Mesh Generation Using Relaxation in Warped Space

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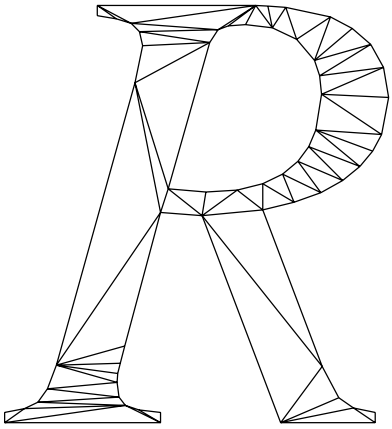
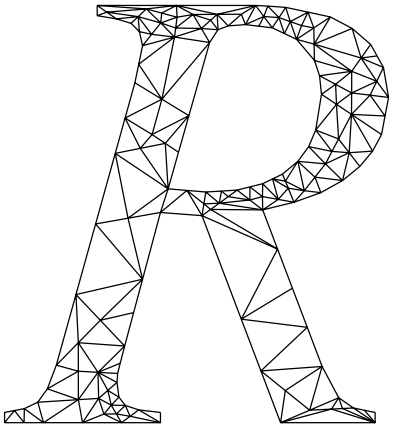
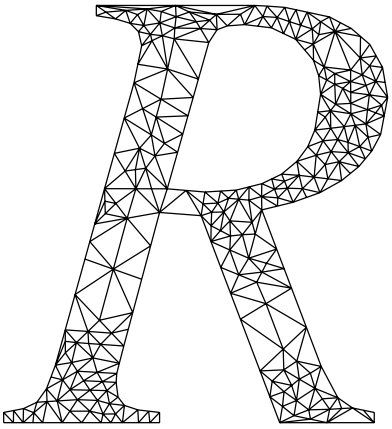
Isotropic mesh generation



