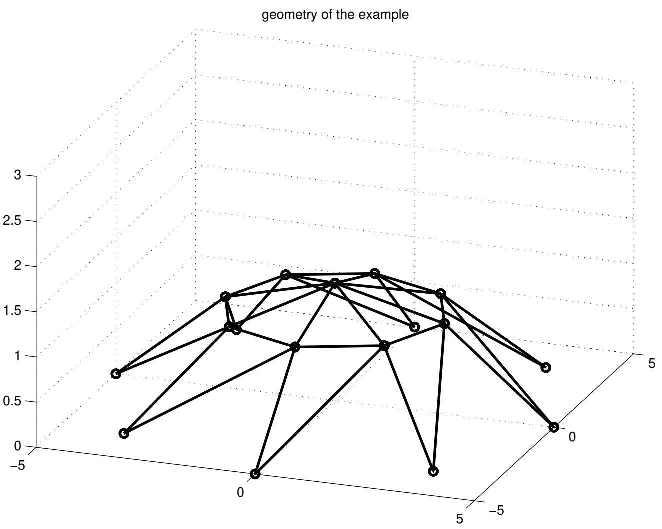
CS/CNS 257c: Simulation
Due Friday, April 23, 11:59pm, *electronic submission*

Homework 2

1. **Finite element program for a linear elastic bar element.**
   Implement the element stiffness matrix for a linear elastic bar element using MATLAB. Provide the necessary programs for the transformation of the element stiffness matrix into a global three-dimensional coordinate system. Based on a given connectivity matrix and fixed boundary condition tags for the nodes, assemble the element stiffness matrices for a global stiffness matrix.
   The sparsity of the stiffness matrix should be exploited using the MATLAB command SPARSE.

2. **Finite element analysis of a three-dimensional bar structure.**
   Use your finite element program from the first part of the assignment for the analysis of a three-dimensional bar structure.



All the nodes on the xy-plane are fixed with respect to the displacements. The structure is loaded by a single force ($F = 0.02$) at the top. The Young's modulus of the material is $E = 30000$ and the cross section is $A = 0.0009$. Visualize the result of your computation (the displacements) of the structure with MATLAB.

The coordinates of the vertices and the connectivity data can be downloaded from the class homepage.