CSMD: Assigment 7

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April 2018

1 Bending of beams strategy selection

1.1 A1 case

For this exercise we have to define:

- Theory
- Element
- Integration
- Boundary conditions

We can see that the plate is composed of two sets of plates: one thicker plate with four smaller and thinner plates in its sides. Given that the structure does not hold symmetry for its half plane, we should use the 3D plate theory. Given the thickness/width ratio we can use the thin plate theory.
For the elements, because the geometry is made of rectangles, the best element type is rectangular (it is also better for the accuracy of the results).
The integration rule should be reduced to avoid locking effect.
Boundary conditions can be imposed looking at the symmetry of the problem. If we see figure 1, red lines indicate symmetry. Along these lines, the rotation must be zero.

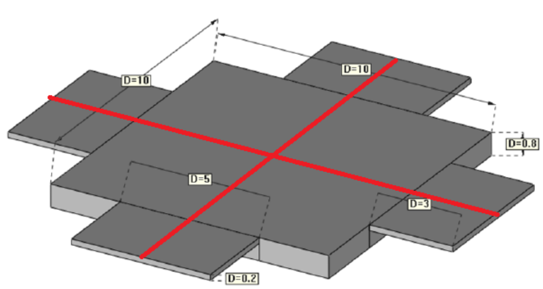

Figure 1: Scheme of the a1 exercise

1.2 A2 case

For this exercise we also have to define:

- Theory
- Element
- Integration
- Boundary conditions

In this case, the plate shows symmetry in the half plane. We can use plane beam theory, with the thin beam (ratio thickness/width smaller than 0.1) formulation. The elements should be again rectangular with reduced integration to avoid locking effects.
Boundary conditions are the same in the previous case, as the symmetry lines coincide.

2 Patch test

We imposed a unit vertical displacement (u = 1) for all the points at the boundary with no loads applied. Because the constant displacement is one of the possible solutions that can be exactly represented by the shapefunctions, it's a valid option. The solution holds for every node.

```
file_name = input('Enter the file name :','s');

tic;                    % Start clock
ttim = 0;               % Initialize time counter
eval (file_name);       % Read input file

patch = 1;
if patch
    for i = 1:3:length(fixdesp)
        fixdesp(i,3) = 1; % Unit displacement
        denss = 0; % No distributed load
    end
end
```

Figure 2: Code modification to include constant displacement (unitary) with no self-weight considered

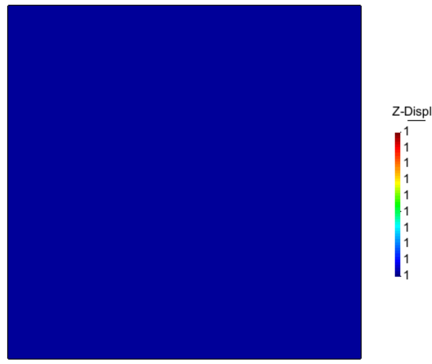

Figure 3: Solution of the previously modified problem. The value is constant and unitary