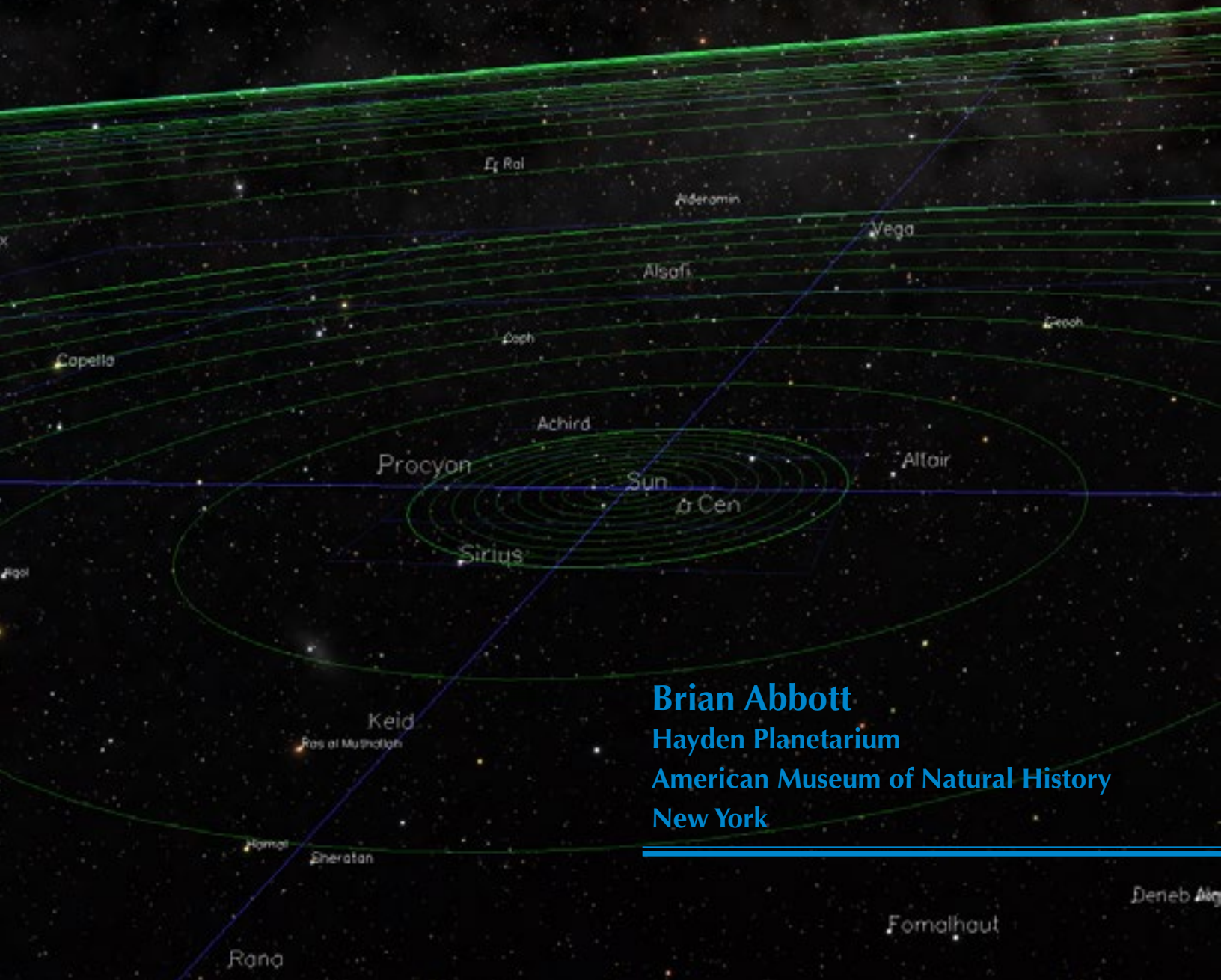# Partiview Quick Start Guide
Using Digital Universe
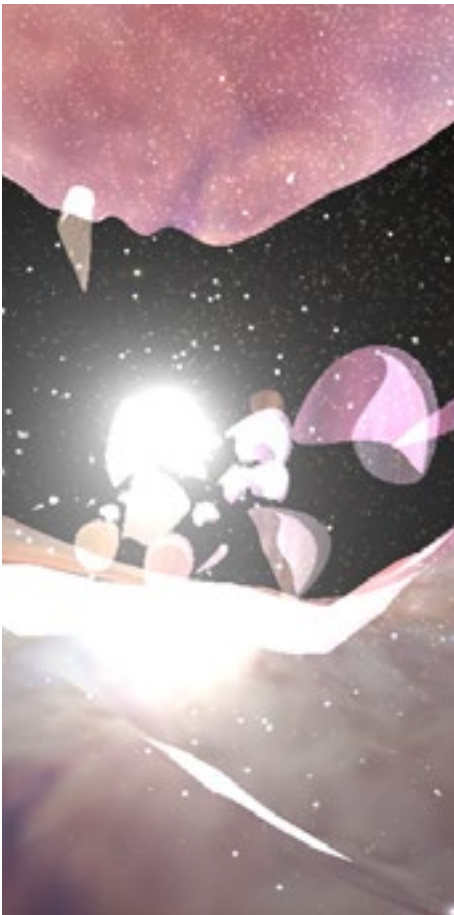
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About

