initmesh

Create initial 2-D mesh

This page describes the legacy workflow. New features might not be compatible with the legacy workflow. For the corresponding step in the recommended workflow, see `generateMesh`.

Syntax

```
[p,e,t] = initmesh(g)
[p,e,t] = initmesh(g,Name,Value)
```

Description

`[p,e,t] = initmesh(g)` generates a triangular mesh for a 2-D geometry. The function uses a Delaunay triangulation algorithm. example

`[p,e,t] = initmesh(g,Name,Value)` generates a 2-D mesh using one or more `Name,Value` pair arguments. example

Examples

collapse all

Initial Mesh for L-shaped Membrane

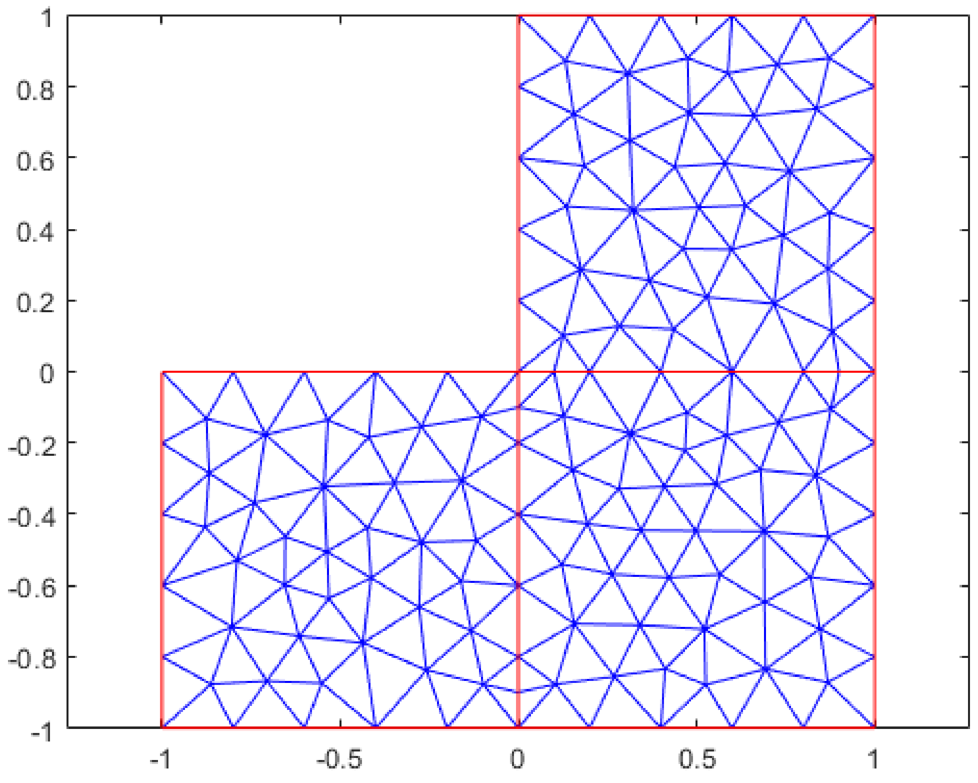
Generate a triangular mesh of the L-shaped membrane.

