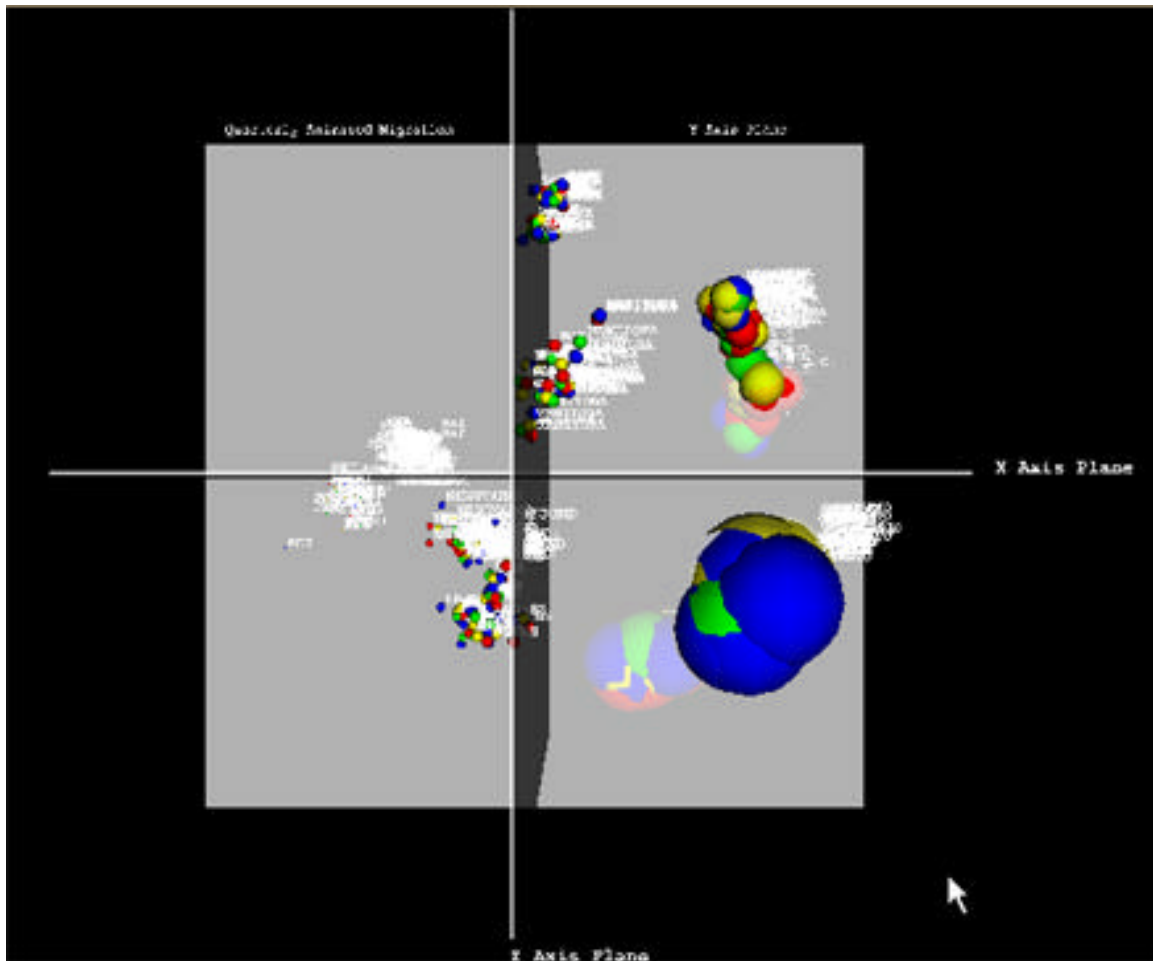


# Jacob's Ladder 10.0



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# Application Specifications

## Requirements

**Jacob's Ladder**© 10.0 is a self-contained application for Windows and should run on Windows 95/98/NT/2000/ME/XP<sup>1</sup>. The more memory and processor you have, the faster it will run.

## Installation

**Jacob's Ladder**© is a non-invasive application and can be placed in any directory. It is provided with example files and this documentation and can be setup with a short-cut on the desktop or run directly from the command line.

Execute the **install.exe** on the provided CD to extract the data to the default folder (C:\Program Files\JacobsLadder). The folder will be created if it does not already exist.

