BE280A Final Project Assignment

Due Date: The completed project is due at 5 p.m. on Monday December 7, 2009. Electronic submission of projects will make use of the website https://learnfmri.ucsd.edu/elearning. Each group will be assigned a user name and password for access to this site. The project components to be submitted are: (a) a viewable movie; (b) a written summary of the project; and (c) files with code written for the project. The final quiz component of the project will occur during the final exam period for this course (Thursday, December 10, 2009 from 8 am to 11 am).

Guidelines:
1) Select a partner to work with (there are 19 registered students, so that there will be 9 groups, with one group of 3 students). Your partner(s) for the final project should **not** be the same as your partner(s) for the midterm project. The group of 3 students is expected to add one additional component to their movie.
2) Discussion of **general ideas** is encouraged between groups, however, each project submitted should reflect each group's own understanding of the material. MATLAB code should be **unique** to each group. Significant discussions with other groups should be given appropriate credit (e.g. we discussed part (a) with so and so).
3) The movie must be playable on a Macintosh computer using either Quicktime, VLC media player, or some other standard software package.
4) It is recommended, although not required, that you use MATLAB or some other software package to create animations and simulations.   You may also find it useful to have some live scenes with people.
5) You may NOT use pre-existing movies, unless they demonstrate a physical phenomenon that is not easy to recreate on your own (e.g. a movie of a metal object being pulled into a magnet). If you use a scene from a pre-existing video, please make sure to cite the source.
6) Use a word-processing program to write the summary report, including all equations (no handwritten reports! Use an equation editor.). Neatness and clarity of exposition will play a **significant** role in the grading of the summary.
7) Where appropriate, title and label the axes on plots and images in the movie.

Movie (50 pts)

The goal of this project is to create a short movie that explains key concepts of magnetic resonance imaging (MRI). Your target viewer is a first year graduate engineering student who knows very little about either Fourier transforms or MRI. The movie should be at least 5 minutes long and should be technically accurate, concise, and engaging.

The required components of the movie are as follows:

    a) Explain how one can make up an image from its Fourier components.
    b) Explain the notion of k-space.
    c) Go over precession in the presence of a magnetic field, the concept of a rotating frame, and the importance of spin phase.
    d) Explain how the use of gradients in MRI enables us to form an image.
    e) Address aliasing and resolution requirements.
    f) Provide an example of at least one MRI pulse sequence.
    g) Cover one additional aspect of MRI that you think is important.

Written Summary and Code (10 pts)
For each component of the movie, provide a brief summary of your approach for explaining this concept. If you wrote code for the project, provide the files you used – clearly labeling which file corresponded to which component. If there is more than one code file, arrange them in a zipped file.

Final Quiz (40 pts).
The quiz will cover all material up to and including MRI Lecture 6 and the material covered in this project.