

MOTIVATING GEOMETRY THROUGH COMPUTATION AND VISUALIZATION

Project Summary

Problem : The standard undergraduate geometry courses are principally designed for pre-service teachers and prospective research mathematicians. Such courses are normally not of interest to students in the technical oriented fields of engineering, computer science, and the applied mathematical sciences. The goal of this proof of concept proposal is develop course materials for an applied geometry course for students pursuing degrees in engineering, computer science, and the applied mathematical sciences.

Objectives :

- To develop an introductory course in geometric modeling for engineering, computer science, and applied science majors.
- To develop interactive course materials that can be used in such an introductory geometric modeling course and that can be used in the pre-requisite calculus courses.
- To re-invigorate the role of geometry in the preparation of engineers, computer scientists, and applied mathematicians.

Methods : Effective courses utilize the current skills and abilities of the students in developing new skills and in developing an understanding of new concepts. In geometry, the crucial abilities tend to be somewhat intuitive, as geometry is similar to a language. The current generations of students tend to have an underdeveloped geometric intuition, possibly because they have played more with virtual reality than physical reality. However, there is a geometric intuition in virtual reality, which is not equivalent to geometric intuition of physical reality. In order to use their virtual geometric intuition, our goal in this project is to develop materials aimed at unifying these two diverse varieties of geometric intuition, by using both modern technology (computers and the internet) together with the traditional tools of geometry (compass, straightedge and physical models). In addition, the materials are to be interactive, as it is important to engage the students with the material. Some examples of the materials to be developed are:

- Interactive web-based notes, where the students cannot proceed until they master the basic concepts.
- Interactive exercises aimed at developing the skills and theoretical framework for problem solving.
- Open-ended projects aimed at advancing the students from routine problems to creative problems.

Dissemination and Evaluation: Dissemination of the materials will principally through the course web page, journal articles, and conference presentations. Evaluation of the materials will through course evaluation, student feedback, the experiences of the PI and the students working on the project, in addition to solicitation of comments from other faculty.