Finite Element Method Application

**-: PROJECT 2:-**

**Performed By:-**

* **Andy Turner**
* **Mayank Patel**
* **Sainag Immidisetty**

**Performed under:-**

**Prof. Dr. Joseph Slater**

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* **Abstract**:-

Finite Element Methods were used in this project to solve an 8 noded brick element in Matlab. WFEM was used to run a single brick element and the required subroutines. The code was tested by analyzing both a Pyramid and Cone structure. The results were then validated with the commercial finite element software, ANSYS and also previously produced beam element codes in WFEM. Mesh convergence studies were conducted for all finite element solvers. All results are then compared to the calculated closed form solution.

* **Problem Statement**:-

Following are the steps that we are going to do for the brick element analysis:

* Write a general code to generate the elemental stiffness matrix for a single brick element for WFEM.
* Write a code to generate the elemental mass matrix.
* Obtain the FE matrices K and M in global coordinates.
* Write a subroutine to assemble these elements into a global matrix.
* Write a subroutine to apply specified boundary conditions (imposed displacements).
* Write a subroutine to solve for the entire displacement vector.
* Test the code on the following: Find the tip displacement of a vertical post to a 10nN transverse tip load for the following structures:
  1. Pyramid: height 190nm, bottom side length 74nm, flat top side length 10nm
  2. Height 190nm, bottom diameter 74nm, flat top diameter 10nm.
* Compare the results to a beam model using the beam code, and results finding from the ANSYS software.
* **Results and Analysis**:-