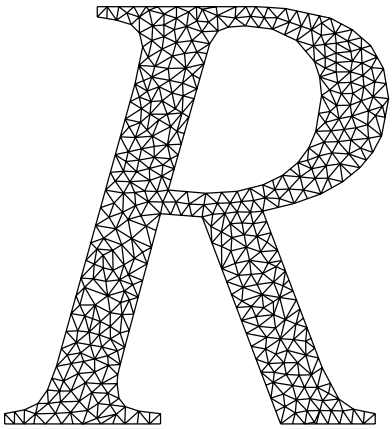
Initial triangulation



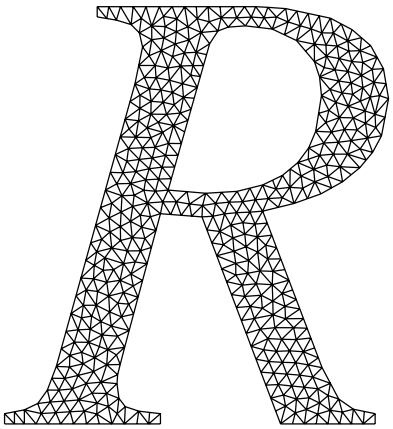
100 iterations



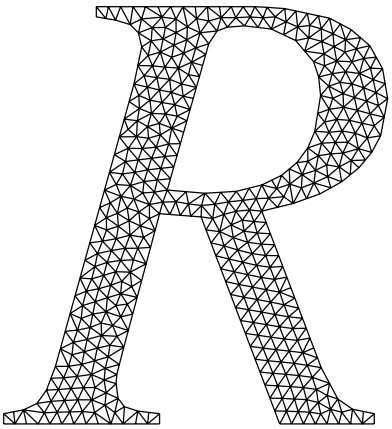
300 iterations



1000 iterations

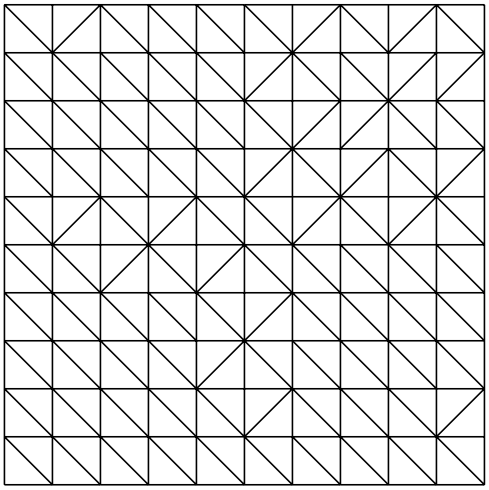


3000 iterations

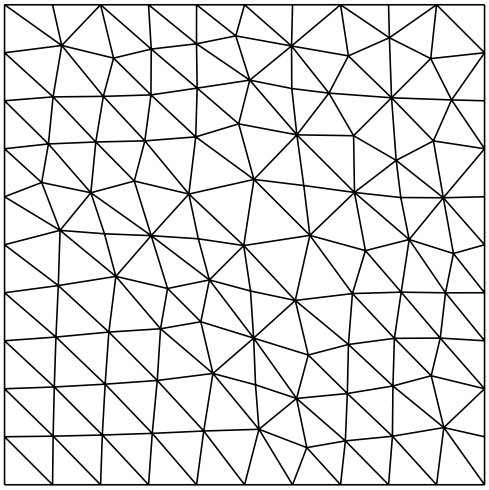


11657 iterations

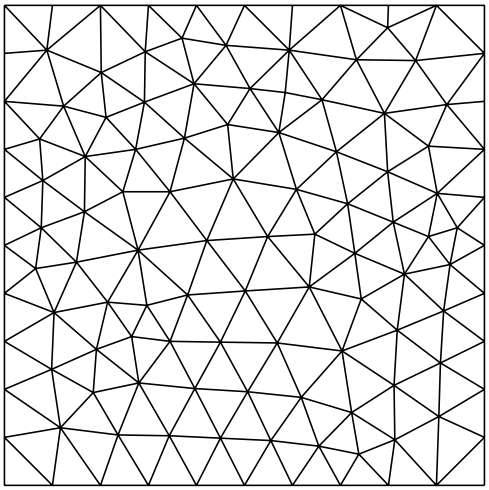
Mesh smoothing



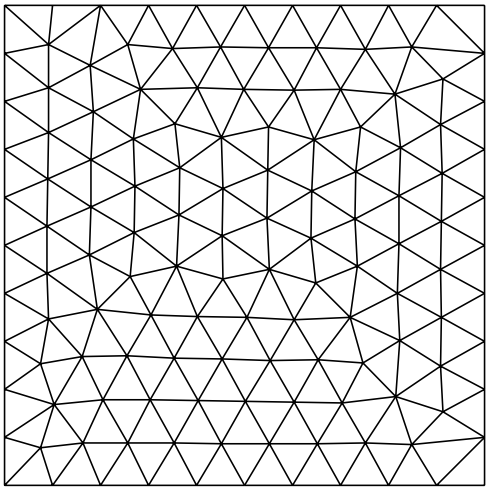
Initial mesh



Laplacian

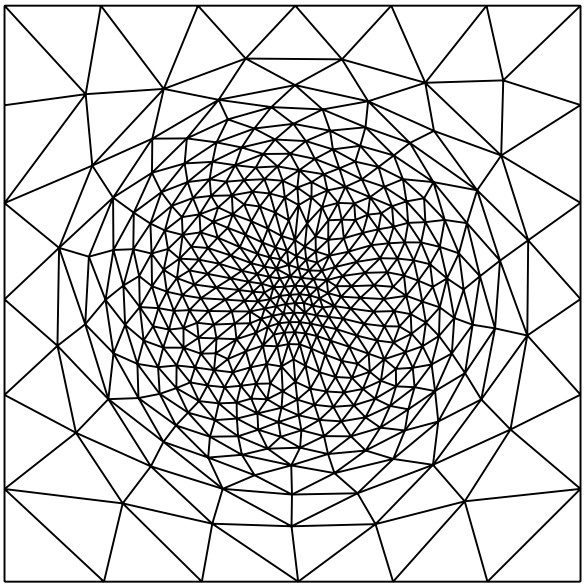


Laplace-Delaunay

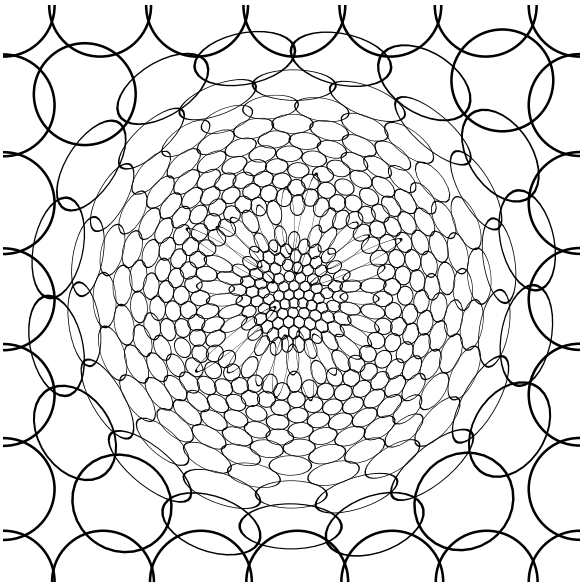


