CGLAB – the Scilab Computational Geometry Toolbox

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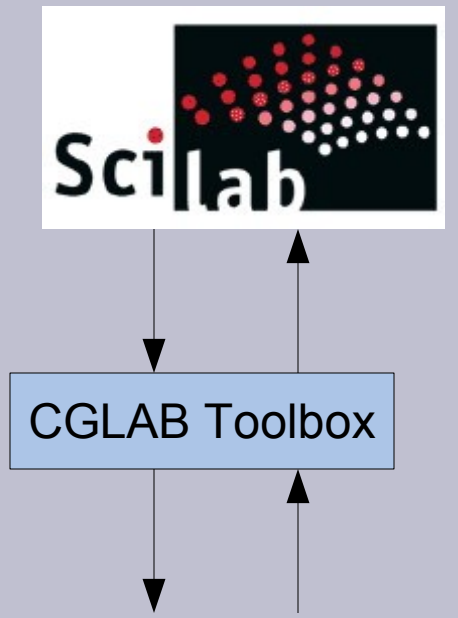
Scilab and CGAL

Scilab

- An interpreted environment
- A programming language for engineers
- Specialized *toolboxes*



CGAL

- Robust and efficient geometric data structures and algorithms
- C++
- Rich APIs

CGLAB Functionality

Triangulations

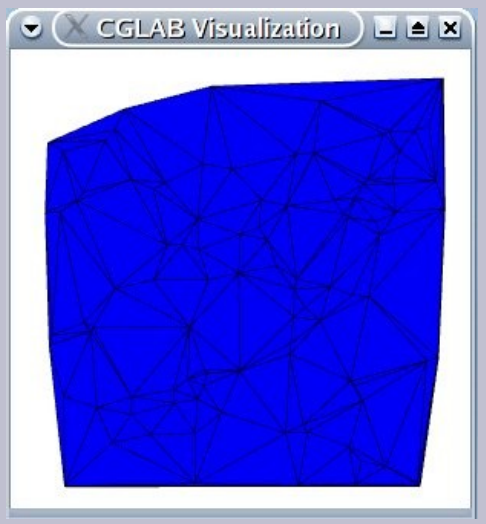
- cgal_delaunay_2
- cgal_delaunay_3
- cgal_delaunay_n
- cgal_constrained_delaunay_2

- cgal_delaunay_2
  - cgal_dt2_get_connectivity
  - cgal_dt2_get_coord
  - cgal_dt2_insert_points
  - cgal_dt2_remove_points
  - cgal_dt2_delete

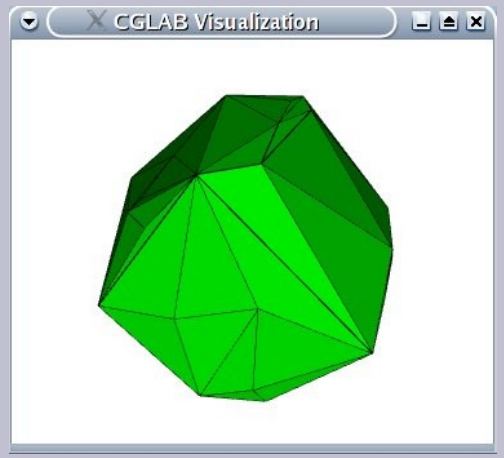
CGLAB Functionality

Examples

```
x = rand(100);
y = rand(100);
tri = cgal_delaunay_2(x,y);
to_vtk(tri,[x' y' zeros(x')],[0 0 1])
```




```
x = rand(100);
y = rand(100);
z = rand(100);
tri = cgal_delaunay_3(x,y,z);
to_vtk(tri,[x' y' z'],[0 1 0])
```



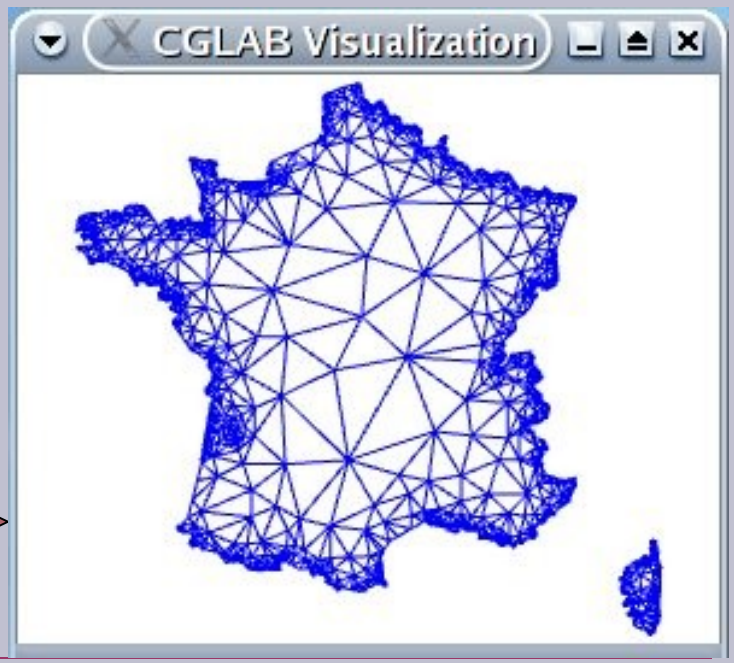
CGLAB Functionality

2D Mesh generation

cgal_mesh_2

cgal_mesh_2_set_seeds
cgal_mesh_2_refine
cgal_mesh_2_get_connectivity
cgal_mesh_2_get_coord
cgal_mesh_2_delete

