

Method S3. Creating a ROM Map in MATLAB

Joint rotations can be exported from Maya 2016 (Autodesk, San Rafael, CA, USA) as a .csv file using the “Export” script in the XROMM_MayaTools package (available at xromm.org), and imported into MATLAB R_2017a (Mathworks, Natick, MA, USA) as column vectors.

The MATLAB code for creating a basic ROM map comparison like the one presented in this study is below:

```
shape1 = alphaShape(rz1,ry1,rx1); %create a 3-D alpha shape using the first set of (FE°, ABAD°, LAR°) points
plot(shape1); %plot the first alpha shape
hold on;

shape2 = alphaShape(rz2,ry2,rx2); %create a 3-D alpha shape using second set of (FE°, ABAD°, LAR°) points
plot(shape2); %plot the second alpha shape on the same axes
hold off;

shape1vol = volume(shape1); %compute the volume of the first alpha shape
disp(shape1vol);
shape2vol = volume(shape2); %compute the volume of the second alpha shape
disp(shape2vol);

percent = shape1vol/shape2vol; %compare volumes
disp(percent)
```

The alphaShape function’s default settings in MATLAB include a hole threshold of 0, preventing the formation of internal holes, and an alpha radius of “criticalAlpha,” the smallest radius that produces an alpha shape enclosing all points. This script assumes joint rotations named rz1, ry1, and rx1 for a first mobility, and rz2, ry2, and rx2 for a second mobility have been imported to MATLAB as column vectors. Any number of mobilities measured with the same joint coordinate system can be added to this ROM map by appending additional alphaShape and plot functions to the code. Using native MATLAB aesthetic functions for surfaces (e.g., FaceAlpha, FaceColor, EdgeAlpha, EdgeColor, etc.) and adding lighting to the scene can help increase clarity of visualizations.