Topologically Consistent Douglas-Peucker Line Simplification in the Context of Planar Constraints

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:

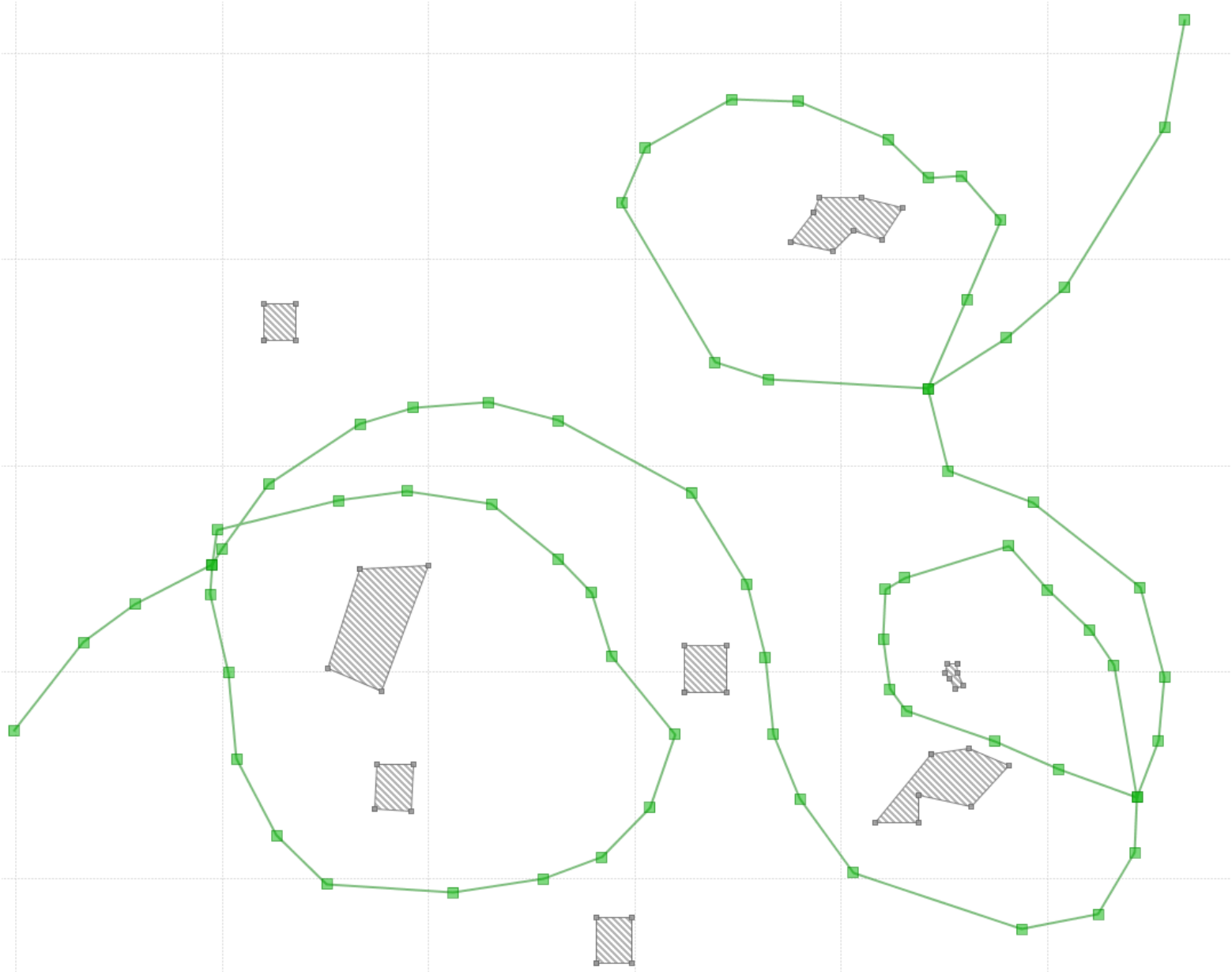
```
[points]
id=array
id=array

