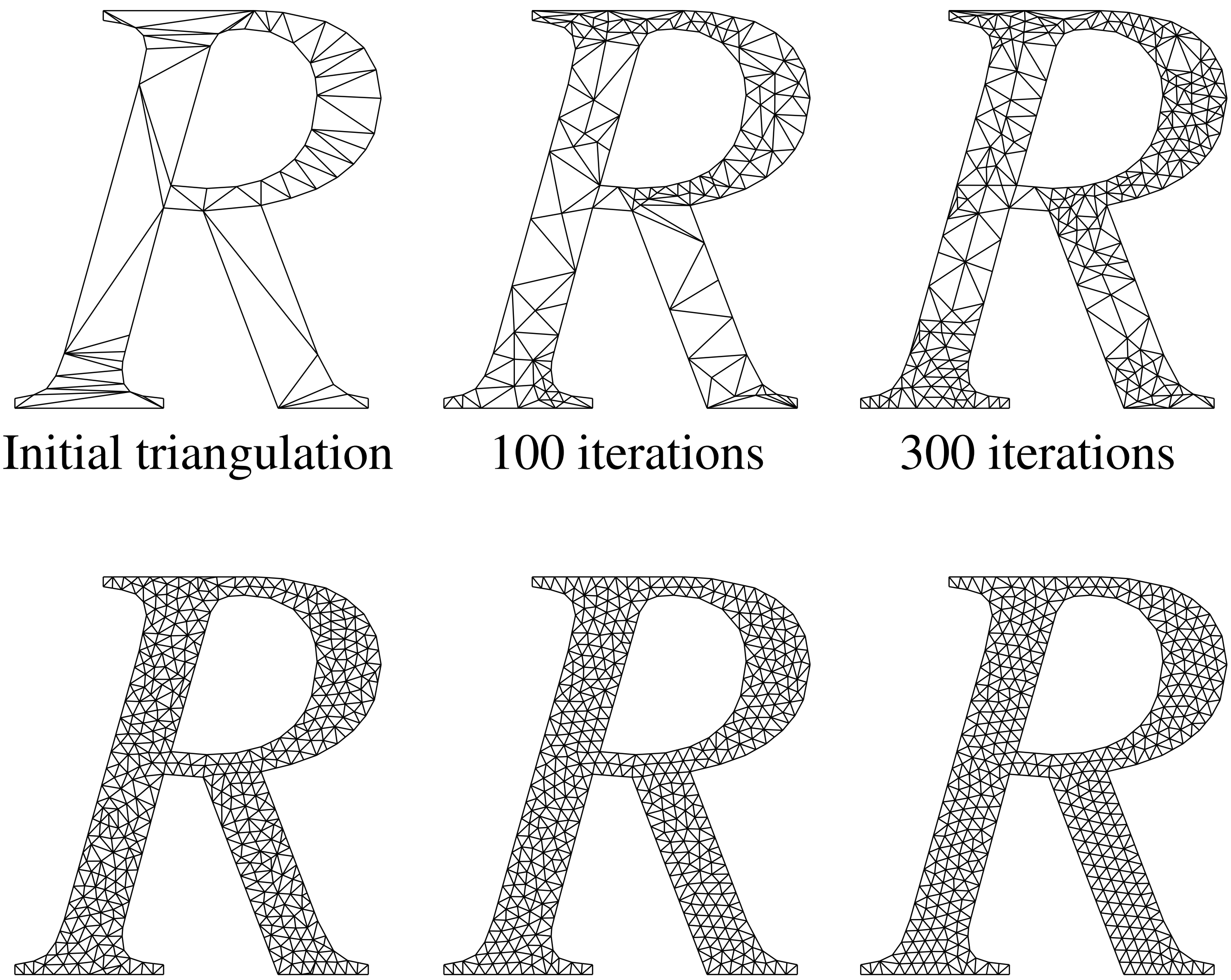
Mesh Generation Using Relaxation in Warped Space