The folder should contain the following files:

JL_10.exe	The Jacob's Ladder Executable
JL 10.pdf	This document (Documentation)
Ex.animation.def	Animation Example Definition File
Ex.animation.xls	Animation Example Data File
Ex.animation.wrl	Animation Example Output VRML File
Ex.still.def	Still Example Definition File
Ex.still.xls	Still Example Data File
Ex.still.wrl	Still Example Output VRML File/
Ex.animation.as.still.def	Animation viewed as Still Definition File
Ex.animation.as.still.wrl	Animation viewed as Still Output File

You can add an icon to your desktop by creating a new shortcut to the application C:\Program Files\JacobsLadder\JL\_10.exe.

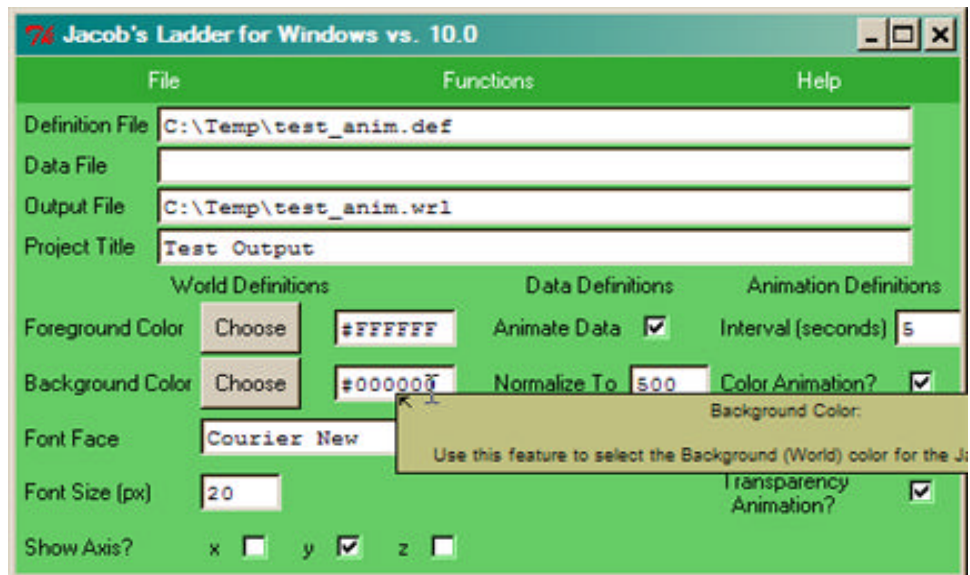
## Known Bugs / Issues

1. Radii animation feature is currently disabled for accuracy and bug review.
2. Viewpoints are not provided in this version so the default viewpoint is at 0,0,0 – this often results in being too close to the data. For now, just hit the “Fit” button provided with the Cortona Viewer™ to zoom out to a better “default” position.
3. **You must re-load your data prior to running Jacob's Ladder a second time on said data.** This problem is a primary concern for the next release.

---

<sup>1</sup> Testing has only occurred in a Windows XP environment however Perl2Exe™ states the compiler creates executables that will work on the listed OS versions.

## Getting Help



Jacob's Ladder provides multiple help options including this manual. You can move your mouse over any input field to get on-demand help as the diagram above shows.

## Contacting the Author

You can contact the author by E-mail at [Sarg\\_6669@yahoo.com](mailto:Sarg_6669@yahoo.com) or regular mail at:

Benjamin Elbirt  
CO. The Galileo Matrix  
1 Bristol Court, Suite D  
Amherst, NY 14228

## Statement of Purpose

**Jacob's Ladder**© is a conversion program for creating multi-dimensional VRML representations of data systems. The first seven (7) versions of this software were dedicated to processing the Galileo™ and Catpac™ Coordinate systems,<sup>2</sup> however this version can process any data so long as it fits within the pre-defined input file format.

## Overview

**Jacob's Ladder**© is now version 10 which is the re-write of the 2004 version 7.4. It takes advantage of advancements in Perl™ and changes in the VRML language and can finally be used as a window environment executable.

The primary features include:

- Environment specification [background / foreground / varying X,Y,Z axis combinations / axis color / origin].
- Spherical representations of data elements with control for radius, transparency and color.
- Data normalization for spatial expansion and contraction.
- Dimensional color, transparency and radii value specification.
- Multiple "still" data displays in one VRML file.
- Animation of data over time with optional color and transparency animation.

## Viewing the VRML Output

There are various VRML viewer plug-in files for browsers available and they come and go with the times. The Cortona™ Viewer (<http://www.parallelgraphics.com/products/cortona/>) is the plug-in for Internet Explorer currently used to test the VRML WRL files.

