

## A5-FEM README – Nicolas Bain

### Scene 1

This scene runs a simulation on 1x1, 2x2, 4x4, and 8x8 meshes where only the bottom set of nodes is fixed. As gravity starts to affect the mesh, you can see the stress increase from the bottom up until all but the top part of the mesh reaches the highest stress threshold.

#### Parameters:

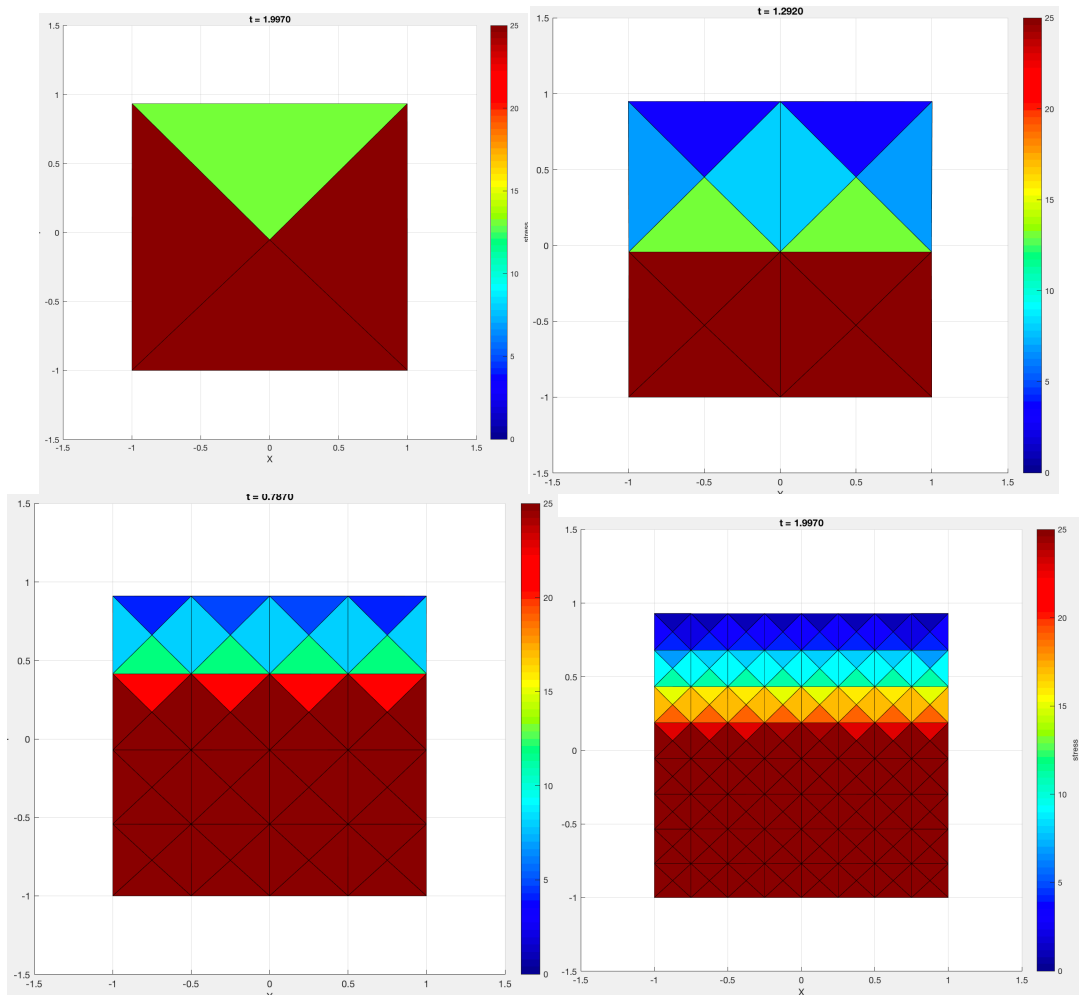
Timestep =  $1e-3$

Area density =  $5e0$

Viscous damping = 1.0

Young's modulus =  $1e3$

Poisson's ratio = 0.0



## Scene 2

This scene runs a simulation on an 8x8 mesh where only the top set of nodes is fixed. The goal of this scene was to tweak the parameters to where the bottom of the mesh stretched down to roughly  $y=-1.5$ .

