

Guide to work with the MRI demo program

Jens E. Wilhjelm and Lars G. Hanson

BME & CMR, DTU Elektro, Ørstedes plads, building 349
Technical University of Denmark
2800 Kgs. Lyngby

(Ver. 1.1 13/9/18) © 2007-2018 by J. E. Wilhjelm

1 Introduction

This document provides a number of questions, that you should try to solve by use of the MRI demo program. There is not much time available, so you should structure your work.

2 Program

The program can be obtained from:

<http://bme.elektro.dtu.dk/jw/jwpublic/courses/31540/demos/>

If there is a several directories at this level, then choose the *youngest* one. You will need all the files in this directory. There might be a `complete.zip` file with all the files you need; unpack this with `pk-zip` or similar file (un)compression software. Be aware, that the files provided are so-called p-files, but they do run in MATLAB.

3 Running the program

You will need to type `mri_demo` at the MATLAB prompt (MATLAB version probably should be 2006b, 2007a or newer). You will then see a figure window as shown in Figure 1 (or most likely, an improved version).

First take a look at the program and get acquainted with the user interface. Also, please read the text that appear when pressing `help` and `about` and also note the yellow *tooltips*.

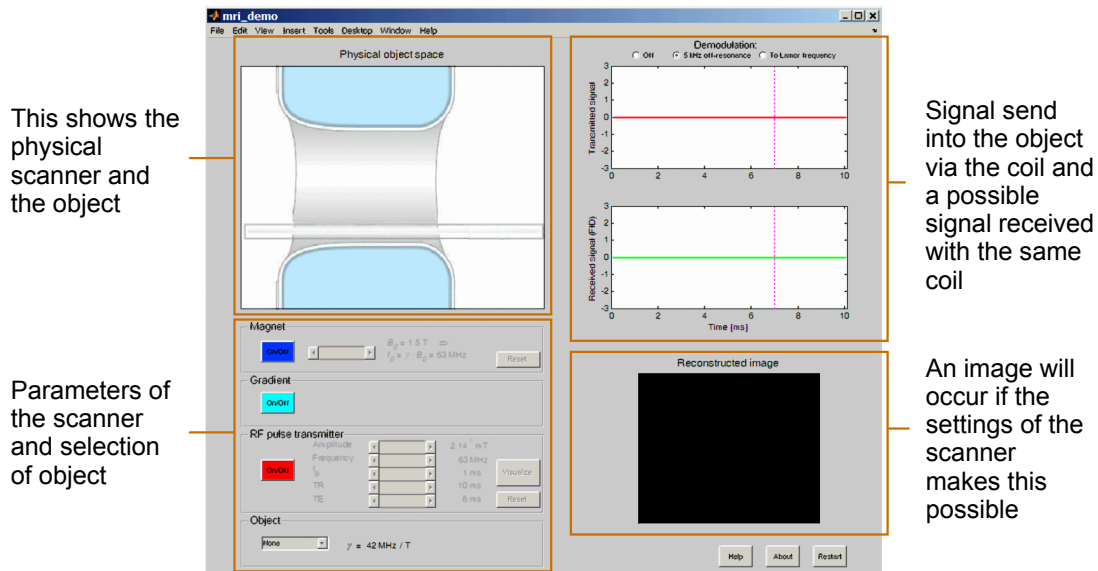
4 Questions to solve

The questions below are intended to guide you to an understanding of the principles of Magnetic resonance imaging (MRI):

- Write down the name of the components of an MR scanner, as well as the responsibilities of each individual component.
- By operating the control panel of the scanner, make a situation with the program, which creates a response from an object.
- What is the difference in the received signal, when the type of object is changed?
- Try to identify how few components of the scanner that needs to be active in order to show the principle of magnetic resonance (i.e. obtaining a response from the object in the scanner).

Questions to solve

- Make a drawing of the signals that you see with correct horizontal axis.
- What does the signal represent?
- Write down parameters, equation(s) and their value for the above situation. Group the parameters logically (*e.g.*, parameters related to the object, the MRI scanner, etc.).
- What is needed to make the radio wave transmitter rotate the magnetization of the Hydrogen nucleus 90 degrees, which gives maximum signal strength in the received signal?
- Try to obtain an image from a human. What happens to the image, when you change the frequency of the transmitted pulse? And why? Or what happens, when you change the Gradient strength?
- Try to identify, if the MRI scanner contains of a gamma camera, a grid or an aluminium filter. Is there any risk of ionizing radiation?



Figur 1 Overview of the front panel of the mri_demo program (the actual version might differ slightly).