**FEM\_TO\_GMSH   
Convert Mesh Data from FEM to GMSH Format**

**FEM\_TO\_GMSH** is a FORTRAN90 program which converts FEM files representing a 1D, 2D, or 3D mesh into a GMSH mesh file.

The FEM files include a node file, which simply lists the coordinates of each node, and an element connectivity file, which lists, for each element, the indices of the nodes that define it. Either 0 or 1-based indexing can be used when referencing the nodes.

**Usage:**

**fem\_to\_gmsh** *prefix*

where *prefix* is the common filename prefix:

* *'prefix'*\_nodes.txt contains the node coordinates,
* *'prefix'*\_elements.txt contains the element node connectivity.
* *'prefix'*.msh will contain the Gmsh mesh file.

**Licensing:**

The computer code and data files made available on this web page are distributed under [the GNU LGPL license.](https://people.sc.fsu.edu/~jburkardt/txt/gnu_lgpl.txt)

**Languages:**

**FEM\_TO\_GMSH** is available in [a C version](https://people.sc.fsu.edu/~jburkardt/c_src/fem_to_gmsh/fem_to_gmsh.html) and [a C++ version](https://people.sc.fsu.edu/~jburkardt/cpp_src/fem_to_gmsh/fem_to_gmsh.html) and [a FORTRAN77 version](https://people.sc.fsu.edu/~jburkardt/f77_src/fem_to_gmsh/fem_to_gmsh.html) and [a FORTRAN90 version](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/fem_to_gmsh.html) and [a MATLAB version](https://people.sc.fsu.edu/~jburkardt/m_src/fem_to_gmsh/fem_to_gmsh.html).

**Related Data and Programs:**

[DOLFIN-CONVERT](https://people.sc.fsu.edu/~jburkardt/py_src/dolfin-convert/dolfin-convert.html), a Python program which can convert mesh file from Gmsh, MEDIT, METIS or SCOTCH format to an XML format suitable for use by DOLFIN or FENICS, by Anders Logg.

[FEM\_TO\_MEDIT](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_medit/fem_to_medit.html), a FORTRAN90 program which reads a pair of FEM files defining node coordinates and elements, and creates a corresponding MEDIT mesh file.

[FEM\_TO\_TRIANGLE](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_triangle/fem_to_triangle.html), a FORTRAN90 program which reads FEM files defining a 2D mesh of triangles, namely a file of node coordinates and a file of elements defined by node indices, and creates a corresponding pair of node and element files for use by Jonathan Shewchuk's triangle program.

[FEM\_TO\_XML](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_xml/fem_to_xml.html), a FORTRAN90 program which reads FEM files defining a 1D, 2D or 3D mesh, namely a file of node coordinates and a file of elements defined by node indices, and creates a corresponding XML file for input to DOLFIN or FENICS.

[GMSH](https://people.sc.fsu.edu/~jburkardt/examples/gmsh/gmsh.html), examples which illustrate the use of the Gmsh program, a 3D mesh generator for the finite element method (FEM).

[GMSH\_IO](https://people.sc.fsu.edu/~jburkardt/f_src/gmsh_io/gmsh_io.html), a FORTRAN90 library which can read or write some of the files created by the Gmsh program for 1D, 2D or 3D meshes used by the finite element method (FEM).

[MSH](https://people.sc.fsu.edu/~jburkardt/data/msh/msh.html), a data directory of examples of MSH files, the native 3D mesh format used by Gmsh.

**Reference:**

1. Christophe Geuzaine, Jean-Francois Remacle,  
   Gmsh: a three-dimensional finite element mesh generator with built-in pre- and post-processing facilities,  
   International Journal for Numerical Methods in Engineering,  
   Volume 79, Number 11, pages 1309-1331, 2009.

**Source Code:**

* [fem\_to\_gmsh.f90](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/fem_to_gmsh.f90), the source code.

**Examples and Tests:**

**CHEBY9** is a 1D interval, [-1,+1], containing 9 nodes and 8 elements.

* [cheby9\_nodes.txt](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/cheby9_nodes.txt), the node coordinates.
* [cheby9\_elements.txt](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/cheby9_elements.txt), the elements.
* [cheby9.msh](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/cheby9.msh), the corresponding GMSH mesh file.

**MESH3D** is a 3D tetrahedral mesh using 8 nodes and 6 elements.

* [mesh3d\_nodes.txt](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/mesh3d_nodes.txt), the nodes for the 4-node tet mesh.
* [mesh3d\_elements.txt](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/mesh3d_elements.txt), the elements for the 4-node tet mesh.
* [mesh3d.msh](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/mesh3d.msh), the Gmsh msh file version of the data.

**RECTANGLE** is a 2D rectangular region which has been divided into 3 rows and 4 columns of squares, each then split into two 3-node triangles. The node and element files of this triangulation are converted into a Gmsh msh file describing the same triangulation.

