POLITECNICO MILANO 1863	051483 Musical Acoustics Module 1: Modeling of musical instruments Academic Year 2022/2023	Homework L1

Homework Lab 1: Glass Harp

Generate and perform the eigenfrequency analysis of the model of a Wineglass for Glass Harp, inspired by the designs that you can find at link and link

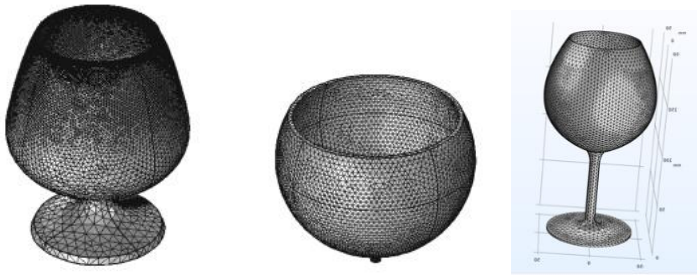

Fig.1 Possible modeling geometries, try to reproduce one these, but feel free to decide the dimensions and shape by yourself (with or without the base, but at least you need to keep the stem).

Ex 1: Generate a 3D model of the Wineglass. (*1.8 points)*

(a) Build the 3D model of the Wineglass (*1.2 points)*

(b) Perform eigenfrequency simulation for the Wineglass using the pinned boundary condition for the bottom face. Searching for at least 20 eigenfrequencies and choose yourself around which frequency (when you specify the study parameters).
What do the first eigenfrequency represent? Export some animations related to the frequency motion. (*0.6 points)*

Ex.2: Generate an axysimmetric model of the Wineglass. (*1.2 points)*

(a) Model the Wineglass geometry using an axysimmetric model. (*0.4 points)*

(b) Repeat the eigenfrequency study with the same configurations as the ones chosen for Ex.1, fix the bottom of the wineglass using the pinned boundary condition for the bottom face. (*0.4 points)*

(c) Repeat the eigenfrequency study, this time using the circumferential mode extension in the axial symmetry approximation in solid Mechanics (*0.2 points)*

(d) Are you able to obtain the same results of Ex1 in the case of (b) and (c)? Elaborate on that. (*0.2 points)*

HINTS

- To draw a geometry, you can either use sketch tools (you can find a guide at the following link) or take advantage of 2D/3D geometry tools and Booleans and Partitions Transformations (e.g. Union/Intersection/Difference) + Revolve (as seen during the labs).
- If you build the geometry in 2D, you may need to use the "Convert to Solid" node to be able to mesh it.
- Details about axial symmetry approximation can be found here and here.
- Pinned node (the principle is similar to when we applied Dirichlet boundary conditions in the isospectral drums)
- For the material you can use a blank material with the following parameters: Young's Modulus 73.1 GPa, Density 2203 kg/m^3, Poisson Ratio 0.17 (of course you are also allowed to choose different type of materials as long as they are of glass type).

Homework Submission Info

Please provide the answers in a report as a PDF file by Thursday 3 November 2022 and upload it using the WeBeep platform in the "Assignments/HL1" delivery folder. One file for each student must be uploaded. If more than one student participated to the assignment, write on the cover page of the assignment the name, surname and ID of the participating students. Also please provide the COMSOL files related to each of the exercises, since uploading of files bigger than 250 MB is not possible, please select the Clear Mesh and Clear Solutions options as detailed here.