Partiview is an open-source, cross-platform application developed by Stuart Levy at the National Center for Supercomputing Applications.

The app is impressively lightweight—it is about one megabyte in size—and is very efficient at rendering particle data in real time.

We adopted the software as a vehicle to explore the Digital Universe Atlas created at the American Museum of Natural History. Because Partiview cannot seamlessly handle the vast scales of the universe in one session, we divide of the atlas into the Milky Way, and everything outside the Milky Way—the Extragalactic.

The software is a bit counterintuitive, but is extremely powerful and versatile. This short guide will provide a basic understanding of the software and its interface, and will allow you to begin exploring the universe. See the Partiview Users Guide for more details on how Partiview works, importing your own data, and its commands.

Install

Installing Digital Universe for Partiview is straightforward.

Download the package for your operating system, unzip the downloaded file if necessary, and move the resulting folder wherever you like on your computer.

The install does not move files outside of this folder, so the package is self-contained and may be placed wherever you like.

Open the Milky Way Atlas

To launch the Milky Way portion of the Digital Universe, open:

For...	Open the file...
Windows	`milkyway.bat`
Mac	`milkyway.command`
UNIX	`milkyway.sh`

Opening the file will launch a terminal and then the Partiview software. The terminal will echo the commands it executes from the configuration file, `milkyway.cf`, for the Milky Way.

Point of Interest

The point of interest in Partiview is the point about which navigation is based. It is the point about which orbital motion is based.

Mouse Controls

Partiview is designed to function with a two- or three-button mouse. If you use a trackpad, it is possible to navigate in Partiview, but it is not as easy.

If you're using a single-button mouse on a Mac, you'll want to activate the right mouse button in the system preferences.

Flight Modes

Partiview has four flight modes: Fly, Orbit, Rotate, and Translate.

Orbit is the default mode, and allows you to orbit around the center of interest with the left button pressed. It also enables flying forward or backward with the right button pressed. The scale for this motion is logarithmic, so your speed increases the farther you are from the point of interest (the Sun).

Fly mode allows you to pan your view, that is, move your head without moving your feet, with the left button. The right button enables forward and backward motion, but at a constant speed.

The types of motion in Partiview include:

orbit	Revolve around the point of interest. If the point of interest is not in view, then you will orbit the point of interest but look forward, akin to looking away from the center of a carousel as you revolve around its center.
forward/reverse	With eyes forward (looking at the center of the display), moving forward or backward along your line of sight.
pan	Change your view without moving from your position.
rotate	Rotate the view about the point of interest. When the point of interest is in view, this produces a twisting motion parallel to your screen. If the point of interest is out of view, then the data will appear to approach from an angle, similar to the carousel analogy for orbit.
translate	Move in a direction parallel to the display, thereby moving the data across the display in the direction of mouse motion. This is equivalent to moving your feet sideways while keeping your eyes looking straight ahead.

Flight Mode	Mouse Button			Scale
	Left	**Middle**	**Right**	
Fly [f]	pan		forward	constant
Orbit [o]	orbit	select [p]	forward	log
Rotate [r]	orbit	select [p]	rotate	
Translate [t]	translate		forward	constant

To change the flight mode, use the Flight Mode Menu at the top-left, or use the keyboard shortcuts listed in the table.

The constant and logarithmic speed scales solve the long-distance problem. In a constant-speed flight mode, your forward and backward speed does not change once you release the mouse button. In a log more, the forward and backward motion speeds up as your distance from the point of interest increases. This allows you to traverse the large scales of the universe.

Select allows you to choose an object in the foreground. Selecting an object will return information about that object in the Console Window.

Active Data Group

Partiview can handle up to forty-seven data groups, each controlled by a button on the Group Buttons row in the interface.

In order to change the properties of a data set (brightness, color, etc.), that data set must be the active data group. The active data group is set by either right-clicking on the group button, or choosing the group from the Groups Menu. We find the former is easiest.

