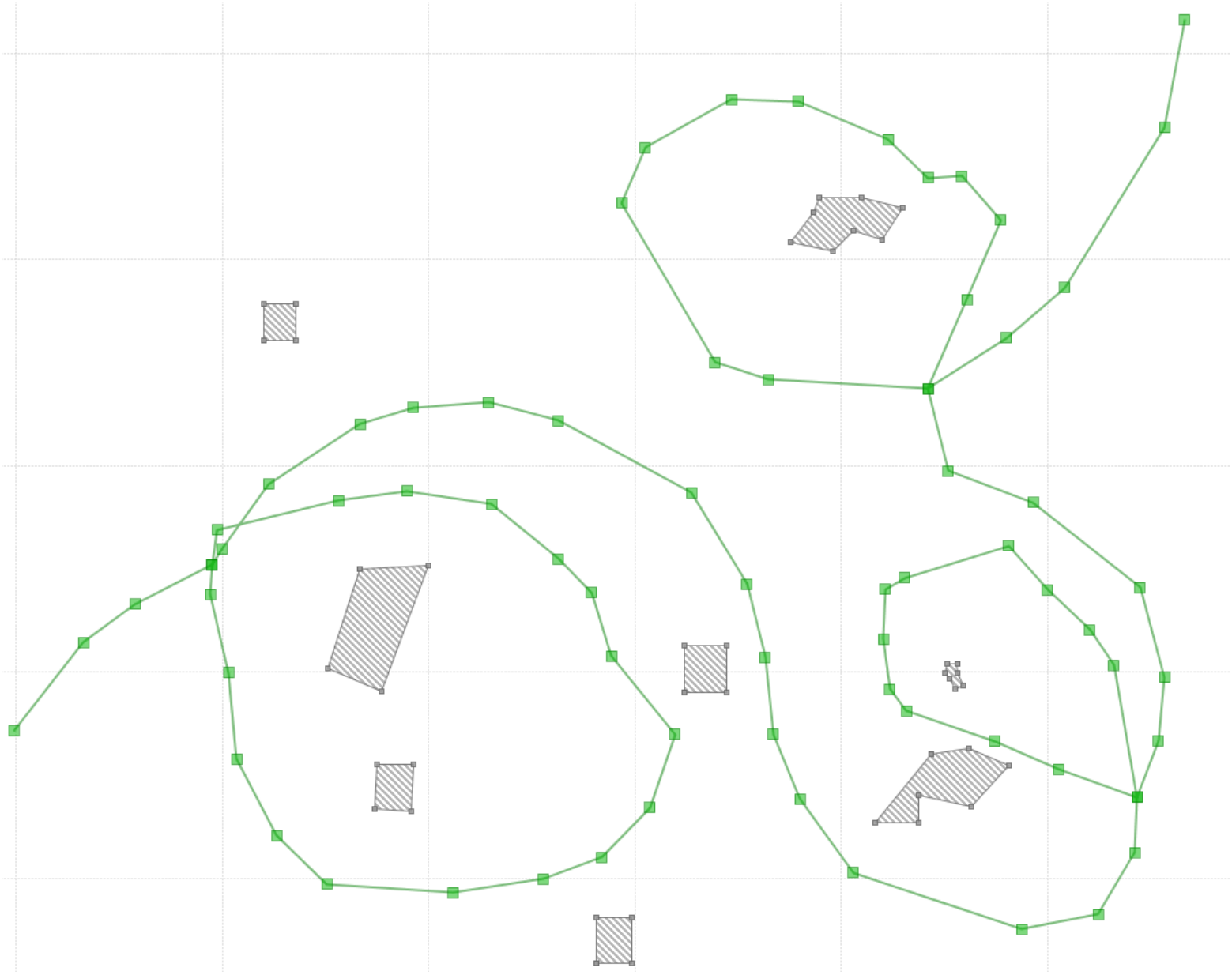
```
[points]
id=array
id=array

[polylines]
id=array
id=array

[polygons]
id=array
id=array
```

