**Description**

The following code is described in the paper:

Doste, R, Soto-Iglesias, D, Bernardino, G, et al. A rule-based method to model myocardial fiber orientation in cardiac biventricular geometries with outflow tracts. *Int J Numer Meth Biomed Engng*. 2019; 35:e3185. <https://doi.org/10.1002/cnm.3185>

The code can be run on Windows or Linux platforms. Fibers can be generated for tetrahedral or hexahedral meshes. Three sample files (surface mesh with labels, initial 3D mesh without fibers and final 3D mesh with the final labels and fibers after running the code) are included in a zip file (‘Sample\_files.zip”).

**Required external Libraries**

* ElmerFem: open source finite element software for multiphysical problems. Used for solving Laplace equation. Can be installed in Windows or Linux environments. Download in: <http://www.elmerfem.org/blog/binaries/>
* Important: add the path at the beginning of the code (line 27 or 35).
* Iso2Mesh: mesh generation and processing toolbox for Matlab.

Download in: <https://sourceforge.net/projects/iso2mesh/files/latest/download>

* Important: unzip the all the files in the RBMfunctions folder

**Input parameters**

In order to execute the code you need to input a superficial mesh in vtk format with labels in the faces. (A sample mesh, “labels.vtk”, is attached). The labels are:

endoLV 1

epi 2

endoRV 3

PulmonaryValve 9

AorticValve 10

MitralValve 13

TricuspidValve 14

ApexLV(epicardium) 12

ApexRV(endocardium) 18

The RBM uses the following parameters that can be modified at the beginning of the script:

Remesh: If activated (Remesh=1), the code uses the library *Isomesh* to create a tetrahedral mesh from the surface mesh. If not, (Remesh=0), the code loads the tetrahedral mesh called with the variable "name".

NewHeatCalculation: If it is activated (NewHeatCalculation=1) the RBM calculates the Laplace equations using Elmer. If not, the program loads the results automatically. It must be activated the first time you generate de fibers on a specific mesh. After that, you can deactivate it and test different angles without having to repeat the Laplace equation computations.

Trabeculations: If activated (trabeculations=1), the RBM detects the treabeculae and assigns longitudinal fiber orientation to them.

The interpolation option "largenumber=1" is used to calculate fibers in heavy meshes or hexahedral meshes.

**Angle definition:**

Interpolation in septumForces continuity of the helix angle in the septum (by default).

If we don’t do force continuity, we can specify the angle difference between the fibers of the LV and RV in the septum (septal RV and LV difference) and the orientation of the RV fibers within the septum (Helix angle in RV).

Default angles (in º):

Interfaz de usuario gráfica, Aplicación, Word

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