# Spray Rendering

Spray rendering [2] is a framework for visualization which uses a spray paint can metaphor; cans are filled with smart particles (*sparts*) that are sprayed into the data to highlight interesting features. Features are displayed when *sparts* become activated and leave visualization objects in their path. These visual objects may be lines, polygons, spheres, and other graphics primitives that delineate the data set under study. Collectively, these are called abstract visualization objects.

Users are given the tools to create their own *sparts* interactively using Mix&Match [3]. Some of these *sparts* may even be used to look for features in two or more data sets simultaneously. Once created, these *sparts* can be loaded into different spray cans so that users can effectively select from a shelf of spray cans to get different visual effects. Figure 1 shows the effects of spraying different types of *sparts* to several co-registered data sets.

Visualization methods such as contour lines, cutting planes, isosurfaces, streamlines, etc. are easily encapsulated by the smart particle paradigm. The spray can metaphor not only provides an intuitive interface for delivering these *sparts* into the data set, but also allows users to control several can parameters and the interaction mode. That is, users can adjust the shape of the nozzle (e.g. circular, rake, point, etc.), the amount of selective focus (i.e. how widely the *sparts* will be dispersed), and the spray density (corresponds to the number of *sparts*). In addition, *sparts* can be asked to traverse gridded data according to a separate position update function or simply using grid indices; Visualization objects may appear only where the can is pointing to (as in the lighted area pointed to be a flashlight) or they may stick around (as in ordinary paint); and delivery of the *sparts* may be set to continuous or dependent on certain events (e.g. mouse down, view or parameter change, etc.). Finally, a facility is also provided for users to interactively create new *sparts*, and hence new visualization methods, by combining different simple reusable components. *Spray* has been applied to different applications (e.g. [1, 4]). More information is available from:

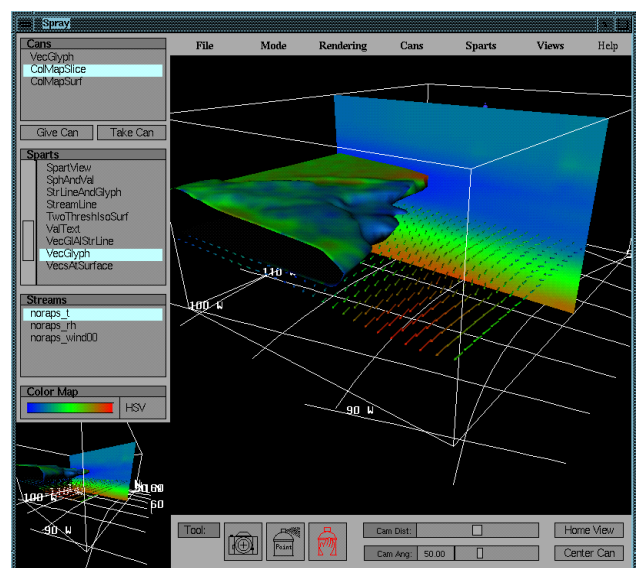http://www.cse.ucsc.edu/research/slvg/research/spray.h



Figure 1: *Spray* rendering workspace showing various visualization effects produced by smart particles (*sparts*). Each *spart* is loaded into a different spray can and associated with possibly different data set(s). Since multiple cans may be present, an extra graphics window on the lower left shows the view from the currently active can. Users can control viewing, can position and orientation, and spraying through either graphics window.

# References

[1] Guy W. Oliver. Visualizing the tracking and diving behavior of marine mammals. In *Proc. Visualization*, pages 397–299, Atlanta, GA, October 1995. IEEE.

[2] Alex Pang. Spray rendering. *IEEE Computer Graphics and Applications*, 14(5):57 − 63, 1994.

[3] Alex Pang and Naim Alper. Mix & Match: A construction kit for visualization. In *Proceedings: Visualization '94*, pages 302 − 309. IEEE Computer Society, 1994.

[4] Alex Pang and Dan Fernandez. REINAS visualization and instrumentation. In *Proceedings of Oceans'95 Conference*, pages 1892–1899, October 1995.