### Parameters:

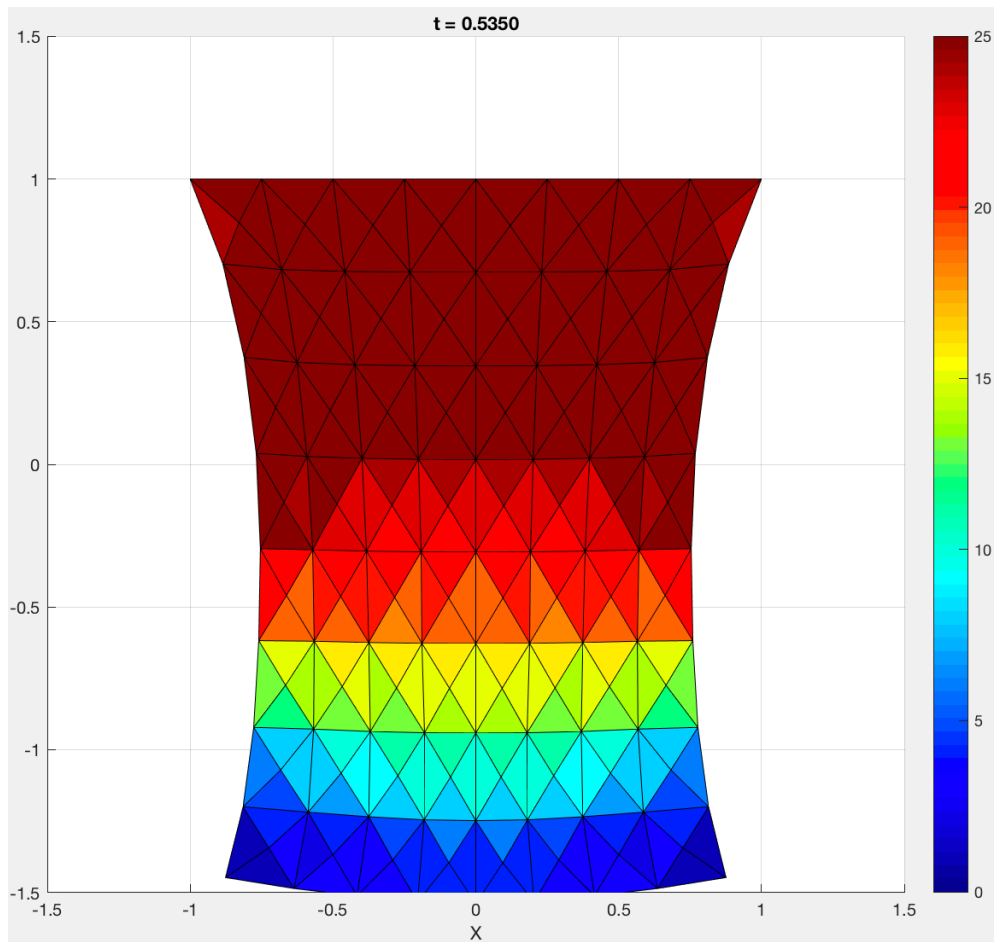
Timestep =  $1e-3$

Area density =  $1e0$

Viscous damping =  $2.0$

Young's modulus =  $.3e2$

Poisson's ratio =  $0.4$



### Scene 3

This scene runs a simulation on the same mesh used in scene 2, but with two different values for Poisson's ratio. The two values used were .3, and -.4. Changing the value to .3 from .4 caused the mesh to stretch further without thinning out as much. Making the ratio negative caused the mesh to expand in width when it was stretched.