Open Live Script

```
[p,e,t] = initmesh('lshapeg');
```

Plot the mesh.

```
pdemesh(p,e,t)
```



Maximum Mesh Edge Length

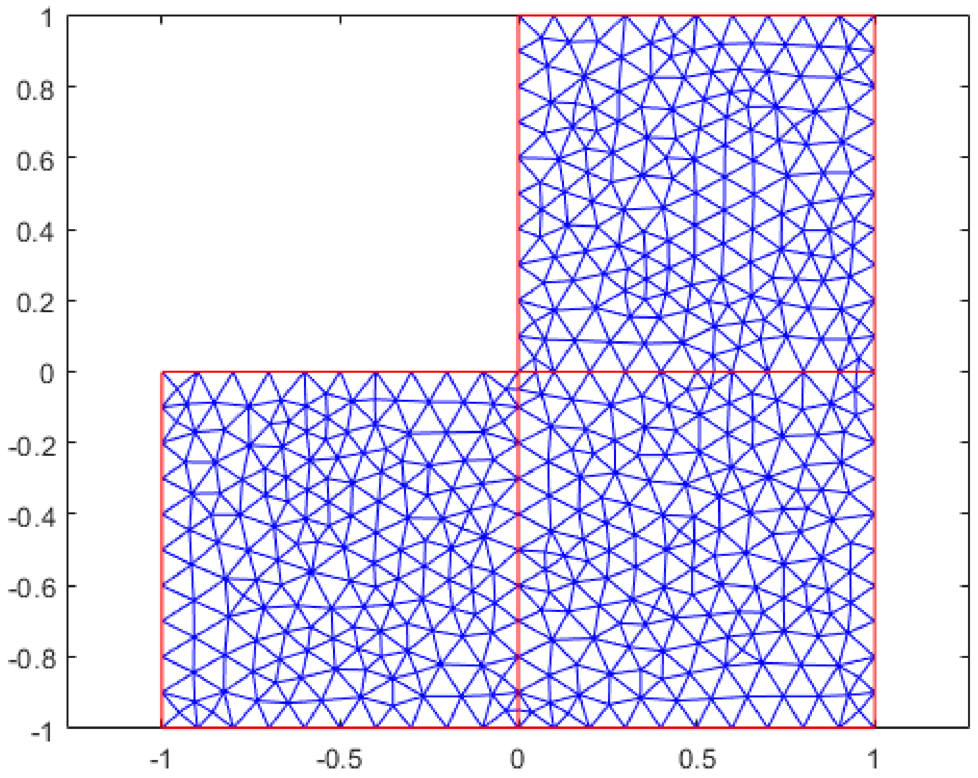
Generate a triangular mesh of the L-shaped membrane with the target maximum mesh edge length of 0.1.

Open Live Script

```
[p,e,t] = initmesh('lshapeg','Hmax',0.1);
```

Plot the mesh.

```
pdemesh(p,e,t)
```



Input Arguments

collapse all

g — Geometry description

decomposed geometry matrix | geometry function | handle to geometry function

Geometry description, specified as a decomposed geometry matrix, a geometry function, or a handle to the geometry function. For details about a decomposed geometry matrix, see `decsg`. For details about a geometry function, see Parametrized Function for 2-D Geometry Creation.

A geometry function must return the same result for the same input arguments in every function call. Thus, it must not contain functions and expressions designed to return a variety of results, such as random number generators.

Data Types: `double` | `char` | `string` | `function_handle`

Name-Value Arguments

Specify optional comma-separated pairs of `Name,Value` arguments. `Name` is the argument name and `Value` is the corresponding value. `Name` must appear inside quotes. You can specify several name and value pair arguments in any order as `Name1,Value1,...,NameN,ValueN`.

Example: `[p,e,t] = initmesh('lshapeg','Hmax',0.1);`

`Hmax` — Target maximum mesh edge length

positive real number

Target maximum mesh edge length, specified as the comma-separated pair consisting of `'Hmax'` and a positive real number.

`Hmax` is an approximate upper bound on the mesh edge lengths. `initmesh` estimates the default value of `Hmax` from overall dimensions of the geometry.

Small `Hmax` values let you create finer meshes, but mesh generation can take a very long time in this case. You can interrupt mesh generation by using **Ctrl+C**. Note that `initmesh` can take additional time to respond to the interrupt.

Example: `[p,e,t] = initmesh(g,'Hmax',0.25);`

Data Types: `double`

`Hgrad` — Mesh growth rate

`1.3` (default) | number strictly greater than 1 and less than 2

Mesh growth rate, specified as the comma-separated pair consisting of `'Hgrad'` and a number strictly greater than 1 and less than 2.

