Volview is an extension module which adds volume visualization capability to the S-Lang interpreter, using the Gtk widget set and volpack rendering library.

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This software was developed with SLIRP at the MIT Kavli Institute for Astrophysics; it was funded in part by NASA and the Smithsonian Institution, through the AISRP grant NNG05GC23G and Smithsonian Astrophysical Observatory contract SV3-73016.

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volview is an extension module which adds volume visualization capability to the S-Lang interpreter, using the volpack rendering library and Gtk widget set (see http://graphics.stanford.edu/software/volpack/ and http://www.gtk.org/). Like VWhere (http://arxiv.org/abs/astro-ph/0412003), volview is also an example of the notion of a guilet (pronounced "gooyelet"), by which we mean to connote visual interfaces of a small-ish, scriptable nature, that may be easily embedded within – and launched from – other programs, even applications with interactive command lines and no ostensible graphical interface. For example, volview is frequently used in ISIS (http://space.mit.edu/cxc/isis/), our platform for robust, high-performance astrophysical analysis and modeling, whose main interface is an interactive Matlab(tm)-style command line prompt. Guilets fill an important software niche, the middle ground between novice users – who often argue that visual interfaces make software easier to use – and power users – who frequently complain that GUIs are more cumbersome and inflexible than command lines. Experience suggests that the code size and development cycle of the typical guilet is considerably smaller than that of traditional, monolithic GUIs (by which we mean to connote applications coded from scratch, typically in a compiled language such as C or C++, to have only a visual interface). Moreover, given their scripting heritage, guilets can be more amenable to changing requirements or ad-hoc experimentation and customization by the end-user. This is especially important in the scientific and engineering research arenas.

1.1 Building

volview ships with a configure script generated by autoconf, and in most cases can be built by issuing the following standard commands within a UNIX-like (e.g. Linux or Cygwin) environment:

```
./configure [options]
make
make install
```

Beyond S-Lang itself, volview has three explicit dependencies: SLIRP, volpack, and SLgtk. The latter two of these, if not present on your system, may be automatically downloaded from our site and installed on your system by using the --enable-download configure option. Issue a ./configure
help command for more information. volview can be loaded at runtime into any suitably configured application which embeds the S-Lang interpreter, using either

```markdown
require("volview");
```

or

```markdown
() = evalfile("volview");
```

### 1.2 Examples

Volumes are visualized from arrays, of either 3 or 4 dimensions, none of which may be zero in length. When a 4D array is given the first element is selected as the 3D volume to be visualized (using a 4D array to perform a 3D slideshow will be supported in the near future). For example, this statement sequence

```markdown
variable volume = tan([1:8000]);
reshape(volume,[20,20,20]);
volview(volume);
```

yields the image:

![Volview Interface](image)
1.2. Examples

Since volumes are just arrays they may be read from virtually any source. For example, consider a classic brain MRI scan example, stored in HDF5 format and read using the slh5 module:

```r
require("h5");
volview( h5_read("brain.h5"));
```

Here the HDF5 file was converted from a "raw volume" format used by volpack (representing an MRI scan of a human head, derived from public domain data provided by SoftLab at UNC Chapel Hill).

Our final example is drawn from astronomy, and utilizes a spectral cube in the FITS file format, generated by CUBISM (http://ssc.spitzer.caltech.edu/archanay/contributed/cubism) from Spitzer observation 3310 of the Cassiopeia A supernova remnant and graciously provided by Dr. Tracey Delaney. The visual is useful because many popular astronomical visualization tools only support visualizing 2D slices of 3D images, which does not reveal interesting structure in the 3rd dimension (e.g. here wavelength). By visualizing the entire volume as a single array

```r
require("fits");
volview( fits_read_image("casa_112_s12.fits") );
```

we see instantly the clumpy areas which correspond to areas of strong emission:
Chapter 1. Introduction
volview

SYNOPSIS
Display a 3D volume array within a graphical user interface

USAGE
volview(3D_or_4D_volume_array [; x=<x0>, y=<y0>, z=<z0>])

DESCRIPTION
This function will launch a GUI in which the given volume will be
displayed, using the optional x,y,z qualifiers to set the initial
viewing angle. From there the volume may be rotated along any
axis, zoomed in or out, or saved to a variety of output file formats.

Right-clicking on the image after rendering will launch a menu from
which rendering parameters (e.g. colormap, opacity) may be modified.

NOTES
The input array may have either 3 or 4 dimensions, none of which may
be zero in length. When a 4D array is given the first element is
selected as the 3D volume to be visualized.

SEE ALSO
volpack, SLgtk