#### Parameters:

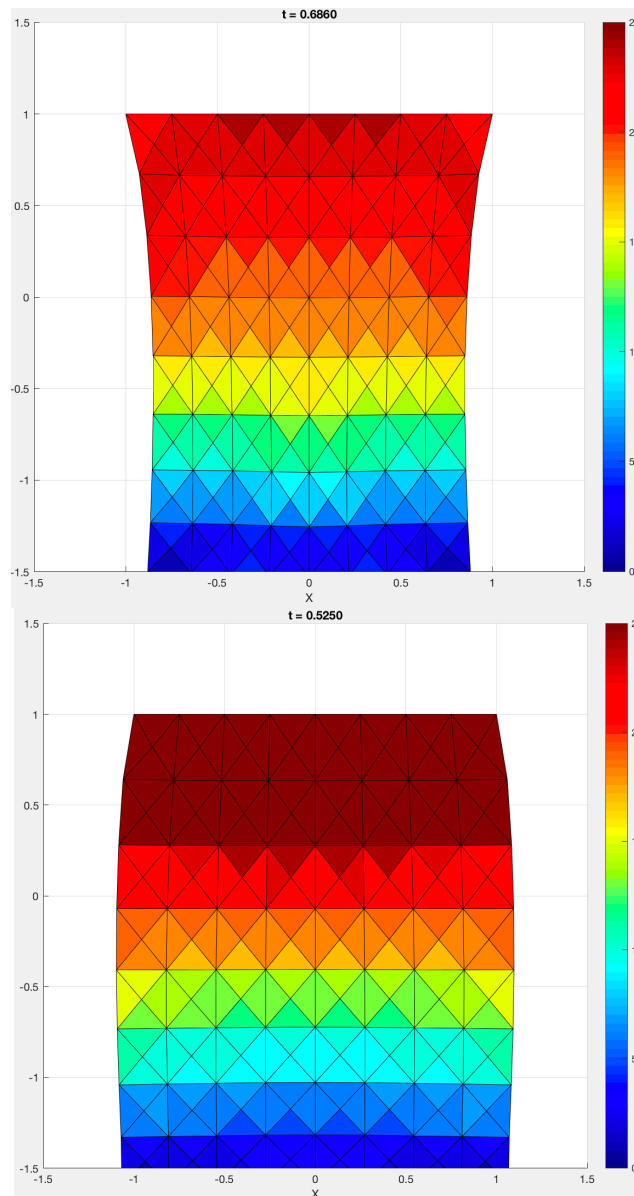
Timestep =  $1e-3$

Area density =  $1e0$

Viscous damping = 2.0

Young's modulus =  $.3e2$

Poisson's ratio = 0.3, -0.4



#### Scene 4

This scene runs a simulation on an 8x8 mesh where the leftmost subset of nodes is fixed. The parameters for this scene (area density and stiffness) had to be changed drastically to avoid having the scene blow up due to too much stress on the triangles.

