

Use the sample code provided in `~z xu2/Public/Proj1/proj1_file_io.c` to implement a code which converts mesh data generated by easymesh to vtk format and display in paraview.

### **Instructions:**

1. Implement function to free memory allocated by `my_matrix()`.
2. Implement a function to convert the data. Let the function prototype be:  
`void Convert_easymesh_to_vtk_unstruc_mesh(...)`; You can specify the arguments of this function.
3. Draw the program flow chart for the whole program to explain its structure. Also draw the flow chart for function “`static char *findfield(...)`”. See section 8 of “Tips for writing clean code” posted on the course website for sample of program flow chart.
4. Test your code. Convert the mesh files: `Test_mesh.e`, `Test_mesh.s`, `Test_mesh.n`, which use easymesh format into the vtk supported mesh data file. Show the result in paraview, take a snapshot and paste the snapshot in the project report.

**Hand-In.** Make a tar ball of all of your source code. Turn in the electronic and hardcopy of your report which contains results and description of your implementations. Email the tar ball of source code. Use the following title for your email: `acms40212S16-Proj1-your-ND-ID`

### **Using easymesh:**

The programs are `~z xu2/ Public/Proj1/Mesh/ EasyMesh` and

`~z xu2/ Public/Proj1/Mesh/ ShowMesh`

Copy the program and the input file (`Test_mesh.d`) to your directory. Use the following command:

```
EasyMesh Test_mesh.d +dxf
```

Data files: `Test_mesh.e`, `Test_mesh.s`, `Test_mesh.n` and `Test_mesh.dxf` will be generated.

To visualize the mesh, use the command:

```
ShowMesh Test_mesh
```

## Data Format for Unstructured Grid in VTK

The unstructured grid dataset consists of arbitrary combinations of any possible cell type. Unstructured grids are defined by points, cells, and cell types. The CELLS keyword requires two parameters: the number of cells  $n$  and the size of the cell list size. The cell list size is the total number of integer values required to represent the list (i.e., sum of numPoints and connectivity indices over each cell). The CELL\_TYPES keyword requires a single parameter: the number of cells  $n$ . This value should match the value specified by the CELLS keyword. The cell types data is a single integer value per cell that specified cell type.

Download example files: 2D\_unstructured\_mesh.vtk, rbc\_001.vtk.

The vtk data format is given below:

---

```
DATASET UNSTRUCTURED_ GRID
POINTS n dataType
p 0x p 0y p 0z
p 1x p 1y p 1z

...
p (n-1) x p (n-1) y p (n-1) z

CELLS n size
numPoints 0 ,i, j, k, l,...
numPoints 1 ,i, j, k, l,...
numPoints 2 ,i, j, k, l,...

...
numPoints n-1 ,i, j, k, l,...
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CELL_ TYPES n
type 0
type 1
type 2

...
type n-1
```

