

GMC Manual

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Overview

The generalized method of cells (GMC) is a method to modelling fibrous composite structures. The microstructure is broken down into rectangular subcells that can be made to represent a repeating unit cell (RUC). Any 2D packing structure can be made and modelled. This code takes the material properties of the components and architecture of the RUC to return the composite stiffness matrix.

Building the Input

The input file for the program must be written in a very specific structure. The code has no capabilities to handle a badly structured input file and the program will fail in this case. A sample input file is shown below.

```
2.5d5,4d4,0.32d0,0.25d0,3d4,1.6d4
3.25d3,0.32d0
2,2
7e-3,3e-3
7e-3,3e-3
1,0
0,0
```

The material properties are given as the “Double Precision” data type and thus need a special format for input. The “d” in the format takes the place of the “e” that is generally used. An example is shown below.

```
1234.56 → 1.23456e3 → 1.23456d3 (double precision)
```

The format for each input file is shown below with the variables they represent.

```
E11f, E22f, ν12f, ν23f, G12f, G23f
Em, νm
Nx, Ny
L (1) , L (2) , ... , L (Nx)
H (1) , H (2) , ... , H (Ny)
SM (1, 1) , SM (1, 2) , ... , SM (1, Nx)
SM (2, 1) , SM (2, 2) , ... , SM (2, Nx)
...
SM (Ny, 1) , SM (Ny, 2) , ... , SM (Ny, Nx)
```

The SM matrix tells the code which cell is matrix and which is fiber. A value of “1” represents a fiber and anything else is matrix.

Running an Input

When the program is run without the command prompt, the code will look for the default input file within its own directory, "input.txt". Other input files may be run through the command prompt by inserting the filename after the executable's. An example is shown below.

```
C:\Users\Public\Generalized Method of Cells>GMC.exe inputfile.txt_
```

Output

The code will output to the console, and the composite stiffness matrix will be written to the file "Stiffness.txt". The code currently has a pause command which requires the user to press enter before the code exits. This will need to be removed for implementation with another program.