## Looking Forward

This application is a scientific exercise in visualization of data and is linked with other projects by the author (The Galileo Matrix [www.thegalileomatrix.com](http://www.thegalileomatrix.com) among others). Constant updates and changes will be made and release availability notification will be made to those who register their e-mail when they obtain a copy.

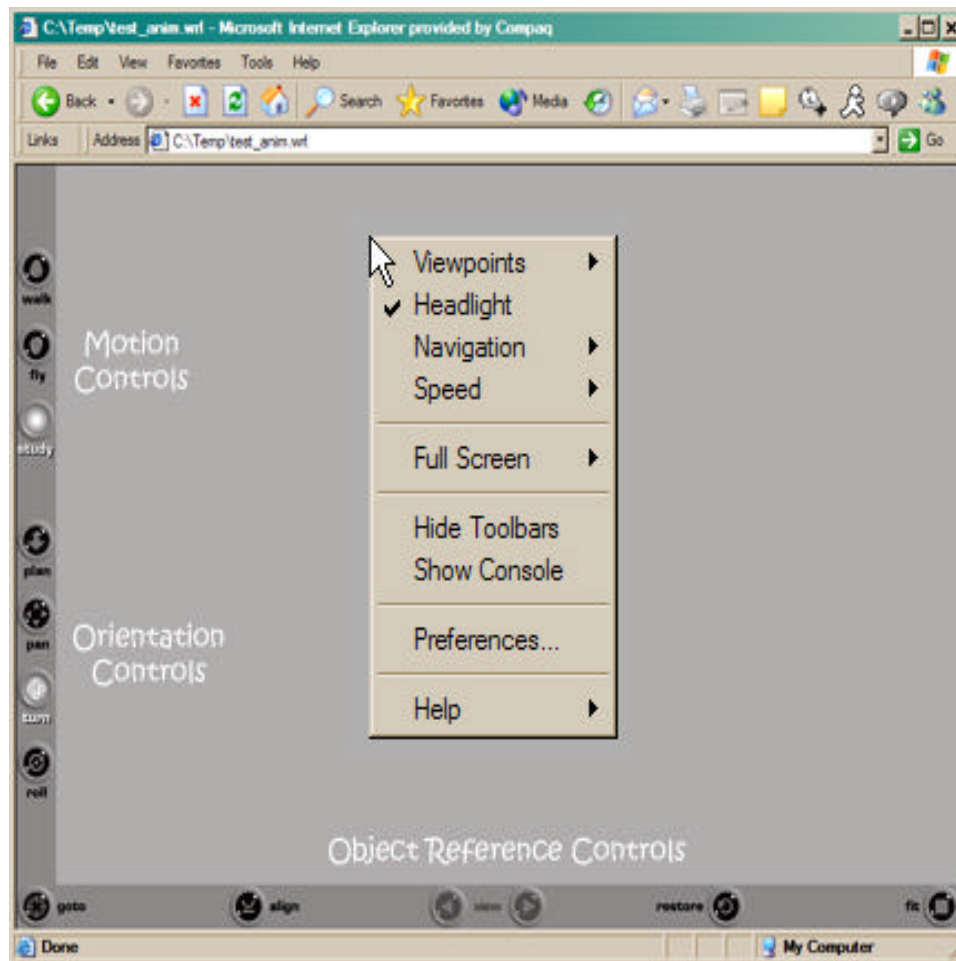
---

<sup>2</sup> Galileo, Catpac, Catpac II, Wolfpa, ThoughtView, Listiac, Oresme, Microgal, Microrot, AMG, Automatic Message Generator, are Copyrights © and/or Trademarks of The Galileo Company (<http://www.galileoco.com>)

## ***Planned Updates***

1. Know It All Reporting – This feature will provide a report about the input data and the resulting VRML output including, but not limited to, warnings and errors related to the interaction of the various spreadsheets.
2. Radii animation and normalization to the space.
3. Box representation vs. sphere for 6 dimensional color and transparency representations [1 per face].
4. “Quick Scripts” for converting SPSS™, Galileo™, CatPac™ and other “standardized” output formats to the MS Excel™ format required by Jacob’s Ladder.
5. Start / Stop features to the Animation for time period specific “hot jumps” – this feature would take advantage of the Viewpoint Cortona™ VRML Viewer functionality on a time-period basis.
6. User controlled animation time sliding – This feature will allow the user to click and drag a timeline and see the changes as a function of the speed in which they drag the timeline.
7. Standard Viewpoints – this feature will allow the user to quickly jump to various points of interest directly noted in the VRML space.
8. Message Generator – this feature is a Galileo™ process that allows someone to generate messages based on the direct alteration of the Galileo Space™.
9. Connective Strings – this feature would connect the various objects with tube or string like objects that represent the connection relationship between those objects.
10. Object Focus – this feature would allow the user to alter the output space by focusing on the specific object [making it the origin of the space].
11. Still with Animation – this feature would allow the creation of animated VRML content WITH still content in the same VRML space.
12. Real-Time interactive updates through data streaming.