Partiview's User Interface

Partiview's graphical user interface (GUI) was written to be simple and compact. The buttons, sliders, and menus are designed to make navigation, data manipulation, and data group toggling effortless, but they result in an interface that looks foreign to most experienced computer users.

Most of Partiview's rich command set is not represented in the GUI. We recommend consulting the Partiview User's Guide for a list of commands and keyboard shortcuts.

Using the screen shot below or the Partiview session you just launched, let's investigate the GUI elements one by one.
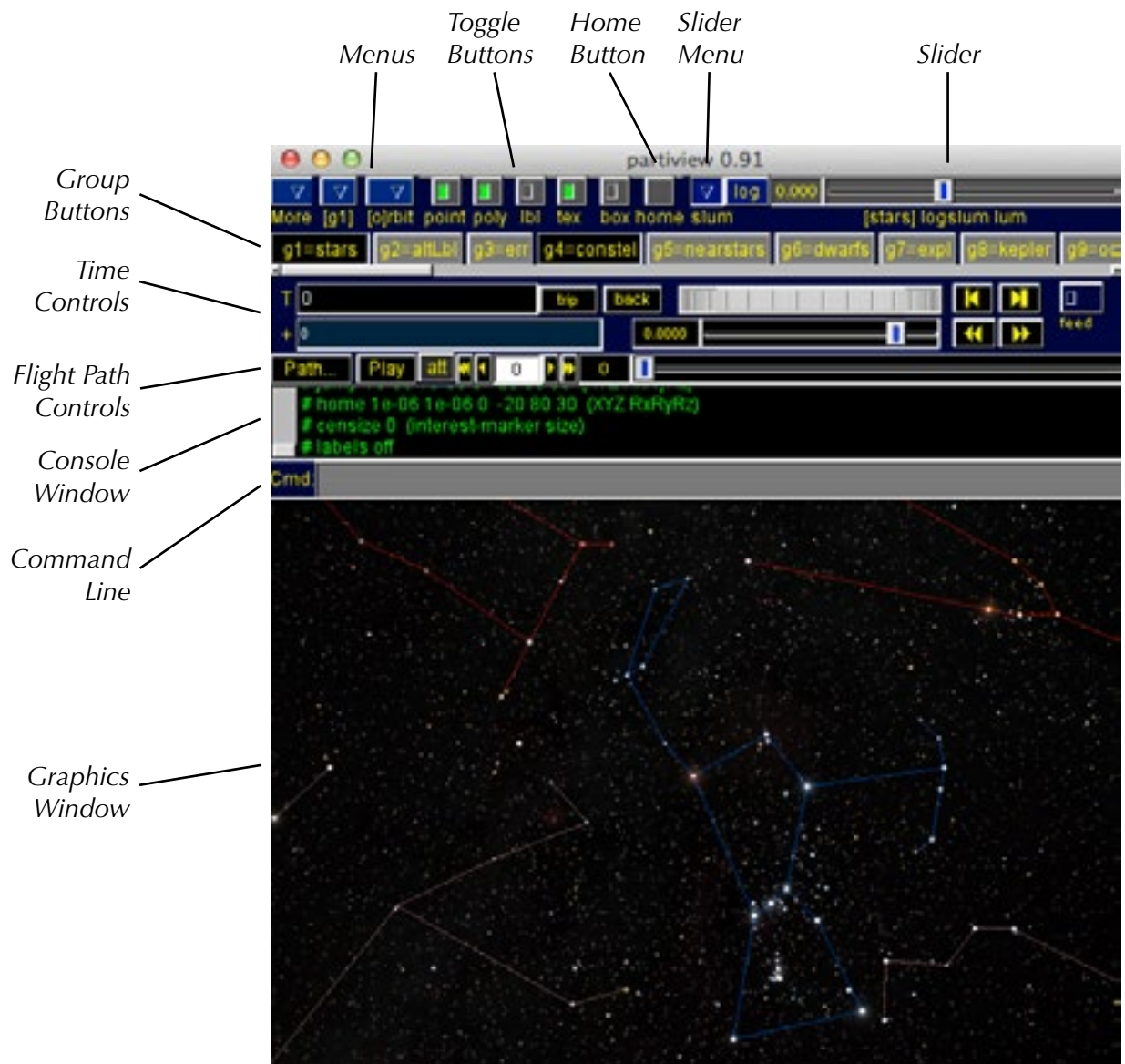
Menus

Menus are convenient for changing the active group and the flight mode, but are largely unnecessary once you know the keyboard shortcuts.

Most menu functions are more easily accessed via the keyboard shortcuts.

