

Project Summary:

The main goal of this project is to improve student understanding of the geometric nature of multivariable calculus concepts, i.e., to help them develop accurate geometric intuition about multivariable calculus concepts and the various relationships among them.



To accomplish this goal, the project includes four parts:

- Creating a Multivariable Calculus Visualization applet using Java and publishing it on a website: web.monroecc.edu/calcNSF
- Creating a series of focused applets that demonstrate and explore particular 3D calculus concepts in a more dedicated way.
- Developing a series of guided exploration/assessments to be used by students to explore calculus concepts visually on their own.
- Dissemination of these materials through presentations and poster sessions at math conferences and through other publications.

Intellectual Merit:

This project provides dynamic visualization tools that enhance the teaching and learning of multivariable calculus. The visualization applets can be used in a number of ways:

- Instructors can use them to visually demonstrate concepts and verify results during lectures.
- Students can use them to explore the concepts visually outside of class, either using a guided activity or on their own.
- Instructors can use the main applet (CalcPlot3D) to create colorful graphs for visual aids (color overheads), worksheets, notes/handouts, or tests. 3D graphs or 2D contour plots can be copied from the applet and pasted into a word processor like Microsoft Word.
- Instructors will be able to use CalcPlot3D to create lecture demonstrations containing particular functions they specify and/or guided explorations for their own students using a scripting feature that is being integrated with this applet.

The guided activities created for this project will provide a means for instructors to get their students to use these applets to actively explore and “play” with the calculus concepts.

Paul Seeburger, the Principal Investigator (PI) for this grant project, has a lot of experience developing applets to bring calculus concepts to life. He has created 100+ Java applets supporting 5 major calculus textbooks (Anton, Thomas, Varberg, Salas, Hughes-Hallett). These applets essentially make textbook figures come to life. See examples of these applets at www.monroecc.edu/wusers/pseeburger/.

Broader Impacts:

This project will provide reliable visualization tools for educators to use to enhance their teaching in calculus and also in various Physics/Engineering classes. It is designed to promote student exploration and discovery, providing a way to truly “see” how the concepts work in motion and living color. The applets and support materials will be published and widely disseminated through the web and conference presentations.