IPBMA. Practice 3.

Building a Phantom

Built two x-ray phantoms using pyhton functions. These functions will be called from a main program. The format of such phantoms is shown in the appendix. The basic shapes of the phantoms will be cubes, for simplicity. Regarding the breast phantoms, it will be composed by a series of cubes of different material, inserted in an air density prism.

The functions to be built, will be called ***cube_phantom()*** and ***breast_phantom()*** and will include the following parameters:

Input → 2 parameters:

i) Size. Use power of 2 dimensions.
ii) Energy of the x-ray beam.

Output→ Numpy array (3D), whose values will be the corresponding linear attenuation coefficients. These values will depend on the type of material used to build each part of the phantom. They will be obtained from attached csv files.

Note.- each student has to bring a zip file called *lastName_Name_P3.zip*, to the following address: *pablogtahoces@gmail.com*. The subject o the e-mail, should be: IPBMA_P3. Inside the zip should be included:

- A jupyter notebook, showing how the software works (see the example).
- A .py file with the python functions created.
- All the necessary files to verify the correct operation of the application.

Appendix

Cube Phantom.- phantom of cubic shape, composed of 2 cubes of different density and dimension, one inserted in the other. The internal cube should be composed of a material of soft tissue density and the size of each edge is half the size of the edge of the external cube. The external cube should be composed of two equal sections. The first one will be filled with air and the second one with water.

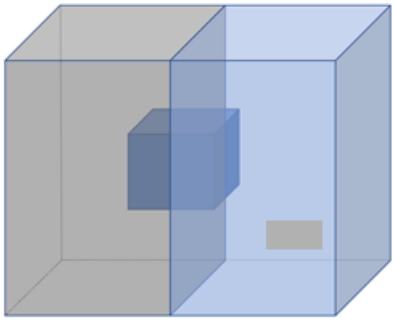

Figure 1

Breast Phantom.- phantom, with symmetric shape, which simulates a breast. It is composed of several cubes of different material and size, inserted into each other. The material densities try to simulate those found inside the real breast: fat (adipose tissue), breast parenchyma (breast tissue) and possible mass (soft tissue). The phantom will be stored as a 3D array, being the parts not occupied by the figure, corresponding to air density. There are three different sizes for the cubes that compose it. The size of the edge of each of these cubes will be half of the previous one.

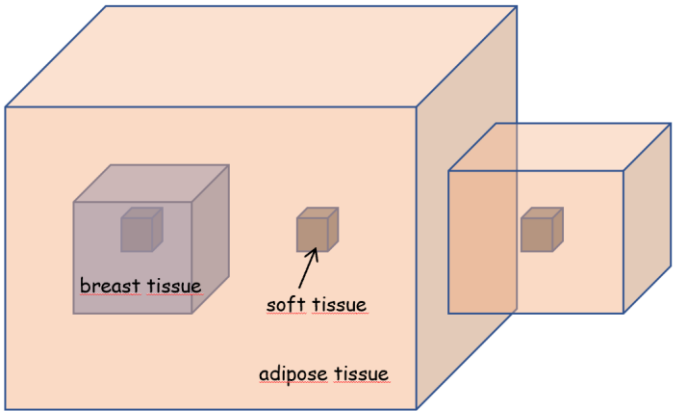

Figure 2

Vascular Phantom.- phantom, with symmetric shape (prism), which simulates a vessel surrounded of sotf tissue. It consists of a cylinder of blood inserted into a cube of soft tissue. The phantom will be stored as a 3D array.