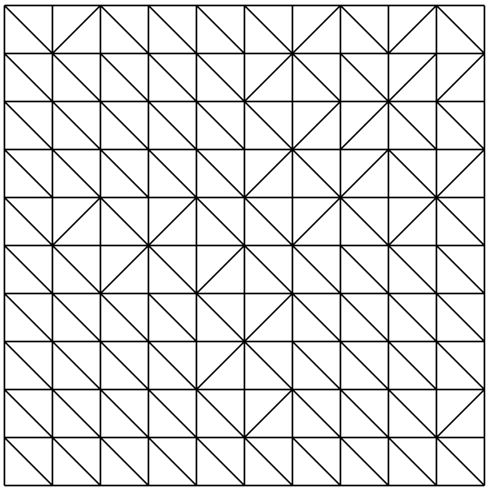
Paul Heckbert
Carnegie Mellon University

Frank Bossen
Swiss Federal Institute of Technology

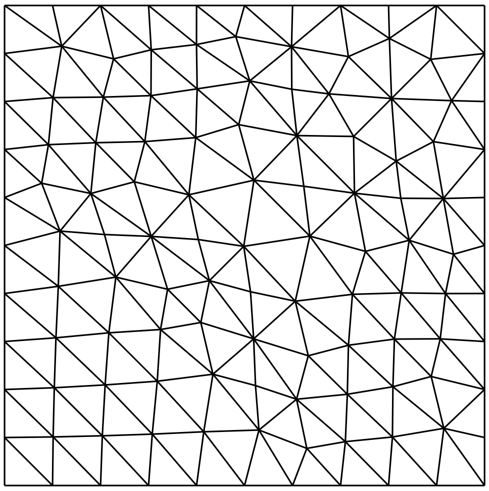
Isotropic mesh generation



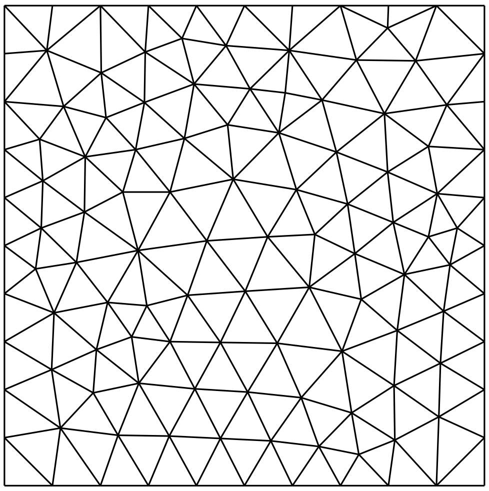
Mesh smoothing



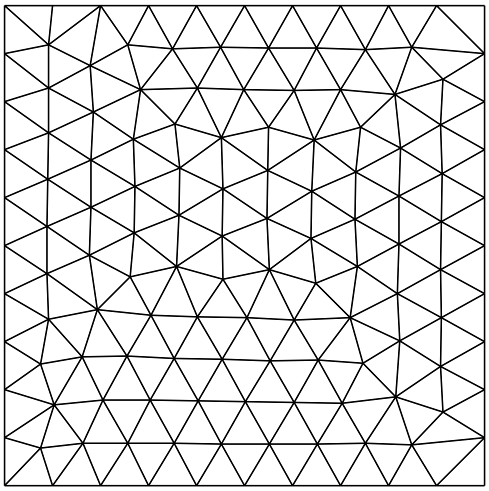
Initial mesh



Laplacian