## Using the Cortona™ VRML Viewer



The Cortona VRML Viewer™ has three (3) basic control sections – the Motion Controls, Orientation Controls and Object Reference Controls. There are special configuration options available when you “right click” your mouse [windows]. Please refer to the diagram above for the general location of these controls.

### ***Motion Controls***

These controls allow you to navigate through the VRML space and, with the Orientation Controls, determine the means in which you will do that navigation. All axes in the following descriptions assume you are in the default orientation and position the VRML loads to.

Note: “Walk” and “Fly” are the same features with restrictions for VRML worlds that use gravity and object collision. The only difference in the Jacob’s Ladder VRML space is that “Walk” does not allow you to “Roll” where “Fly” does.

“Walk” with “Plan” allows you to walk forward or back (Z axis) and change your point of view left or right (X Axis), but not UP or Down (Y axis). In other words, you can walk forward or backward, and turn to your left or right as you are walking, but you cannot look or move up or down.

“Walk” with “Pan” allows you to move forward, backward (Z axis), left or right (X axis), but does not allow you to move UP or Down (Y axis) or *change your point of view* in any direction. You are always looking forward and either side stepping or forward / backward stepping.

“Walk” with “Turn” allows you to change your point of view (X and Y axis), but no motion on any axis is possible. This is used to set your point of view without worrying about physically moving from the physical space you are in.

“Fly” with “Roll” allow you to rotate the space on any axis based on the current center point of view. Imagine standing **in** a large pipe and being rolled.

“Study” and “Plan” allow you to rotate the world objects on the X Plane based on YOUR current position.

“Study” and “Pan” allows you to move your position with regard to the object on the X and Y axis; however orientation and point of view remain constant.

“Study” and “Turn” allow you to rotate the world in relation to YOUR current position on any of the three axis (X, Y and Z). “Study” and “Roll” does the same thing.

## ***Object Reference Controls***

These controls are quick reference for specific positions and orientations in the VRML space.

“Go To” allows you to quickly move to the center of the object you click on. **Remember, you must be able to physically see the object [no barriers] to click on it.** This feature will often zoom in too close and will require using the “Walk” feature to move back from the object.

“Align” will re-orient your point of view with relation to the object so you are on the normal X, Y, Z plane perspective. This often leaves the user looking in a completely odd area of space rather than the intended one and should be used carefully.

“View” provides the user with the ability to scroll through the various Viewpoints placed within the VRML. These viewpoints are often “quick links” to various areas of interest.



“Restore” will place the viewer in the original / default position the VRML file loads in.

“Fit” will alter the viewer’s position so the ENTIRE world space is visible under the current orientation.

## ***Configuration Options***

This menu gives you a quick and easy way to reference various elements previously described and some additional features not common to the viewer space.

The Viewpoints list is the same one used with the “View” Object Reference Control.

Headlight is a spotlight that points in the direction you are facing so you can see the objects in front of you when there are no artificial lighting features provided in the VRML world. Jacob’s Ladder currently requires the use of the Headlight as world lighting has not been researched for potential effect on data display.

Navigation provides a quick list of Motion Controls as previously described.