* [rectangle\_nodes.txt](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/rectangle_nodes.txt), the node coordinates.
* [rectangle\_elements.txt](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/rectangle_elements.txt), the elements.
* [rectangle.png](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/rectangle.png), a PNG image of the triangulation, created by TRIANGULATION\_PLOT.
* [rectangle.msh](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/rectangle.msh), the corresponding Gmsh msh file.

**List of Routines:**

* **MAIN** is the main program for FEM\_TO\_GMSH.
* **CH\_CAP** capitalizes a single character.
* **CH\_EQI** is a case insensitive comparison of two characters for equality.
* **CH\_TO\_DIGIT** returns the value of a base 10 digit.
* **FILE\_COLUMN\_COUNT** counts the number of columns in the first line of a file.
* **FILE\_ROW\_COUNT** counts the number of row records in a file.
* **GET\_UNIT** returns a free FORTRAN unit number.
* **GMSH\_WRITE** writes the triangulation data as a Gmsh mesh file.
* **I4MAT\_DATA\_READ** reads data from an I4MAT file.
* **I4MAT\_HEADER\_READ** reads the header from an I4MAT.
* **I4MAT\_TRANSPOSE\_PRINT** prints an I4MAT, transposed.
* **I4MAT\_TRANSPOSE\_PRINT\_SOME** prints some of the transpose of an I4MAT.
* **MESH\_BASE\_ONE** ensures that the element definition is one-based.
* **R8MAT\_DATA\_READ** reads data from an R8MAT file.
* **R8MAT\_HEADER\_READ** reads the header from an R8MAT file.
* **R8MAT\_TRANSPOSE\_PRINT** prints an R8MAT, transposed.
* **R8MAT\_TRANSPOSE\_PRINT\_SOME** prints some of an R8MAT, transposed.
* **S\_TO\_I4** reads an I4 from a string.
* **S\_TO\_I4VEC** reads an I4VEC from a string.
* **S\_TO\_R8** reads an R8 from a string.
* **S\_TO\_R8VEC** reads an R8VEC from a string.
* **S\_WORD\_COUNT** counts the number of "words" in a string.
* **TIMESTAMP** prints the current YMDHMS date as a time stamp.

You can go up one level to [the FORTRAN90 source codes](https://people.sc.fsu.edu/~jburkardt/f_src/f_src.html).

*Last revised on 06 October 2014.*

**FEM\_TO\_GMSH   
将网格数据从FEM转换为GMSH格式**

**FEM\_TO\_GMSH** 是FORTRAN90程序，它将表示1D，2D或3D网格的FEM文件转换为GMSH网格文件。

FEM文件包括节点文件和元素连接文件，节点文件仅列出每个节点的坐标，元素连接文件为每个元素列出定义它的节点的索引。引用节点时可以使用基于0或1的索引。

**用法：**

**fem\_to\_gmsh***前缀*

其中*prefix*是常用文件名前缀：

* *'* prefix'\_nodes.txt包含节点坐标，
* *'* prefix'\_elements.txt包含元素节点连接。
* *'* prefix'.msh将包含Gmsh网格文件。

**许可：**

此网页上提供的计算机代码和数据文件是在[GNU LGPL许可](https://people.sc.fsu.edu/~jburkardt/txt/gnu_lgpl.txt)下分发 [的。](https://people.sc.fsu.edu/~jburkardt/txt/gnu_lgpl.txt)

**语言：**

**FEM\_TO\_GMSH**提供 [C版本](https://people.sc.fsu.edu/~jburkardt/c_src/fem_to_gmsh/fem_to_gmsh.html)和 [C ++版本](https://people.sc.fsu.edu/~jburkardt/cpp_src/fem_to_gmsh/fem_to_gmsh.html)以及 [FORTRAN77版本](https://people.sc.fsu.edu/~jburkardt/f77_src/fem_to_gmsh/fem_to_gmsh.html)和 [FORTRAN90版本](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/fem_to_gmsh.html)以及 [MATLAB版本](https://people.sc.fsu.edu/~jburkardt/m_src/fem_to_gmsh/fem_to_gmsh.html)。

**相关数据和程序：**

[DOLFIN-CONVERT](https://people.sc.fsu.edu/~jburkardt/py_src/dolfin-convert/dolfin-convert.html)，一个Python程序，可以将网格文件从Gmsh，MEDIT，METIS或SCOTCH格式转换为适合由DOLFIN或FENICS使用的XML格式，由Anders Logg提供。

[FEM\_TO\_MEDIT](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_medit/fem_to_medit.html)，FORTRAN90程序，读取定义节点坐标和元素的一对FEM文件，并创建相应的MEDIT网格文件。

[FEM\_TO\_TRIANGLE](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_triangle/fem_to_triangle.html)，FORTRAN90程序，读取定义二维网格三角形的FEM文件，即节点坐标文件和节点索引定义的元素文件，并创建一对相应的节点和元素文件供Jonathan Shewchuk的三角程序使用。

