AE4132 HW4: 1D Bar Elements in 2D Space

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1.1 FEA Program

see python script 'fea_hw4.py'

1.2 Simply supported triangle test case

```
Enter input filename (without the .txt extension): simp_triangle
Finished parsing.
3 nodes and 3 elements.
         displacement      force
         u (m)             f (N)
node1x:  0.00000           -2.00
node1y:  0.00000           -2.00
node2x:  -0.00000          -0.00
node2y:  0.00000           1.00
node3x:  0.40003           2.00
node3y:  -0.20000          1.00
```
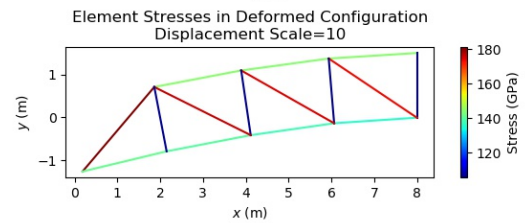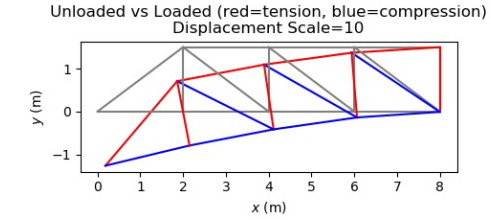
1.3 Solve for nodal displacements

1.4 Plot deformed structure

1.5 Solve for reactions

Outputs and plots are shown on the next page. Displacement values were scaled by a factor of 10 to better visualize deformation and range of stress values.

```
Enter input filename (without the .txt extension): hw4_case1
Finished parsing.
9 nodes and 15 elements.
        displacement     force
        u (m)            f (N)
node1x:  0.00000          2133.33
node1y:  0.00000          400.00
node2x:  -0.00610         0.00
node2y:  -0.01295         -0.00
node3x:  -0.01067         0.00
node3y:  -0.04073         0.00
node4x:  -0.01371         -0.00
node4y:  -0.07928         0.00
node5x:  0.01858          692.82
node5y:  -0.12632         -400.00
node6x:  0.01508          0.00
node6y:  -0.07928         -0.00
node7x:  0.01158          -0.00
node7y:  -0.04159         0.00
node8x:  0.00655          -0.00
node8y:  -0.01381         0.00
node9x:  0.00000          -2826.15
node9y:  -0.00086         0.00
```

Unloaded vs Loaded (red=tension, blue=compression)
Displacement Scale=10

Element Stresses in Deformed Configuration
Displacement Scale=10

```
Enter input filename (without the .txt extension): hw4_case2
Finished parsing.
9 nodes and 15 elements.
        displacement     force
        u (m)            f (N)
node1x:  0.00000          2133.33
node1y:  0.00000          400.00
node2x:  -0.00457         0.00
node2y:  -0.01559         0.00
node3x:  -0.00762         0.00
node3y:  -0.04601         -0.00
node4x:  -0.00914         0.00
node4y:  -0.08720         -0.00
node5x:  0.02316          692.82
node5y:  -0.13423         -400.00
node6x:  0.01965          0.00
node6y:  -0.08634         0.00
node7x:  0.01463          0.00
node7y:  -0.04516         -0.00
node8x:  0.00807          0.00
node8y:  -0.01473         0.00
node9x:  0.00000          -2826.15
node9y:  0.00000          0.00
```

Unloaded vs Loaded (red=tension, blue=compression)
Displacement Scale=10

Element Stresses in Deformed Configuration
Displacement Scale=10