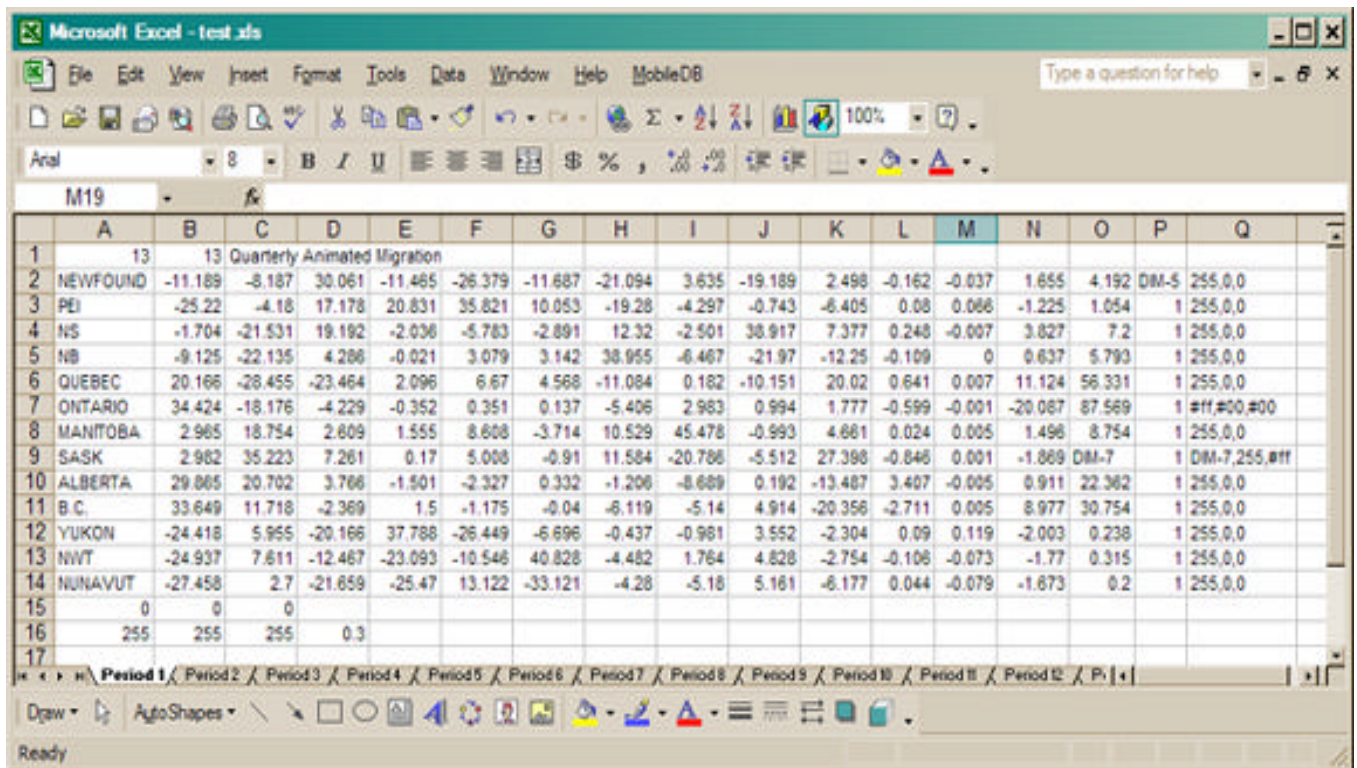
Speed allows you to configure how fast the VRML space adjusts to your motion and orientation controls.

The rest of the controls are advanced and you should consult the software documentation. The official Cortona VRML Viewer™ user guide is located at <http://www.parallelgraphics.com/developer/products/cortona/help>.

## The Input File – Pre-formatting the Data

This is where the fun really begins, because you get to do so much with regards to your display by massaging your inputs and configuring the definitions Jacob's Ladder will look for. The current input file format is a Microsoft Excel™ spreadsheet file for the following reasons:

1. It is really easy to use.
2. This is a Windows Application so it should use related resources.
3. It is really easy to import any form of data into MS Excel™, where writing a converter for all programs available is beyond the scope of the current version of the application.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	13	13	Quarterly Animated Migration														
2	NEWFOUND	-11.189	-8.187	30.061	-11.465	-26.379	-11.687	-21.094	3.635	-19.189	2.498	-0.162	-0.037	1.655	4.192	DM-5	255,0,0
3	PEI	-25.22	-4.18	17.178	20.831	35.821	10.053	-19.28	-4.297	-0.743	-6.405	0.08	0.066	-1.225	1.054	1	255,0,0
4	NS	-1.704	-21.531	19.192	-2.036	-5.783	-2.891	12.32	-2.501	38.917	7.377	0.248	-0.007	3.827	7.2	1	255,0,0
5	NB	-9.125	-22.135	4.286	-0.021	3.079	3.142	38.955	-6.467	-21.97	-12.25	-0.109	0	0.637	5.793	1	255,0,0
6	QUEBEC	20.166	-28.455	-23.464	2.096	6.67	4.568	-11.084	0.182	-10.151	20.02	0.641	0.007	11.124	56.331	1	255,0,0
7	ONTARIO	34.424	-18.176	-4.229	-0.352	0.351	0.137	-5.406	2.983	0.994	1.777	-0.599	-0.001	-20.087	87.569	1	#ff,#00,#00
8	MANITOBA	2.965	18.754	2.809	1.555	8.608	-3.714	10.529	45.478	-0.993	4.681	0.024	0.005	1.496	8.754	1	255,0,0
9	SASK	2.982	35.223	7.261	0.17	5.008	-0.91	11.584	-20.788	-5.512	27.398	-0.846	0.001	-1.869	DM-7	1	DM-7,255,#ff
10	ALBERTA	29.865	20.702	3.766	-1.501	-2.327	0.332	-1.206	-8.689	0.192	-13.487	3.407	-0.005	0.911	22.362	1	255,0,0
11	B.C.	33.649	11.718	-2.369	1.5	-1.175	-0.04	-6.119	-5.14	4.914	-20.356	-2.711	0.005	8.977	30.754	1	255,0,0
12	YUKON	-24.418	5.955	-20.166	37.788	-26.449	-6.696	-0.437	-0.981	3.552	-2.304	0.09	0.119	-2.003	0.238	1	255,0,0
13	NWT	-24.937	7.611	-12.467	-23.093	-10.546	40.828	-4.482	1.764	4.828	-2.754	-0.106	-0.073	-1.77	0.315	1	255,0,0
14	NUNAVUT	-27.458	2.7	-21.659	-25.47	13.122	-33.121	-4.28	-5.18	5.161	-6.177	0.044	-0.079	-1.673	0.2	1	255,0,0
15	0	0	0														
16	255	255	255	0.3													
17																	