Example: `[p,e,t] = initmesh(g,'Hgrad',1.5);`

Data Types: `double`

`Box` — Toggle to preserve bounding box

`'off'` (default) | `'on'`

Toggle to preserve bounding box, specified as the comma-separated pair consisting of `'Box'` and `'on'` or `'off'`. By turning on `'Box'` you can get a good idea of how the mesh generation algorithm works within the bounding box.

Example: `[p,e,t] = initmesh(g,'Box','on');`

Data Types: `char` | `string`

`Init` — Toggle to use edge triangulation

`'off'` (default) | `'on'`

Toggle to use edge triangulation, specified as the comma-separated pair consisting of `'Init'` and `'on'` or `'off'`. By turning on `Init` you can see the initial triangulation of the boundaries. For example, use these commands to determine the subdomain number `n` of the point `xy`.

```
[p,e,t] = initmesh(g,'Hmax',Inf,'Init','on');
[uxy,tn,a2,a3] = tri2grid(p,t,zeros(size(p,2)),x,y);
n = t(4,tn);
```

If the point is outside the geometry, `tn` is `NaN`, and the command `n = t(4,tn)` results in a failure.

Data Types: `char` | `string`

`Jiggle` — Toggle to call `jigglemesh` after creating the mesh

`'mean'` (default) | `'minimum'` | `'on'` | `'off'`

Toggle to call `jigglemesh` after creating the mesh, specified as the comma-separated pair consisting of `'Jiggle'` and `'mean'`, `'minimum''on'`, or `'off'`.

- `'mean'` — call `jigglemesh` with the argument `'Opt'` set to `'mean'`.
- `'minimum'` — call `jigglemesh` with the argument `'Opt'` set to `'minimum'`.
- `'on'` — call `jigglemesh` with the argument `'Opt'` set to `'off'`.
- `'off'` — do not call `jigglemesh`.

Example: `[p,e,t] = initmesh(g,'Jiggle','minimum');`

Data Types: `char` | `string`

`JiggleIter` — Maximum number of iterations for `jigglemesh`

`10` (default) | positive integer

Maximum number of iterations for `jigglemesh`, specified as the comma-separated pair consisting of `'JiggleIter'` and a positive integer.

Example: `[p,e,t] = initmesh(g,'Jiggle','on','JiggleIter',50);`

Data Types: `double`

`MesherVersion` — Algorithm for generating initial mesh

`'preR2013a'` (default) | `'R2013a'`

Algorithm for generating initial mesh, specified as the comma-separated pair consisting of `'MesherVersion'` and either `'R2013a'` or `'preR2013a'`. The `'R2013a'` algorithm runs faster, and can triangulate more geometries than the `'preR2013a'` algorithm. Both algorithms use Delaunay triangulation.

Data Types: `char` | `string`

Output Arguments

collapse all

`p` — Mesh points

2-by-`Np` matrix

Mesh points, returned as a 2-by-`Np` matrix. `Np` is the number of points (nodes) in the mesh. Column `k` of `p` consists of the x-coordinate of point `k` in `p(1,k)` and the y-coordinate of point `k` in `p(2,k)`. For details, see Mesh Data as [p,e,t] Triples.

e — Mesh edges

7-by-Ne matrix

Mesh edges, returned as a 7-by-Ne matrix, where Ne is the number of boundary edges in the mesh. An edge is a pair of points in p containing a boundary between subdomains, or containing an outer boundary. For details, see Mesh Data as [p,e,t] Triples.

t — Mesh elements

4-by-Nt matrix

Mesh elements, returned as a 4-by-Nt matrix. Nt is the number of triangles in the mesh.

The t(i,k), with i ranging from 1 through end - 1, contain indices to the corner points of element k. For details, see Mesh Data as [p,e,t] Triples. The last row, t(end,k), contains the subdomain number of the element.

References

[1] George, P. L. *Automatic Mesh Generation — Application to Finite Element Methods*. Wiley, 1991.

See Also

decsg | jigglemesh | refinemesh | adaptmesh

Topics

Mesh Data as [p,e,t] Triples

Introduced before R2006a