COE 321k Homework 5

John Steinman (johnsteinman@utexas.edu)

March 29, 2021

1. Two-dimensional Truss Solver

Attached to this submission is a file named `truss3d.py`, which contains functions to solve for the displacements, internal forces, strains, and external forces for an arbitrary 3D truss structure. Please see the README for further details and instructions to run the code.

2. Input Files

To demonstrate the functionality of the code, I created input files for the problem shown below. I assumed that each element has a cross sectional area of 0.01 m^2 and Young's Modulus 210 GPa. I prescribed a force of 10^8 N in the negative y direction at node 5.

The input files have the following form.

nodes.txt:

x1	y1
z1	
...	...
...	
xN	yN
zN	

elements.txt

node11	node12	E	A
...	...	...	...

displacements.txt

node	dof	value
...	...	...

forces.txt

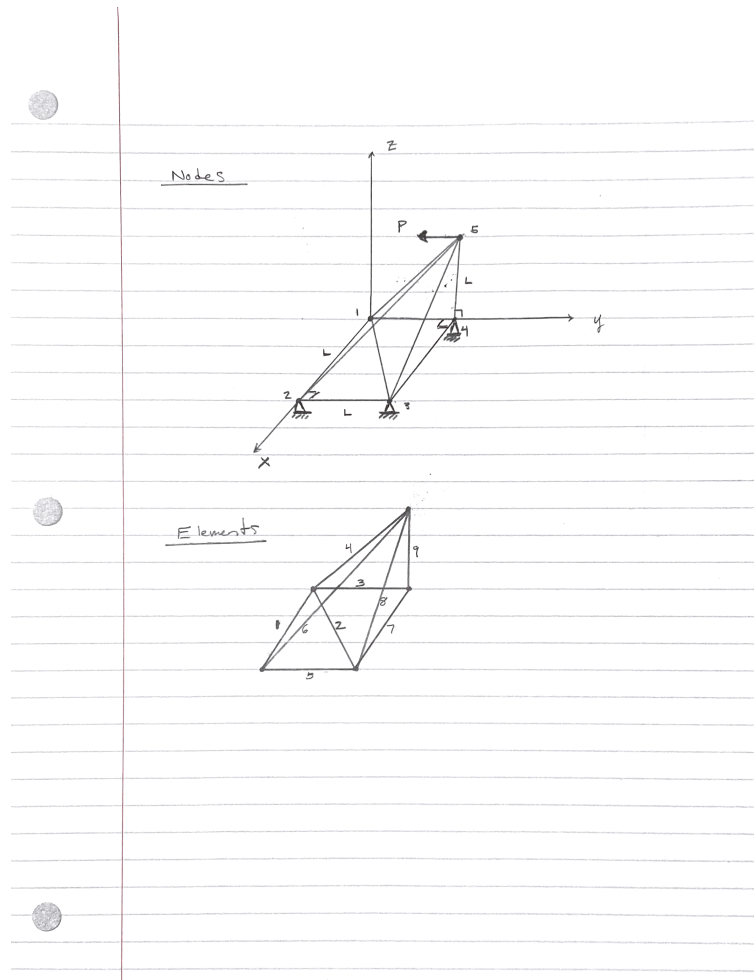| node	dof	value
...	...	...

Figure 1: System Diagrams

Using the truss2d function to solve for displacement, we get the following output.

```
node       u/L        v/L        w/L
0       0.000000   0.000000  -0.382123
1       0.000000   0.000000   0.000000
2       0.000000   0.000000   0.000000
3       0.000000   0.000000   0.000000
4      -0.134687  -0.382123   0.000000
```

Figure 2: Nodal Displacements