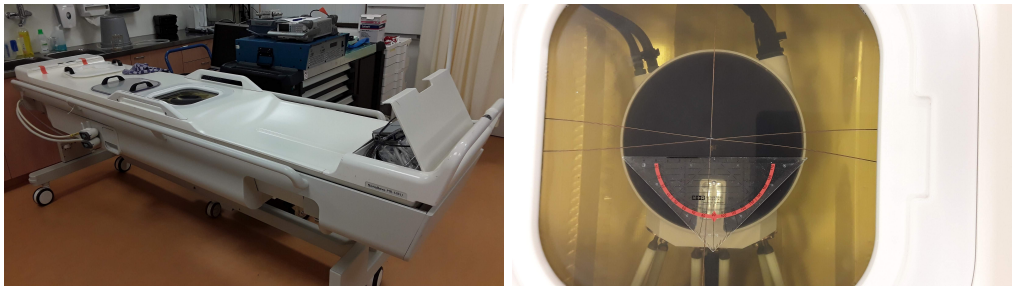
Geometric manipulation of simulated HIFU objects

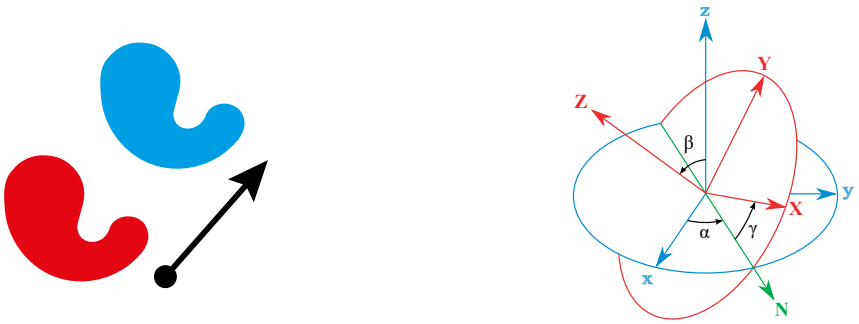
High Intensity Focused Ultrasound (HIFU) is a technique that is used for cancer treatment (e.g. prostate cancer and bone metastases). An ultrasonic beam leaving a transducer is focused on a specific part of the tumor (the focal point) and the temperature increase caused by the supplied high intensity waves lead to the ablation of the cancerous tissue.



(a) A table with a built-in transducer. (b) Close-up of the transducer.

Figure 1: Philips Sonalleve transducer system

Models for HIFU propagation play a crucial role to predict the exact heat deposition and the exact temperature increase. In one such model the geometry is divided into 2 entities; the transducer and the object. Your task is to add the ability to define and apply rotation and translation manipulations on these 2 objects by means of a configuration file.



(a) Translation (b) Rotation

Figure 2: Affine geometric operations.

For this assignment the geometrical part of the model will be provided as well as a number of example entities.