[FEM\_TO\_XML](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_xml/fem_to_xml.html)，FORTRAN90程序，读取定义1D，2D或3D网格的FEM文件，即节点坐标文件和节点索引定义的元素文件，并创建相应的XML文件以输入DOLFIN或FENICS。

[GMSH](https://people.sc.fsu.edu/~jburkardt/examples/gmsh/gmsh.html)，示例说明了Gmsh程序的使用，3D网格生成器用于有限元法（FEM）。

[GMSH\_IO](https://people.sc.fsu.edu/~jburkardt/f_src/gmsh_io/gmsh_io.html)，一个FORTRAN90库，可以读取或写入由Gmsh程序创建的一些文件，用于有限元法（FEM）使用的一维，二维或三维网格。

[MSH](https://people.sc.fsu.edu/~jburkardt/data/msh/msh.html)，MSH文件示例的数据目录，Gmsh使用的原生3D网格格式。

**参考：**

1. Christophe Geuzaine，Jean-Francois Remacle，  
   Gmsh：一种三维有限元网格生成器，内置预处理和后处理设施，  
   国际工程数值方法期刊，  
   第79卷，第11期，第1309-1331页，2009年。

**源代码：**

* [fem\_to\_gmsh.f90](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/fem_to_gmsh.f90)，源代码。

**示例和测试：**

**CHEBY9**是1D区间，[ - 1，+ 1]，包含9个节点和8个元素。

* [cheby9\_nodes.txt](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/cheby9_nodes.txt)，节点坐标。
* [cheby9\_elements.txt](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/cheby9_elements.txt)，元素。
* [cheby9.msh](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/cheby9.msh)，相应的GMSH网格文件。

**MESH3D**是一个使用8个节点和6个元素的3D四面体网格。

* [mesh3d\_nodes.txt](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/mesh3d_nodes.txt)，4节点tet网格的节点。
* [mesh3d\_elements.txt](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/mesh3d_elements.txt)，4节点tet网格的元素。
* [mesh3d.msh](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/mesh3d.msh)，Gmsh msh文件版本的数据。

**RECTANGLE**是一个2D矩形区域，它被分成3行和4列正方形，然后分成两个3节点三角形。此三角测量的节点和元素文件将转换为描述相同三角测量的Gmsh msh文件。

* [rectangle\_nodes.txt](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/rectangle_nodes.txt)，节点坐标。
* [rectangle\_elements.txt](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/rectangle_elements.txt)，元素。
* [rectangle.png](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/rectangle.png)，三角测量的PNG图像，由TRIANGULATION\_PLOT创建。
* [rectangle.msh](https://people.sc.fsu.edu/~jburkardt/f_src/fem_to_gmsh/rectangle.msh)，相应的Gmsh msh文件。

**例程列表：**

* **MAIN**是FEM\_TO\_GMSH的主程序。
* **CH\_CAP**将单个字符大写。
* **CH\_EQI**是对两个字符进行不区分大小写的比较。
* **CH\_TO\_DIGIT**返回基数为10的数字。
* **FILE\_COLUMN\_COUNT**计算文件第一行中的列数。
* **FILE\_ROW\_COUNT**计算文件中的行记录数。
* **GET\_UNIT**返回一个免费的FORTRAN单元号。
* **GMSH\_WRITE**将三角测量数据写为Gmsh网格文件。
* **I4MAT\_DATA\_READ**从I4MAT文件中读取数据。
* **I4MAT\_HEADER\_READ**从**I4MAT**读取标头。
* **I4MAT\_TRANSPOSE\_PRINT**打印I4MAT，转置。
* **I4MAT\_TRANSPOSE\_PRINT\_SOME**打印一些**I4MAT**的转置。
* **MESH\_BASE\_ONE**确保元素定义基于一个。
* **R8MAT\_DATA\_READ**从R8MAT文件中读取数据。
* **R8MAT\_HEADER\_READ**从R8MAT文件中读取标头。
* **R8MAT\_TRANSPOSE\_PRINT**打印一个转置的R8MAT。
* **R8MAT\_TRANSPOSE\_PRINT\_SOME**打印一些转置的R8MAT。
* **S\_TO\_I4**从字符串中读取I4。
* **S\_TO\_I4VEC**从字符串中读取I4VEC。
* **S\_TO\_R8**从字符串中读取R8。
* **S\_TO\_R8VEC**从字符串中读取R8VEC。
* **S\_WORD\_COUNT**计算字符串中“单词”的数量。
* **TIMESTAMP**将当前YMDHMS日期打印为时间戳。

您可以上一级到[FORTRAN90源代码](https://people.sc.fsu.edu/~jburkardt/f_src/f_src.html)。

*最后修订于2014年10月6日。*