## Excel File Organization

The file is organized on a very simple level and allows you to add additional, non Jacob's Ladder content to the spreadsheet so long as it does not appear in an expected Jacob's Ladder data definition area. This facilitates multiple usages for the Excel file beyond Jacob's Ladder and keeps everything together.

Each Excel file contains multiple Spreadsheets, and each unique set of data should be confined to its own unique spreadsheet. This is the case if you are animating or producing a series of still images. Jacobs Ladder will

expect a single set of data for every spreadsheet provided and will ignore anything outside of the scope of the expected set.

The first thing to note about the file is the multiple spreadsheets. As the diagram above shows, more than 12 spreadsheets are a part of the file and each one is named “Period N” where N is some number.

**FEATURE:** If you do not specify an explicit title for your spreadsheet it will be assigned for you as the name specified in Excel for that spreadsheet.

## Spreadsheet Contents

With the file layout defined we can define each spreadsheet as follows:

	A	B	C	D	E
1	13	13	Quarterly Animated Migration		
2	NEWFOUND	11.189	8.187	20.061	11.465

Row 1, Col A = Number of Data Labels / Concepts.

Row 1, Col B = Number of Spatial Dimensions of Data.

Row 1, Col C = Explicit Title to use.

This first row is the “header” that outlines how to read the rows that follow. Jacob’s Ladder will read in all rows from 2..(A+1) where A is the number of Data Labels / Concepts specified in Row 1, Col A. It will also read horizontally along the columns from 2..(B+1) where B is the number of Spatial Dimensions of Data specified in Row 1, Col B<sup>3</sup>.

2	NEWFOUND	-11.189	-8.187	30.061	-11.465	-26.379	-11.667	-21.094	3.635	-19.189	2.496	-0.162	-0.037	1.655
3	PEI	-25.22	-4.18	17.178	20.831	35.821	10.053	-19.28	-4.297	-0.743	-6.405	0.08	0.066	-1.225
4	NS	-1.704	-21.531	19.192	-2.036	-5.783	-2.891	12.32	-2.501	38.917	7.377	0.248	-0.007	3.827
5	NB	-9.125	-22.135	4.286	-0.021	3.079	3.142	38.955	-6.467	-21.97	-12.25	-0.109	0	0.637
6	QUEBEC	20.166	-28.455	-23.464	2.096	6.67	4.568	-11.084	0.162	-10.151	20.02	0.641	0.007	11.124
7	ONTARIO	34.424	-18.176	-4.229	-0.352	0.351	0.137	-5.406	2.983	0.994	1.777	-0.599	-0.001	-20.087
8	MANITOBA	2.965	18.754	2.609	1.555	8.608	-3.714	10.529	45.478	-0.993	4.661	0.024	0.005	1.496
9	SASK	2.982	35.223	7.261	0.17	5.008	-0.91	11.584	-20.786	-5.512	27.398	-0.846	0.001	-1.869
10	ALBERTA	29.865	20.702	3.766	-1.501	-2.327	0.332	-1.206	-8.689	0.192	-13.487	3.407	-0.005	0.911
11	B.C.	33.649	11.718	-2.369	1.5	-1.175	-0.04	-6.119	-5.14	4.914	-20.356	-2.711	0.005	8.977
12	YUKON	-24.418	5.955	-20.166	37.788	-26.449	-6.696	-0.437	-0.981	3.552	-2.304	0.09	0.119	-2.003
13	NWT	-24.937	7.611	-12.467	-23.093	-10.546	40.626	-4.482	1.764	4.626	-2.754	-0.106	-0.073	-1.77
14	NUNAVUT	-27.458	2.7	-21.659	-25.47	13.122	-33.121	-4.28	-5.18	5.161	-6.177	0.044	-0.079	-1.673