	More Menu	Contains two items that are rarely used. `Inertia` toggles the "drift" feature on and off when you are flying. `H-R Diagram` invokes a separate window where an H-R Diagram will be displayed, but is not implemented.
	Groups Menu	Choose the active data group. The active data group is displayed below the menu (here it is group 1, indicated by `[g1]`).
	Flight Mode Menu	Choose your flight mode. The active flight mode is indicated below the menu, indicated by `[o]rbit` in this example.

Toggle Buttons

The Toggle Buttons provide an easy on-off for point, images, and labels, and can turn any predefined boxes on and off.

If the active data group is off, the Toggle Buttons will be inactive. Turn the active group on, or set a new active group to restore their functionality.

	Point	Turn the points on and off for the active group.
	Polygon	Turn the polygons on and off for the active group.
	Label	Turn the labels on and off for the active group.
	Texture	Turn the textures (images) on and off for the active group.
	Box	Turn the boxes on and off for the active group.
	Home	Return to the 'home' position set by the home command in the config file. Home is near the Sun's position in Digital Universe.

Group Buttons

The group buttons offer easy access to your data groups.

Press them to turn a data group on and off.

Right-click on a button to make it the active data group. All changes to a data set like brightness, transparency, label size, can only occur if the data set is the active group.

💡 *To change the properties of a data set (brightness, etc.), the data group must be activated.*

Set the active data group by right-clicking on its group button.

If you're trying to change a data set and nothing is happening, it's most likely because it is not the active group.

Notice the small, horizontal scroll bar below the buttons. To reach those groups that lie outside the window, use this scroll bar.

If you're using Partiview with one data set, the group buttons will not appear in the interface.

Mouse Button	Function
Left	Turn the active group on or off
Right	Activate a group

Slider

The Slider enables the adjustment of various properties for the active data group, including brightness (`slum`), and transparency (`alpha`).

💡 *If the active data group is off, the Slider will be inactive. Turn the active group on, or set a new active group to restore the Slider.*

	Slider Scale Button	A toggle button between the logarithmic or linear scale (if available) for the active slider. See the following tables for the range on each slider in the log and linear modes.
	Slider	Use the blue value adjuster to alter the value of the active slider. The logarithmic or linear value is indicated to the left of the Slider. Below the slider you'll see the active data group and the linear value of the slider (except for the Slum Slider, which has no value shown).
	Slider Menu	A drop-down menu to select the slider function. Slider functions are described in the next table below.

Slider Menu

The Slider Menu sets the attribute on which the Slider acts.

alpha	Sets the opaqueness of an object or image.
FOV	Adjusts the field of view. We typically use values near 60°, "telescopic" views may be achieved with small values for the field of view.
censize	The size of the Cartesian point of interest marker. Values are in the units of the particular data you are viewing. For the Milky Way Atlas, the units of distance are parsecs (1 parsec = 3.26 light years). In the Extragalactic Atlas, the units are megaparsecs.
labelmin	Set the minimum pixel height for labels. For example, setting labelmin to 20 will draw labels only when they are more than 20 pixels high. This is useful if you want only the nearby labels displayed. Set this value to 0 pixels for all labels to be drawn.
labelsize	Set the height of the labels in pixels.
polysides	Adjust the number of sides of the polygons in the active group.
polysize	Set the size of the polygons.
slum	Scale the luminosity of the particles, increasing or decreasing their brightness.

💡 *Slum and Alpha are the two most useful Sliders.*

Slum scales the brightness for point-based data, like the stars, exoplanets, globular clusters by making them larger.

Alpha sets the transparency of images and polygons used for the all-sky surveys, the Milky Way, and particle polygons, like the globular clusters, as well as wire-frame models.

Slider	Linear Range	Log Range	Default Range
alpha	0–1	not available	linear
FOV	0–180	not available	linear
censize	0–10,000	0.001–10,000	log
labelmin	0–20	not available	linear
labelsize	0.01–1,000	0.001–1,000	log
polysides	3–16	not available	linear
polysize	0–10	0.001–10	log
slum	not available	0.001–31,623	log

Console Window & Command Line

Enter commands in the Command Line and see their output in the Console Window.

The Console Window shows the input and output to and from Partiview. Some commands issued by the user are echoed here in yellow, along with Partiview's response to them in green.

💡 *Partiview commands are listed in the Partiview User's Guide.*

Use the Command Line to enter Partiview commands interactively. To type in this line, focus must be given to this narrow, gray window. You can do this by either placing the mouse in this small space or use the Tab key to move the cursor to the Command Line. Use the up and down arrow keys to scroll through the history of commands issued.