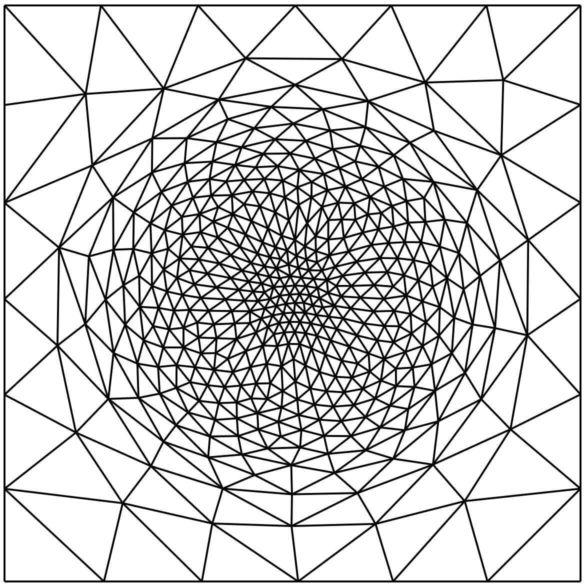


Laplace-Delaunay

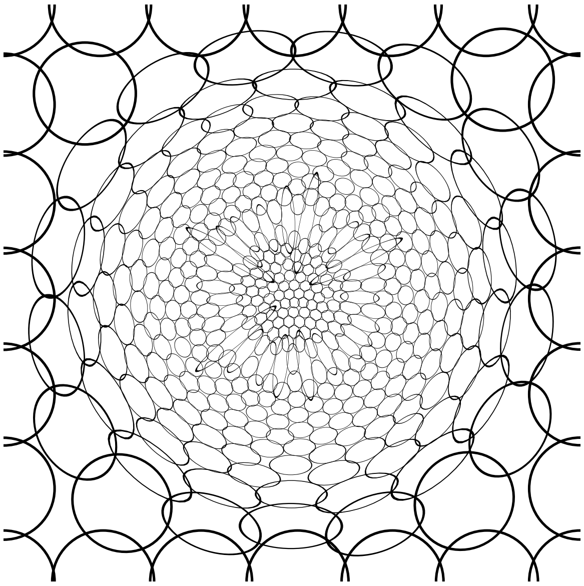


Ours

Anisotropic approximation of a Gaussian

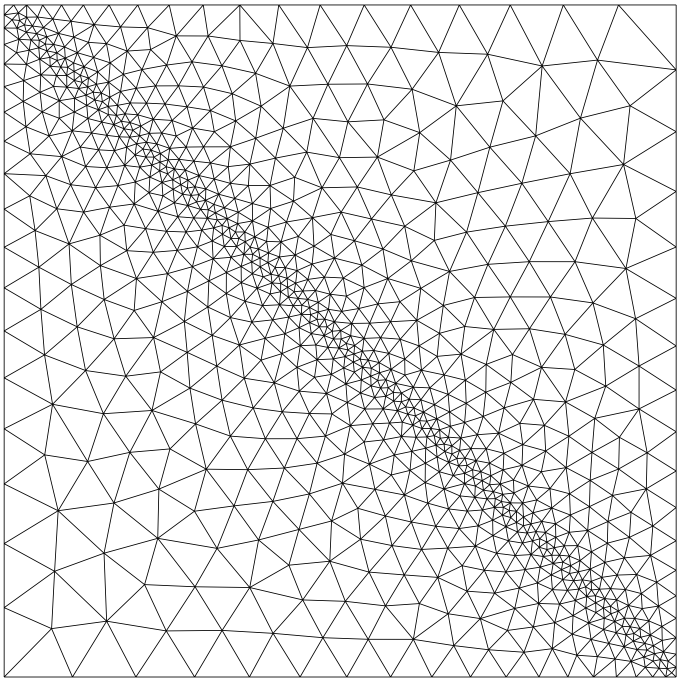


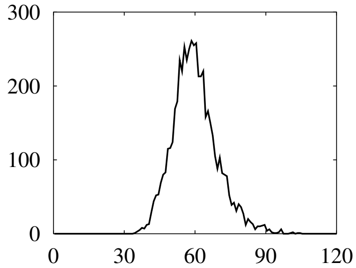
Mesh, 430 nodes



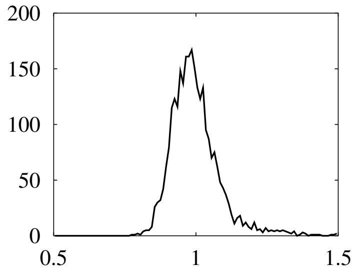
Ellipse around each node