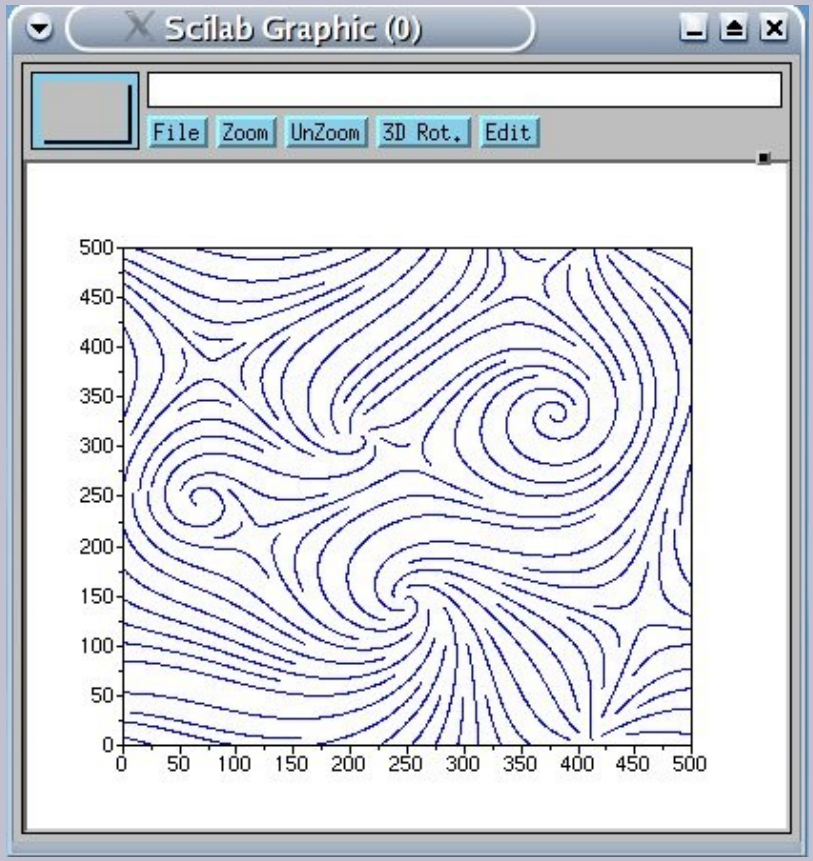
```
u=file('open','/path_to_france.edg','old');
nbpts = read(u,1,1);
domaine = read(u , nbpts , 4);
[coord,tri]= cgal_mesh_2(domaine);
to_vtk(tri,[coord zeros(coord(:,1))],[0 0 1]);
```



CGLAB Functionality

2D Streamlines

```
load('data/field','u','v');
c = cgal_stream_2(u,v,1.5);
cgal_streamlines(c);
```



CGLAB Functionality

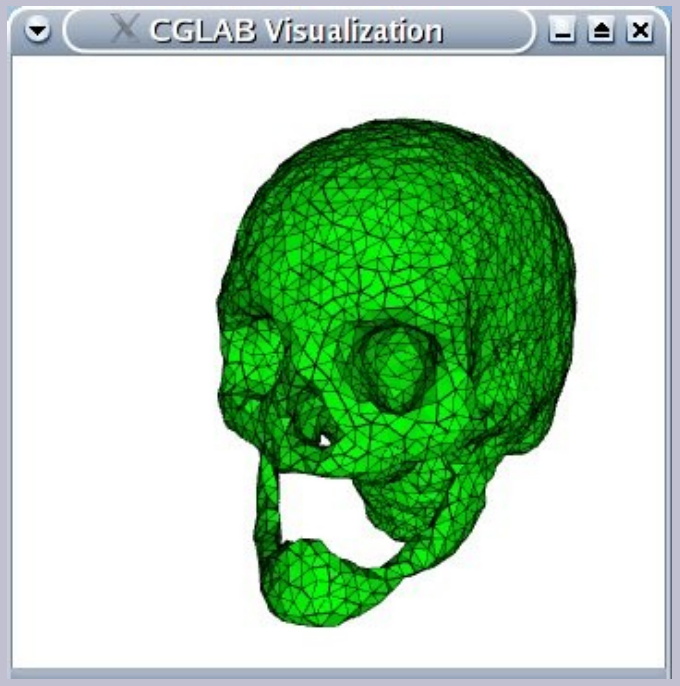
3D Surface mesh generation

```
image = "path_to/skull_2.9.inr.gz ";

bounded_sphere = [122.0 102 177 8000];
mesh_criteria = [30 5 5];

[tri,coord] = cgal_surface_mesher(image,2.9,
                                  bounded_sphere,
                                  mesh_criteria );

to_vtk(tri,coord,[0 1 0]);
```



License Issues

- CGAL is under an Open Source license that forces the users also to make Open Source.
- Same rule applies to Scilab programs which use CGLAB.
- Otherwise, you need a commercial license.

Next Steps

- AftRel 1.0 in Oct 2006
- Communicate in the right places

- Get feedback from Scilab users
  - Have we chosen the appropriate matrix representation for CGAL data structures
  - Do users need rich APIs
  - Are there other needs in geometric computing