

SAS HONORS SEMINAR

SPRING SEMESTER 2009

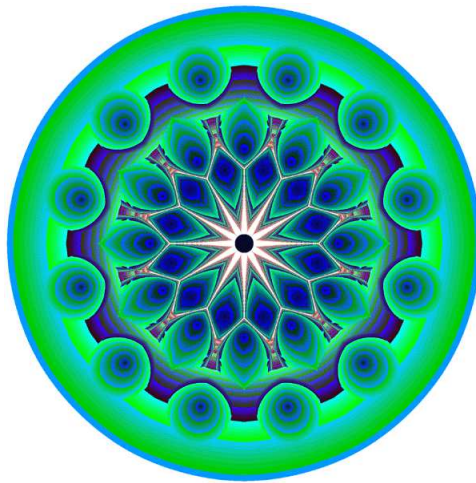
Creating Art and Discovering Science Through Visualization in Polynomiography

Course Number: 01:090:285:53504

Meeting day & time: M 06:10-09:00 PM

Location: Brett Hall Seminar Room - College Avenue Campus

Credit: 3



POLYNOMIOGRAPHY

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Course Description

This seminar will introduce a novel and interdisciplinary field, Polynomiography, the fine art and science of visualizing a polynomial equation through computer-generated images. Students will learn the basics of the underlying mathematical and algorithmic foundation of polynomiography aimed at solving a polynomial equation, a task present in every branch of science and mathematics. However, through polynomiography and its software students will learn to create art and design by turning the polynomial root-finding problem upside down. That is, through the ease of software students will be able to experiment with polynomials and root-finding algorithms as the basis for creating intricate designs and patterns, as well as animations. Not only polynomiography and individual's creativity could result in art and design analogous to the most sophisticated human creations, but artwork of a degree of complexity and sophistication not possible without the use of polynomiography and its software.

Students will learn to create art through the science of polynomiography while also learning about science and mathematics. While polynomiography allows virtual painting using the

computer screen as its canvas, it also inspires new artistic styles and actual paintings, whether originated directly from polynomiography software, or indirectly from its concepts.

In this seminar, students will be introduced to a range of possible course projects to be carried out either individually or in small groups. Sample projects consist of: Creating quality and novel 2D or 3D artwork using polynomiography software, e.g. as prints or video productions. Novel visualization or animations, as art or as means in conveying a mathematical property or concept. Comparison of polynomiographic images and traditional human art and design, e.g. discovering parallels between classes of polynomiographs and artworks of known artists, or comparison with particular styles of painting. Using polynomiography to produce interesting designs or paintings. Using polynomiography to make a noteworthy mathematical conjecture, better yet proving it. Exploring potentials in cryptography and encryption of numbers, as art, as math, or otherwise. Discovering ‘ novel and useful applications of polynomiography at any level of K-16 education. Exploring the usage of polynomiography in science. In addition to the above, students may propose their own creative projects as well.

GRADING will be based on classroom participation (20 %), oral presentation of their project (20 %), followed at the end by a hand-written version of the presentation (10 - 15 pages), as well as supplementary images, artworks, animations, or online links (60 %).

The mathematical prerequisite for the course includes calculus, and interest to explore.

BAHMAN KALANTARI is a professor of computer science and the inventor of the U.S. patented technology of Polynomiography. His research interests lie in theory, algorithms, and applications in a wide range of topics that include mathematical programming; discrete and combinatorial optimization; polynomial root-finding and approximation theory; and Polynomiography. Kalantari’s Polynomiography has received national and international media recognition that include the Star-Ledger, New Jersey Savvy Living Magazine, Science News, DISCOVER Magazine, Tiede (popular science magazine of Finland), Muy Interesante (popular science magazine of Spain) and more. His artworks have been exhibited in such venues as a traveling art-math exhibition in France, SIGGRAPH Art Gallery in LA, as well as at Rutgers and around New Jersey. His artworks have also appeared on the cover of publications such as Computer Graphics Quarterly, Princeton University Press book, art-math conference proceedings, and in science magazines. He has delivered numerous lectures, including invited presentations in Paris, Vienna, Rome, Montreal, Puerto Rico, as well as in middle and high schools in New Jersey, and K-12 teacher conferences. He hopes to internationalize Polynomiography as a medium for art, math, science, and education, and at many different levels. His book, “Polynomial Root-Finding and Polynomiography” will be published in January 2009. www.polynomiography.com