

Marco da Silva

08/17/00

CS 193

Independent Study in Scientific Visualization

High level objective

The goal of this independent study is to combine my background in mathematics and computer science (specifically, computer graphics) in a useful way to study some of the current problems in the field of scientific visualization.

Objectives for this semester

- Learn about the current state of the art in visualization techniques for multi-valued data sets
- Explore ways to effectively portray 3D multi-valued data sets, specifically MRI diffusion data from the brains of patients with obsessive compulsive disorder (OCD)
- Develop a system that allows the user to easily study large diffusion data sets

Prerequisites

- A strong background in mathematics
- Some knowledge of MR imaging techniques
- Programming ability

Discussion

This project intends to expand upon the work done in "Visualizing Diffusion Tensor MR Image Using Streamtubes and Streamsurfaces" by Song Zhang. The target of this work will be an application used to study the effects of surgery on the brain of people inflicted with OCD.

The system will be developed iteratively with feedback from investigators from Butler Hospital. The first step will be rendering the relevant anatomy of the brain before and after surgery to show the overall form or structure (underpainting), using streamtubes and streamsurfaces. The next step will be to try and generate an informative "diff" picture that will focus in on the changes in neural connectivity, etc. that have occurred as a result of the surgery. After this initial prototype is evaluated, I will have a better idea of what needs to be improved or changed.

Milestones

Week	Topic	Description
1-3	Background	Survey papers on multi-valued rendering techniques, especially in 3D. Talk with the people from Butler who are interested in this problem. Result: Works Cited section for paper
4	Specification	Decide what I can accomplish in code given what I've read. Result: UML software design, Introduction section for paper
5-6	Development 1	Generate the first iteration of the application.
7-8	Development 2	Get feedback and modify existing program
9-12	Development 3	Get feedback and modify existing program
13-14	Package	Complete paper summarizing what I have learned and accomplished Result: Paper

Evaluators

John Hughes, David Laidlaw