The values specified for the dimensional data can be +/- floating points and they MUST exist from Row 2 forward. The first Column (A) of each row is the data label name and each subsequent column is the dimensional data. The total columns should be 1 + the number of total dimensions.

There are three additional columns of data that appear at the end of the last dimension data for the Number of Spatial Dimensions of Data specified in Row 1, Col B. These three columns are, in order, the RADIUS, TRANSPARENCY and COLOR definitions.

<sup>3</sup> The program that reads the data and interfaces with the spreadsheet does not read columns as alpha character combinations. It uses numerical referencing.

## RADIUS

The Radius is used in determining the VRML object size and the value can either be some number greater than zero (  $0 < N$  ) or a reference to a value in one of the dimensions of space NOT including the first three dimensions of space (  $3 < N$  ).

Animation does not occur on radii at this time, however varying radii specifications do display in still VRML worlds. Animation is planned for the next release.

**Note:** In general, your radii should be no larger than 1/5 (20%) of the normalization size. So, if you have a normalization of 500, you should try and keep your radii under 100. This will ensure a more visible coordinate system where objects don't engulf other objects.

O	P	Q
4.192	DIM-5	255,0,0
1.054	1	255,0,0
7.2	1	255,0,0
5.793	1	255,0,0
56.331	1	255,0,0
87.569	1	#ff,#00,#00
8.754	1	255,0,0
DIM-7	1	DIM-7,255,#ff
22.362	1	255,0,0
30.754	1	255,0,0
0.238	1	255,0,0
0.315	1	255,0,0
0.2	1	255,0,0

## TRANSPARENCY

This value determines how visible the object is (transparent). VRML reads transparent as a value of one and opaque as a value of zero (  $0 \leq T \leq 1$  ). Data, however, would normally consider a *larger* value to be more transparent. This *reversal* of logic is covered by the application so ALL values provided should be done such that zero is transparent and one is opaque (  $1 \leq T \leq 0$  ). All dimensions of space used are normalized to values between zero and one.

## COLOR

This value is one of the greatest features added to Jacob's Ladder with the 10.0 release. VRML colors are specified as a function of RGB (Red Green Blue). This provides the ability to define up to 16 million variations of color.

As per RADII and TRANSPARENCY, the value specified here can be related to a dimension of space. It can also be specified as a function of RGB color codes (  $0 \leq N \leq 255$  ) or HTML color codes using Hexadecimal (  $0 \leq N \leq f$  ) referencing.

Unlike the RADII and TRANSPARENCY, this value is broken down into three parts and they are listed with comma delimitation. Example:

**255,255,0**

## Defining Dimensions for Values

So, you want to use a dimension of space to represent your radius, transparency or colors? Want to know how? It is REALLY easy. Make the value: **DIM-#** where # is the dimension of space to refer to. Example:

**DIM-5**

## Radii / Transparency / Color Examples

- Radii

**DIM-6**

**0.5**

**5385**

- Transparency

**DIM-6**

**1**

**0**

**.583583058**

- Colors

**DIM-5,DIM-6,DIM-7**

**255,255,0**

**#ff,#00,#ff**

**DIM-5,255,#00**

## The Final 2 Lines

15	0	0	0	
16	255	255	255	0.3

The last two lines in the excel spreadsheet are for defining the origin of the space and the axis color / transparency.

