Project: A phantom for use in an MR imager

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Date: 11/04/05 – 11/10/05

Problem Statement: Design a phantom for use in an MR imager to calibrate T2 relaxation value to water concentration in a gel over a range of 70 - 90%.

Restatement of Team Goals: The phantom is meant to assess the accuracy of an MR scanner. Measurements made with the phantom will help assess which variables affect the accuracy of the MR scanner, such as the distance between the spinal coil and the patient’s spine, the size of the patient, and the sensitivity of the MR scanner to very similar doped water solutions. The phantom will hold artificial samples which are comparable to that of lumbar intervertebral disk tissue in order to compare known disk composition (% water) to experimentally found T2 values.

The initial prototype from spring of 2005 needed the following improvements: a new container without the sloping sides (image artifact), possibly new material for container to replace HDPE (less material interface artifact), more testing of doped water samples (more exact T2 values), a new way to compose the intervertebral disk samples (hydrogels or alginites?). Also, the placement of the samples within the phantom needs to be closer together such that the magnetic field the samples are in is constant.

Last week’s goals:
- Call manufacturing companies and request quotes
- Select manufacturing company
- Acquire MR scan data from the acrylimide and gelatin hydrogels
- Acquire copy of Matlab program from John Perry
- Analyze MR data
- Research and order GAG
- Make alginate and agarose hydrogels

Summary of last week’s accomplishments:
- Completed computer modeling with ProE
• Emailed and called ~15 fabrication companies for price quotes
• Explored option of on-campus rapid prototyping
• Additional vials ordered
• GAG ordered and received
• Tested the Gd samples in relaxometer with Maritza Hobson
• Decided not to pursue agarose and alginate gels right now

This week’s goals:
• Select manufacturing company
• Send chosen company final drawings and a vial to work with
• Acquire MR scan data from the acrylimide and gelatin hydrogels
• Acquire copy of Matlab program from John Perry
• Analyze MR data
• Make additional hydrogels (depends on MR data) with GAG
• Analyze the Gd sample data

Difficulties: Need the MR data from the gelatin and acrylimide samples so that more hydrogels can be appropriately made.

Rough Project Schedule:
9/09/05: Meet with Client
9/16/05: First draft of PDS to advisor and client
9/02/05 - 09/16/05: Research new materials for phantom
  o Contact Standard Imaging company
  o Contact other MR materials company
  o Test plastic samples from these companies
9/09/05 - 09/30/05: Research hydrogels disk samples
9/30/05: Hydrogel testing in MR scanner
10/14/05: Midsemester design presentation
10/1/05-12/02/05: Construct and test phantom and disk samples
  o Order supplies needed for samples (GAGs, vials)
  o Purchase the prototype container of a new shape and material
  o Make up disk (hydrogels) and doped water samples
  o Test doped water samples with relaxometer (with Ernie Madsen)
  o Combine samples and phantom container
  o Prototype manufacturing (by 11/23/05)
  o Test prototype phantom
12/02/05: Final poster presentations
12/09/05: Final report and notebooks due to advisor
12/14/05: Final meeting with advisor

Activities:
Week to date:
• Missy – progress report, human subjects training, class meeting, fabrication company research and communication, project timeline, notebook updates: 7.5 hours
- Can – class meeting, updating notebook, BSAC, lab work, communications, human subjects training: 4 hours
- Ben – class meeting, communication with client and researchers, phantom design modeling, fabrication company research and communication, Gd samples, notebook updates, human subjects training: 16 hours
- Andrea – website updates, class meeting, notebook updates, Gd samples, human subjects training: 7 hours

**Running Total (as of 11/10/05):**
- Missy – 43 hr
- Can – 36.5 hr
- Ben – 60 hr
- Andrea – 42 hr