Software Engineering for Scientists and Engineers (CME 211): Assignment 4

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1 Summary of Truss.py Program

This program takes in two arguments of the directory where the folder containing the truss data is located. The folder should consists of the following data pertaining to the truss:

1. the joint coordinates
2. beams and the corresponding joints
3. support reaction forces and external forces corresponding to each joint coordinate.

The file with information corresponding to joint coordinate information should be named joints.dat and the file with the beam information should be named joints.dat. Any deviations from these file names will result in a runtime error. Additionally, if the directory in the command line argument does not exits, the program will output a runtime error. The program computes the by beam forces by summing the forces in the in x and y directions at each joint and constructing a coefficient matrix corresponding to the equations. The A matrix contains the coefficients of beam forces as well as the coefficients of the support reaction forces, while the B matrix contains coefficients of the external forces. It is important to note that every two rows corresponds to a joint - that is the sum of the forces in the x and y directions for the joint. The linear system of equations is sovled using the follwing formula.

$$Ax = B \tag{1.1}$$

If the coefficient matrix A is under- or over-defined the program will return a runtime error. If an output directory argument is given, the funciton will save a plot of the truss geometry to the said directory.