Isotropic mesh



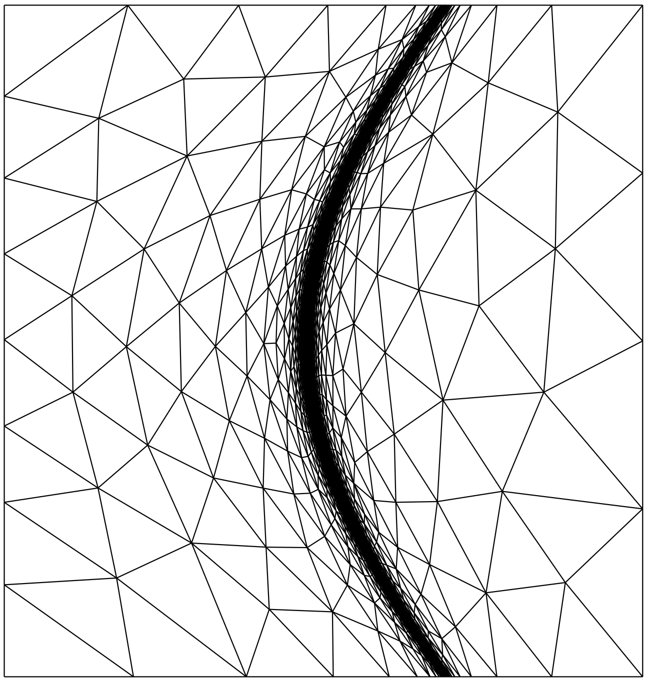


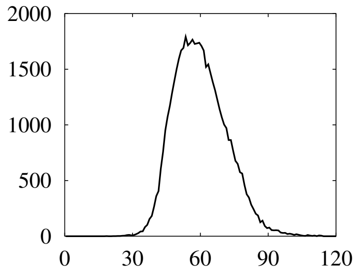
Angle histogram



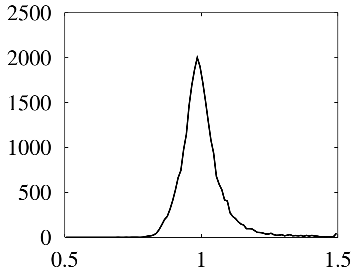
Edge length
histogram

Anisotropic mesh: shock front

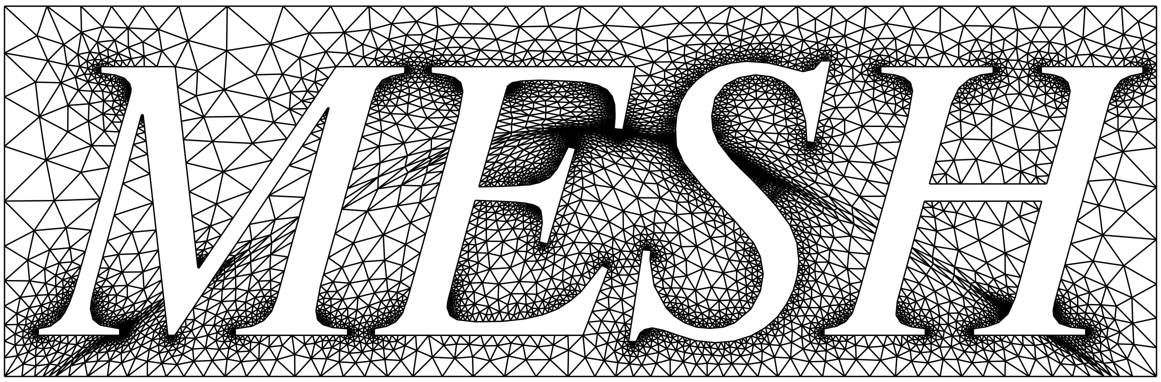




Angle histogram



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