[polylines]
id=array
id=array

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

example

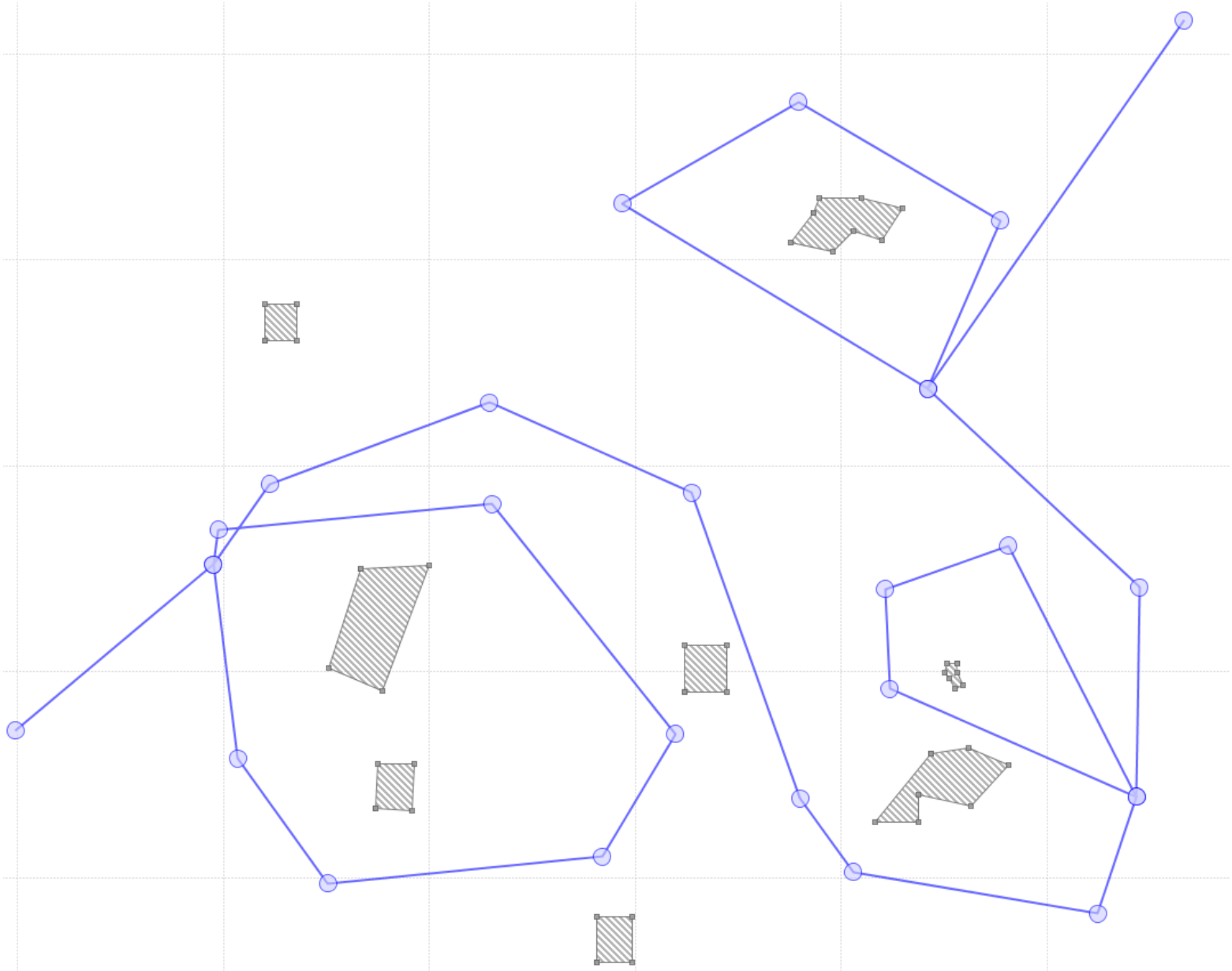
Given a polyline in `resource/input.wkt`

```
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
```