Time Controls

Advanced

The time controls will appear only if there's a data set with time information.

In the Digital Universe, proper motion data are included in the stars data group. These controls will enable that motion. Press ◄◄ ►► to start the time backward or forward. Use the Speed Slider to adjust the speed.

T 0	**Time Display**	Black text box displays the current time. If an offset has been set using the Trip Button, this shows the offset from the trip meter. The absolute time is the sum of the T and + text boxes.
+ 0	**Reference Time Display**	If the Trip Button is pressed, this blue text box shows the reference time.
trip	**Trip Button**	Marks a reference in time. Sets the Time to zero and the Reference Time to the current time.
back	**Back Button**	Sets Time to zero. If the Trip Button has been set, this will return the time to the Reference Time.
	Time Dial	Fine-control time adjuster.
	Time Control Buttons	Adjust time by $(0.1 \times speed)$ data time units.
-0.0000	**Speed Slider**	Logarithmic control of the speed.
◄◄ ►►	**Speed Toggle Buttons**	Toggle time forward or backward.
feed	**Feed Button**	This button has no effect and was built into the GUI for future use.

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Flight Path Controls

Advanced

Partiview cannot record a flight path, it can only play one.

The flight path controls are used to play a preexisting flight path file. Partiview cannot record a flight path.

|		
Path...	**Path Button**	Load a flight path file.
Play	**Play/Stop Button**	Toggle the path animation on and off. Right-click on this button to adjust the play speed. `play 0.5` play at half speed `play 5` play 5 times as fast `play 5f` increases frame rate 5x
att	**att Button**	This button appears to have no function.
Frame controls	**Frame Controls**	Displays the frame number in the white box. advances the path by 1 frame. advances the path by 10 frames.
Slider	**Flight Path Slider**	Manually adjust the time, and, hence the position, on the path. Wall-clock path time is shown in the black text box to the left of the slider.

A flight path file can be constructed manually via routines that output the required format.

The flight path is described by the position, camera angles, and the field of view, in this format: x y z Rx Ry Rz fov. These seven numbers describe the parameters for one time step, so the file will be a list of such lines, saved in a .wf file. Once you have such a file, use the Path button to read it into Partiview and play it.

Digital Universe Files

Advanced

The underlying file structure and file types are not necessary to use the Digital Universe. But, we offer this information here for those who want to peek under the hood or add their own data.

The Digital Universe is a self-contained package in one folder. Inside you'll find the Partiview application, several start scripts, and data folders.

The data files for Digital Universe are contained in the `data` folder. Within that folder, you'll find the two configuration files: `milkyway.cf` and `extragalactic.cf`. These contain the initial settings for all the data groups and configure the Partiview session. Each of them are merely a series of Partiview commands that load data files, set characteristics like brightnesses, colors, and label size.

You can alter these files to customize the Digital Universe. More detail on these commands is described in the Partiview User's Guide.

Common file types in the Digital Universe are:

File Type	File Extension	Description

Launcher Files	`*.bat`
	`*.command`
	`*.sh`
		Double-click on these files to launch the Milky Way Atlas or the Extragalactic Atlas. (You will have only one of these, depending on your operating system.)

Data Files	`*.speck`
	`*.label`
	`*.cmap`
	`*.obj`
		Data and data variable commands
		Labels for the data
		Color map data
		Surface data

Images	`*.pbm` `*.sgi`	Image files
Configure Files	`*.cf`	Initialization commands and configure options. Customize the atlas with these files.

Keyboard Controls

Partiview keyboard shortcuts may be used in lieu of point-and-click interface elements. These are the most useful shortcuts for the beginner.

A complete list of Partiview shortcut keys may be found in the [Partiview Reference Manual](#).

Key	Function
[tab]	Changes the focus to the Command Line
[esc]	Quit
f	Change to Fly Flight Mode
o	Change to Orbit Flight Mode
r	Change to Rotate Flight Mode
t	Change to Translate Flight Mode
[shift]	Finer control during flight
cw	Reset the position to (x,y,z) = (0,0,3)
p	Pick the nearest object under the mouse cursor
[shift]-p	Change the point of interest to the selected object
s	Toggle stereo viewing mode on and off

More Information

Partiview is developed by Stuart Levy at the National Center for Supercomputing Applications. Their [Partiview website](#) has links to other resources and documentation. These include a more through discussion of accessing the source code, a list of Partiview commands, and data manipulation.

Documentation
[Partiview Users Guide](#), by Brian Abbott
[Partiview Reference Manual](#), by Peter Teuben and Stuart Levy

License
The terms and conditions for the use and distribution of the data viewer, Partiview, may be viewed on the [Partiview website](#).