Kevin Kolz: Undergraduate Research 3999: Summer 2007

Faculty Advisor: Prof Gabrielle Allen, Computer Science

Mentoring Structure:

Kevin will be provided with a desk and workstation at CCT and will be expected to schedule regular hours for working at CCT.

Kevin will meet weekly with Prof Allen to review and discuss progress towards research objectives. Kevin will be guided on a daily basis by Shalini Venkataraman (CCT) on OpenGL and Social Networks.

Research Experiences:

1) Working in a diverse, interdisciplinary research center at CCT, interacting primarily with students, researchers and professors in research groups in Computational Frameworks (Prof Gabrielle Allen), Scientific Visualization (Shalini Venkataruman), Numerical Relativity (Dr Erik Schnetter) and Coastal Modeling (Archit Kulshrestha).
2) Basic understanding of visualization APIs and tools through learning OpenGL.
3) Innovations with new social networking technologies (e.g. SecondLife) to integrate with scientific applications (e.g. black hole Cactus Framework simulations, SCOOP ADCIRC storm surge modeling) for education, outreach and collaboration.
4) Maintaining a research notebook (online via Wiki or Blog)
5) Use of collaborative technologies, including Wiki's and source code repositories.
6) Preparation of scientific articles, including Wiki tutorial for OpenGL and report for SecondLife integration using LaTeX. Depending on the work performed we may decide to write an article for an undergraduate research journal.
7) Presentation of research at CCT Computational Science research group meeting including demonstration.

Track 1: OpenGL

1) Work through tutorials on the following topics from http://nehe.gamedev.net
    a. Setup OpenGL
    b. Drawing and Transformations
    c. Texture mapping

    d. Lighting and Fog
    e. Transparency and Blending
    f. Particle Systems
    g. High-level geometry – quadrics, surfaces etc
    h. Intro to Shader Programming
2) Prepare a wiki page on wiki.cct.lsu.edu/sciviz on the above topics with results and problems encountered
3) Present a 1hr tutorial on “Introduction to OpenGL”.

Track 2: Realtime Scientific Simulations and Social Networks

1) Investigate the functionality, scripting language, programming APIs for SecondLife.
2) Create mechanisms (buttons and speech objects) in SecondLife that can retrieve information from, and steer, Cactus simulations.
3) Create visualization screens in SecondLife which can display realtime images from Cactus and ADCIRC simulations via HTTP.
4) Get SecondLife running on CCT stereoscopic wall – use the existing code available on the geowall.org website.
5) Write a final report describing achievements and conclusions of research.