#### Parameters:

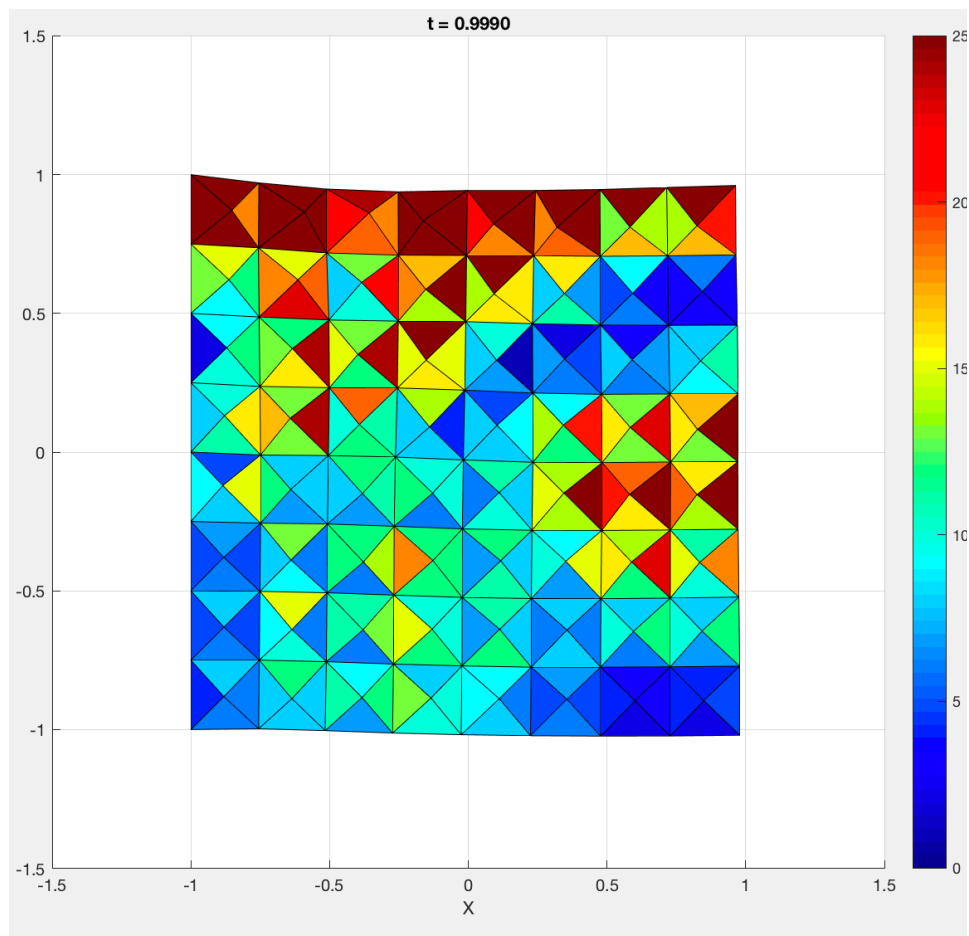
Timestep =  $1e-3$

Area density =  $11e-2$

Viscous damping = 2.0

Young's modulus =  $1e2$

Poisson's ratio = -0.4



#### Scene 4

This scene runs a simulation on an 8x8 mesh where all nodes following the line  $y=x$  are fixed. This triangle stiffness in this scene is also non-uniform. Each triangle is assigned a stiffness of either  $1e2$ , or  $.3e2$  during its creation. I also have sections in the scene that allow the user to switch the fixed nodes. The other options are left and rightmost subsets are fixed, or left and top subsets are fixed.

