Graphics Made Easier
(Through Computational Geometry and Optimization)

Joe Marks

MERL—A Mitsubishi Electric Research Laboratory

Whether it is a diagram for a business presentation, a scene model for an architectural walkthrough, or a computer animation for a movie, designing computer graphics always seems to take more effort than one would like to expend. Getting the computer to do more of the work therefore has obvious appeal.

A promising approach for achieving a better division of labor between user and computer is *inverse design*: the user states declaratively the criteria for a good graphic or animation, and the computer finds one, usually by means of heuristic optimization. Although this idea has proven very successful for some problems, it is not a panacea. In this talk I will present a selection of graphics and animation tasks to which we have applied the inverse-design approach. These examples serve to illustrate why some problems are more amenable to inverse design than others.

I will also describe a general alternative to inverse design that we have developed, called "Design Galleries." In this approach, the computer's task is to generate an optimal *selection* of graphics, not a single optimal graphic; the user's task is to browse the automatically generated selection and identify desirable graphics. In contrast to the inverse-design approach, the user does not have to articulate design criteria ahead of time, but need only recognize a good design when it is presented. The computer's task is also simpler, since it need only sample the design space, not search it. The Design-Gallery approach appears to be most useful when the application of inverse design is problematic.