

# The Action Menu

The 3D-XplorMath Consortium

This is a non-standard Macintosh menu! Most books on human interface design warn that the items in a menu should remain fixed (except for simple changes like Hide xxx to Show xxx and back), or the user will get confused. The advice is to disable (i.e., gray out) menu items at times when they are not applicable, rather than to delete them. But 3D-XplorMath is in a sense a combination of many closely connected programs (one for each Category) and many menu choices only make sense for one or two of the Categories. When we attempted to follow the above rule, the result was that the menus became very large and their enable/disable logic complex and hard to maintain. Our solution was to keep items that were meaningful for all or nearly all Categories in most of the 3D-XplorMath menus (Settings, View, Animation) and to create a new menu, the Action menu, that had Category or object specific items in it. The Action menu does contain one stable item, namely, Create, but all the other items are created on the fly each time the menu is chosen, on the basis of which Category and which Object are current.

If you are the kind of person who enjoys learning what a program has to offer by experimenting with its menu choices, then the 3D-XplorMath Action menu should be a happy hunting ground for you. In fact, after choosing an object from the Main menu and seeing the default view of the object, perhaps

the best way to proceed next is to read the ATO (About This Object) and then to see what the Action menu has to offer.

The items Show All Gridlines, Show Alternate Gridlines, Show Every Third Gridline, etc. all refer only to the Surface category and behave just as you would expect. In particular the Show No Gridlines item will turn off the display of the  $u,v$  coordinate curves entirely when a surface is redrawn (except, of course, in wire-frame mode).

The group of items, Show Original Surface, Show Conjugate Surface, Set Associate Family Parameter..., Show Reflections/Don't Show Reflections, refer only to minimal surfaces given by Weierstrass Enneper data (those at the bottom of the minimal surface submenu) and are not present unless one of these is selected.

The items Project ODE Orbits, Show Direction Fields, and Show ODE Controls are switches and refer only to the ODE category. In any of the ODE categories (except for a first order equation in one variable) the main display shows the evolution of an orbit in the phase space. By default, the program also shows projections of the orbit on the various coordinate axes (using different colors to distinguish the projections). This display occurs in a second pane of the graphics window that opens automatically below the main pane. This pane can be hidden by choosing the the Project ODE Orbits item, and the boundary between the two panes can be adjusted by dragging the button at the right hand edge of the window. For a first order ODE category in two variables and a first or second order ODE in one variable the program by default shows the vector

field defining the ODE. The display of the direction field can be turned on and off by choosing the Show/Hide Direction Fields item of the Action menu.

When one of the ODE categories is chosen, there is normally a special Control Panel visible that permits the user to see and adjust various data associated to a selected ODE. You can choose whether to have this panel visible by using the Show/Hide ODE Controls items of the Action menu. You can select the Show/Hide Direction Fields and Project ODE Orbits in the Action menus to turn these features on and off.

The Fractal & Chaos category has a particularly complex Action menu when the selected object is the Julia set. In this case it provides a way to choose a point in the complex plane to serve as a parameter value for a Julia set, against a backdrop of the Mandelbrot set. It also provides a collection of submenus that have carefully computed special parameter values that give Julia sets of particular interest. The details will be found in the ATO (About This Object) dealing with the Mandelbrot and Julia sets.