example

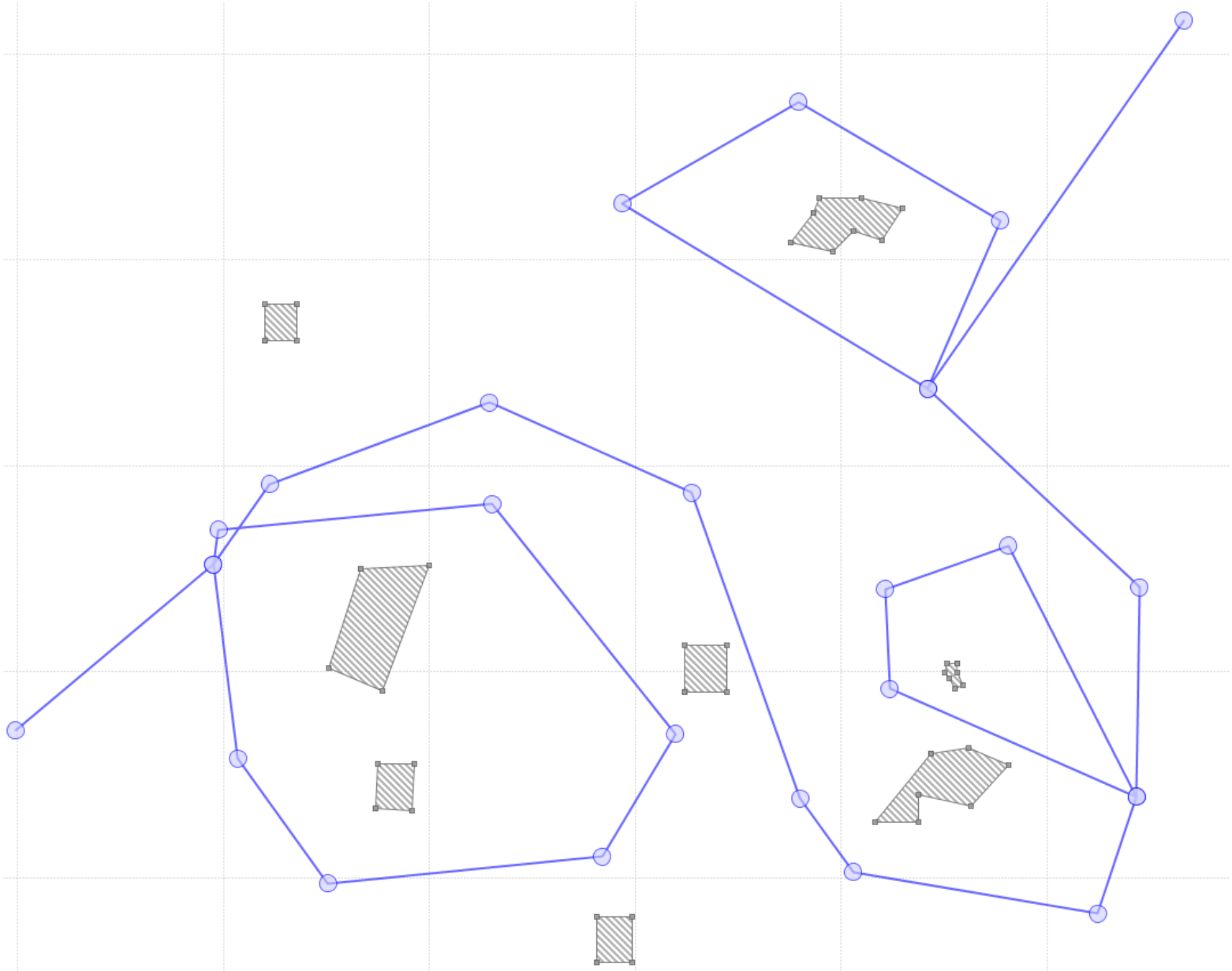
Given a polyline in `resource/input.wkt`

```
Input                = "resource/input.wkt"
Output               = ""
Constraints          = "resource/constraints.wkt"
SimplificationType   = "DP"
Threshold            = 50.0
MinDist              = 20.0
RelaxDist            = 30.0
IsFeatureClass       = false
PlanarSelf           = true
NonPlanarSelf        = true
AvoidNewSelfIntersects = true
GeomRelation         = true
DistRelation         = true
SideRelation         = true
```

Original polyline in the context of planar objects:



Constrained simplification with respect to config options(above):



Unconstrained simplification with these options turned `false`:

```
IsFeatureClass         = false
PlanarSelf             = false
NonPlanarSelf          = false
AvoidNewSelfIntersects = false
GeomRelation           = false
DistRelation           = false
SideRelation           = false
```