luamesh: compute and draw meshes with LuaLATEX

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The package `luamesh` allows to compute and draw 2D triangulation of Delaunay. The algorithm is written with lua, and depending of the choice of the "engine", the draw is done by MetaPost (with `luamplib`) or by `tikz`.

The Delaunay triangulation algorithm is the Bowyer and Watson algorithm. Several macros are provided to draw the global mesh, the set of points, a particular step of the algorithm.

1 Installation

1.1 With Linux

To install `luamesh` with TEXlive, you have to create the local `texmf` directory in your `home`.

```
user $> mkdir ~/texmf
```

Then we have to files to place in the correct directories. First, the `luamesh.sty` file must be in the directory:

~/texmf/tex/latex/luamesh/

and secondly, the `luamesh.lua` must be in the directory:

~/texmf/scripts/luamesh/

Once you have done this, `luamesh` can be included in your document with

```
\usepackage{luamesh}
```

1.2 Dependencies

This package is built upon two main packages to draw the triangulations :

1. `luamplib` to use MetaPost via the LuaTEX library `mplib`;

2. or `tikz`.

We will see how to choose between these two *drawing engines*.

Moreover, the following packages are necessary:

1. `xkeyval` to manage the optional arguments;

2. `xcolor` to use colors (needed by `luamplib`);

3. `ifthen` to help the programming with TEX.

2 The Basic Macros

If you want to use this package, you must compile your document with `lualatex`:

```
user $>    lualatex mylatexfile.tex
```

Let us recall that this package provides macros to draw two dimensional triangulations (or meshes).
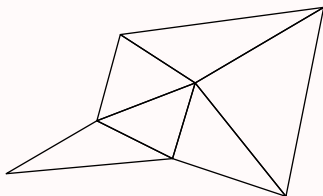
2.1 Draw a Complete Mesh

`\buildMeshBW[`⟨*options*⟩`]{`⟨*list of points*⟩ or ⟨*file name*⟩`}`

This macro produce the Delaunay triangulation (using the Bowyer and Watson algorithm) of the given ⟨*list of points*⟩. The list of points must be given in the following way :

$$(x1,y1);(x2,y2);(x3,y3);...;(xn,yn)$$

```
\buildMeshBW{(0.3,0.3);(1.5,1);(4,0);(4.5,2.5);(1.81,2.14);(2.5,0.5);(2.8,1.5)}
```

2.1.1 The Options

There are several options to customize the drawing.

mode = int (default) or ext: the mode option allow to use either the previously described set of point in the argument, or a file, containing, line by line (2 columns), the points. Such a file looks like :

```
x1   y1
x2   y2
x3   y3
...
xn  yn
```

2.2 Draw the Set of Points

\tracePointsMesh[⟨*options*⟩]{⟨*list of points*⟩ or ⟨*file name*⟩}

2.3 Draw a Step of the Bowyer and Watson Algorithm

\meshAddPointBW[⟨*options*⟩]{⟨*list of points*⟩ or ⟨*file name*⟩}{⟨*point*⟩ or ⟨*number of line*⟩}

3 The *inc* Macros

4 Gallery of Examples