#### Parameters:

Timestep =  $1e-3$

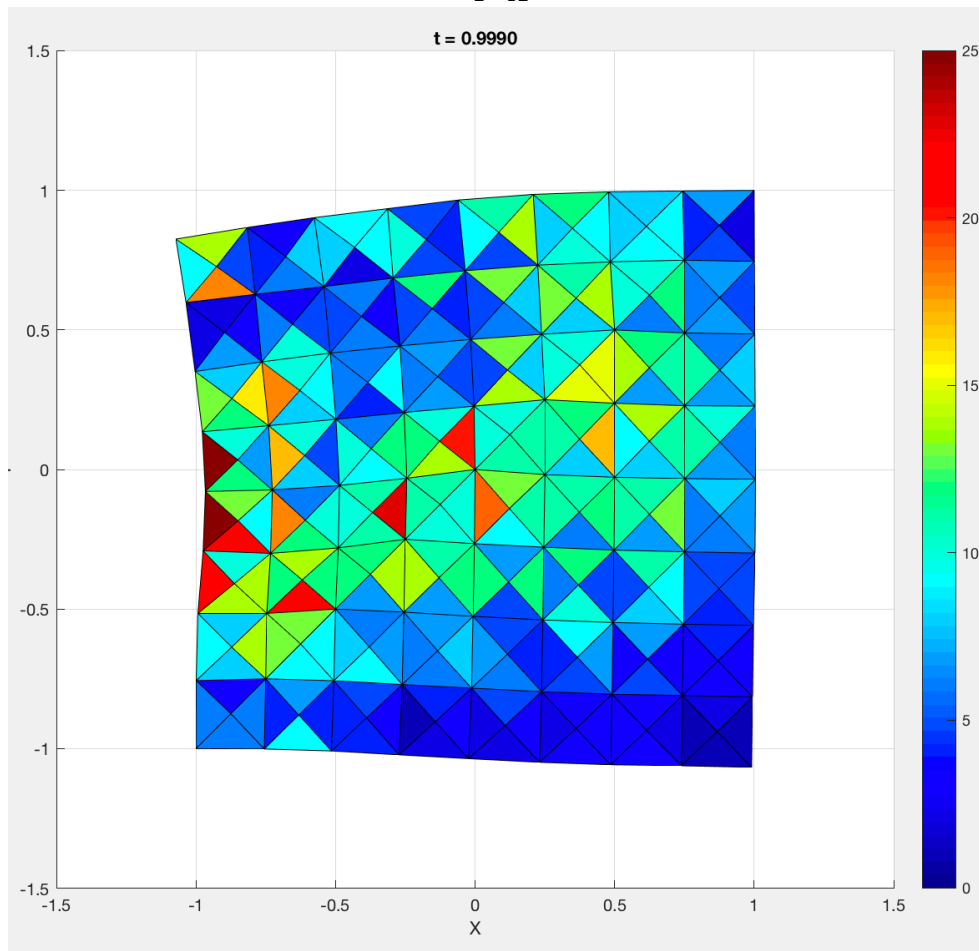
Area density =  $11e-2$

Viscous damping = 2.0

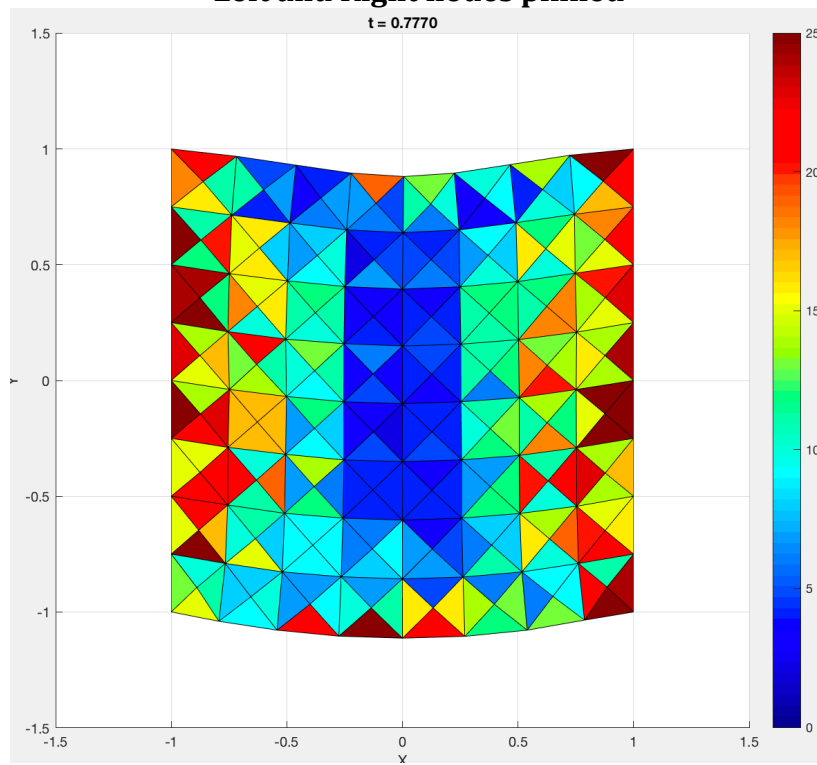
Young's modulus =  $1e2$ ,  $.3e2$

Poisson's ratio = -0.4

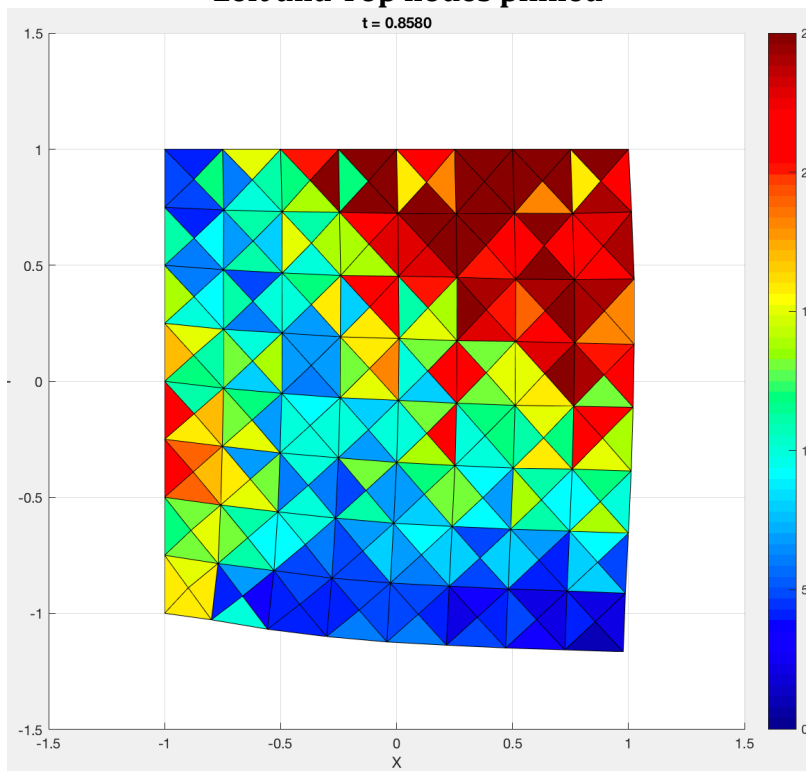
**Y=X**



**Left and Right nodes pinned**



**Left and Top nodes pinned**



### **References:**

Formula for area of a triangle: [www.mathopenref.com/coordtrianglearea.html](http://www.mathopenref.com/coordtrianglearea.html)

Everything else was gathered through the class presentations.

### **Problems:**

The code has no known problems.

### **Comments:**

Like all this class' assignments, this was thoroughly enjoyable. The effort put into the assignment produces easily recognizable results and is extremely gratifying. This has by far been one of my favorite classes at A&M and I'm excited to start working on the final project.