Ours

Anisotropic approximation of a Gaussian

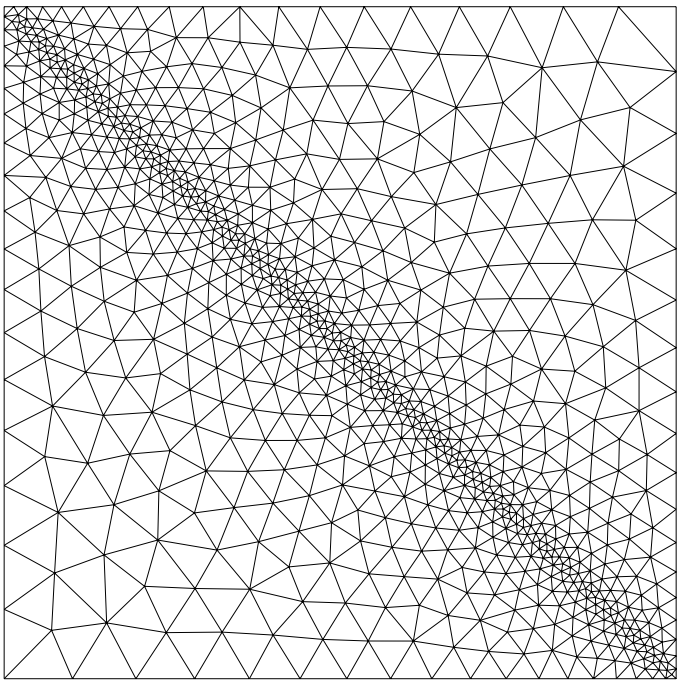


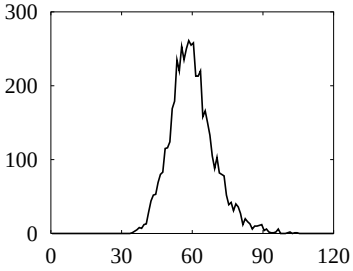
Mesh, 430 nodes



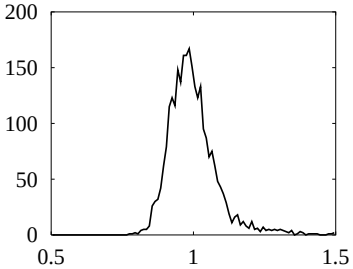
Ellipse around each node

Isotropic mesh



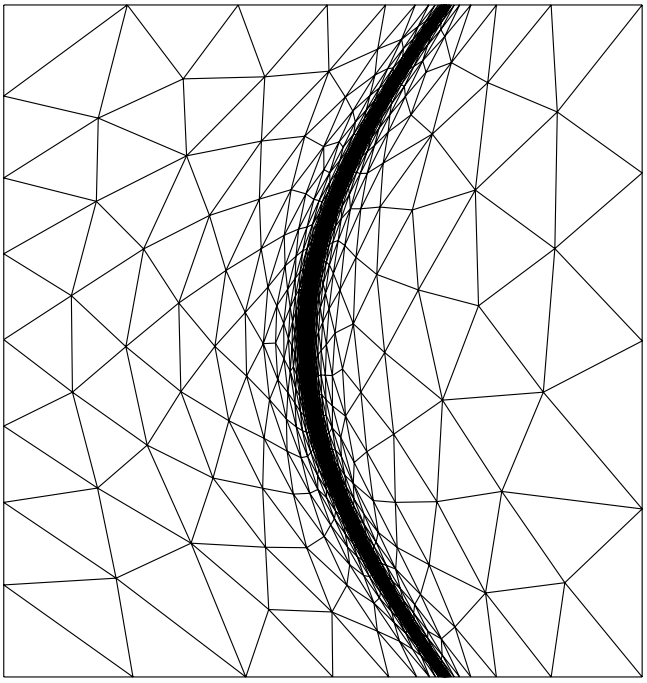


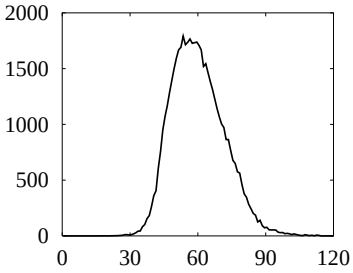
Angle histogram



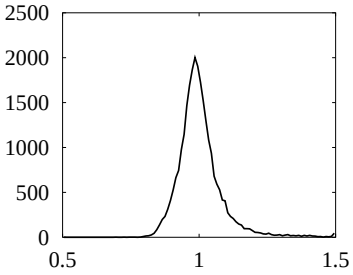
Edge length histogram

Anisotropic mesh: shock front

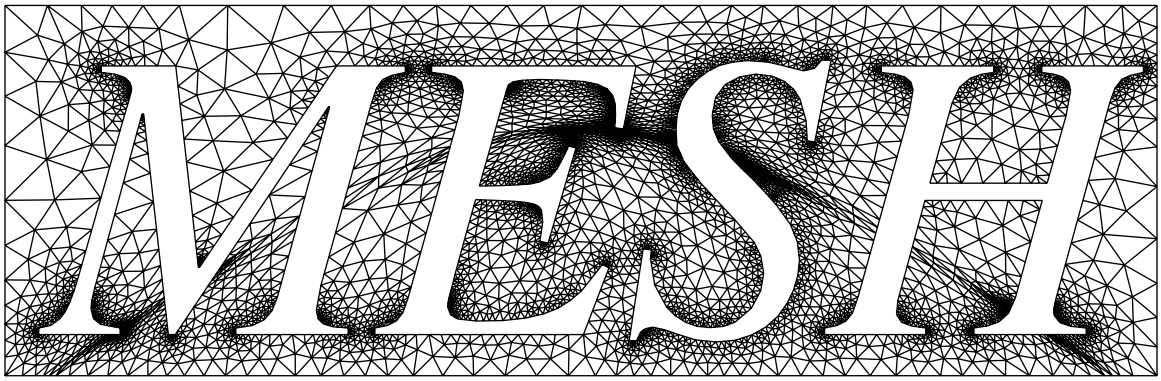




Angle histogram



Edge length histogram



http://ltswww.epfl.ch/∼bossen

Mesh generation algorithm

inputs: boundary and element size function

create initial constrained Delaunay triangulation
until all nodes inactive
    randomly pick an active node i
    reposition node i according to positions of neighbors
    retriangulate to satisfy Delaunay criterion
    if extent of node i is too low, delete it and retriangulate
    else
        find extents of adjacent edges
        if largest edge extent is too high, split edge and retriangulate
    update active/inactive flags of node i and its neighbors

output: triangle mesh