The code has been divided into three functions: *coef_basis1*, *coef_basis2* and *coef_basis3*. In each one of them, the coefficients of a set of m surfaces are estimated with respect to each of the three bases of functions described in the paper.

Although some small parts of the code are repeated in the different functions, and could be abbreviated, it has been preferred to make three independent functions, which are able to estimate by themselves the necessary data to define each one of the three models. In addition, in this way, the software is more accessible and user friendly because it follows the same steps of the paper.

INPUTS:

- V contains the normal area vectors, M contains the barycenters of the triangulated surfaces. Their dimensions are *num_triang* $\times 3 \times m$. $V(:,:,ii)$ and $M(:,:,ii)$ are the *(num_triang*x3)-matrices for surface ii.
- *grid* is a $(N \times 3)$-matrix, where N is the number of points in the grid. $grid(ii,:)$ is one of the points.
- *lambda* is a positive number, the parameter of the Gaussian kernel.
- *gamma* is a positive number, a regularization parameter that is used when calculating the 'beta' vectors.

Coef1=coef_basis1(V, M, grid, lambda, gamma)

[Coef2, products_basis2_HK]=coef_basis2(V, M, grid, lambda)

[Coef3, products_basis3_HK]=coef_basis3(V, M, grid, lambda)

OUTPUTS

- *Coef1*, *Coef2* and *Coef3* are the coefficients with respect to each one of the three basis of functions of the set of m surfaces. Each one of the m rows of one of these matrices corresponds with the estimation of the first coefficients of a surface.
- *products_basis3_HK* and *products_basis2_HK* are the $(3N$x$3N)$-matrix where the element (ii, jj) corresponds with the inner-product in H_K of the elements ii and jj of the second and third basis of functions, respectively.

Then, these bases are truncated with a low number r of terms using cross-validation procedures and the *clmm* function of the R-package ordinal (Christensen, 2015) is used to fit the model in all three cases.

A MAT-file called *Example figures - spheres, ellipsoids and pears.mat* has also been included. Load its data using Matlab to easily test the functions.

It includes 30 three-dimensional figures, in this order: 10 spheres (with slight deformations so that they are not exactly spheres), 10 ellipsoids, and 10 pears.

The only required variables are V and M, but two extra variables are included.

The *vertex_points* variable shows the points of each figure (that is, the triangle vertices) in the same format of V and M.

The *triangulation_indices* variable shows the triangulation of the figures (the same for every figure). The *jj*-th vertex of the *ii*-th triangle of the *kk*-th figure is *vertex_points(triangulation_indices(ii,jj),:,kk)*.