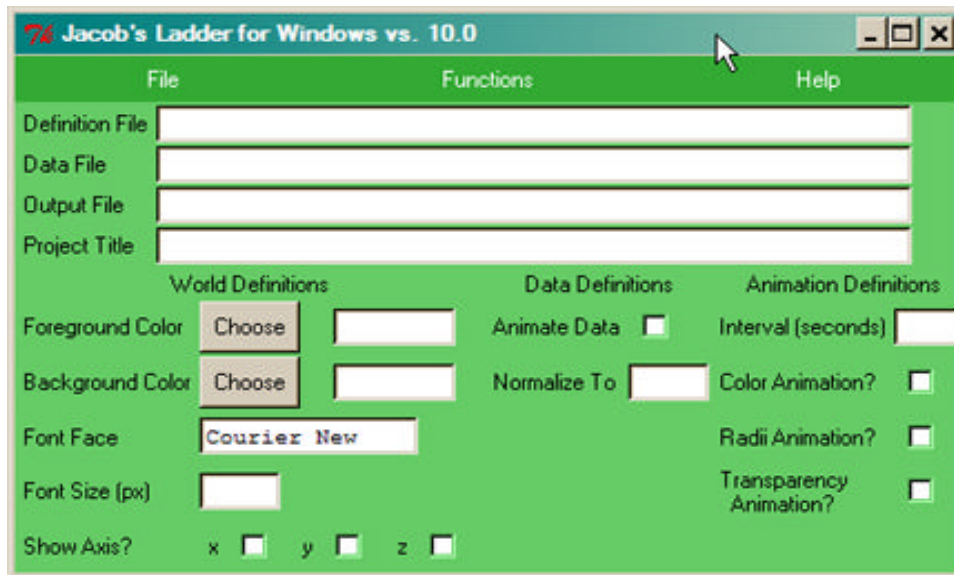
The origin should be specified as an X, Y, Z coordinate point in space and the X should appear in "Cell A", the Y should appear in "Cell B" and the Z should appear in "Cell C".

The axis colors are RGB (  $0 \leq N \leq 255$  ) and should be specified in the same format as the origin on the row that appears *after* the origin specification. The transparency value (  $0 \leq N \leq 1$  ) should appear in "Cell D" of the axis definition row where 0 is OPAQUE and 1 is TRANSPARENT.

**Note:** When defining your ORIGIN position you need to consider your axis in relation to the data. If you normalize your data to a space of 500, you will likely want to define a distance between origins of  $((2*500) + (500/5))$  or 1100. This will put about 50 units of space between each axis space and the next.



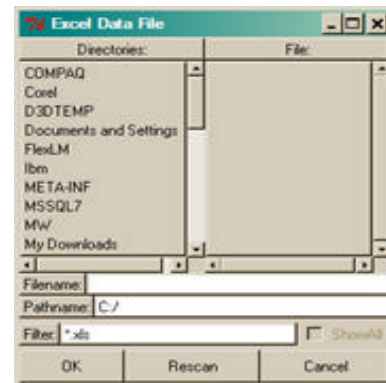
## The Jacob's Ladder Interface



The Jacob's Ladder interface provides various controls for creating the final Jacob's Ladder VRML output. These controls can be loaded and saved via the "File" menu provided at the top left corner of the interface.

To create the final Jacob's Ladder VRML outputs simply use the "Functions" menu at the top of the interface and select "Jacob's Ladder."

Each of the "File" menu options uses the interface to the right and will key to the specific extension expected when performing a search. You can specify the Filename contents in the "Filename" field at the bottom of the interface when saving the Definition file or specifying the Jacob's Ladder Output File. Loading functionality only allows existing files to be specified.



1. **Definition File** – This is the name of the file you loaded / saved as the definition currently in use. To load or save a file, use the "File" menu options "Load Definition File" and "Save Current Definition" respectively.

Specification of the File Name for load / save is done in the interface provided when activating the "File" menu options. This limitation is specifically provided to reduce the potential for file I/O errors.

Definition files should end with the .DEF extension name and are

defaulted as such when searching. The files Ex.animation.def and Ex.still.def are example definition files.

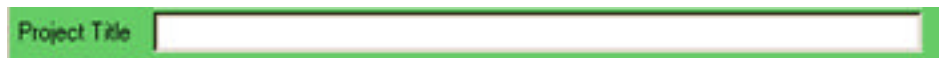
2. **Data File** – This is the Microsoft Excel™ file that contains your data and can be loaded / specified with the “File” menu option “Load Data File”. It will default to the .xls file extension when searching for files. Ex.animation.xls and Ex.still.xls are example data files.
3. **Output File** – This is the filename and location for output of the Jacob’s Ladder VRML. The definition file will retain the last specification of this file as the default output file name / location for future uses of the definition file. Ex.animation.wrl and Ex.still.xls are example output files.

This file is specified through the “File” menu option “Specify Output File” and should *always* have the extension .WRL for proper browser / Cortona Viewer™ recognition.



A screenshot of a software interface with a green header bar. Below the header, there are three horizontal input fields. The first field is labeled 'Definition File', the second 'Data File', and the third 'Output File'. Each field has a small green icon to its left.

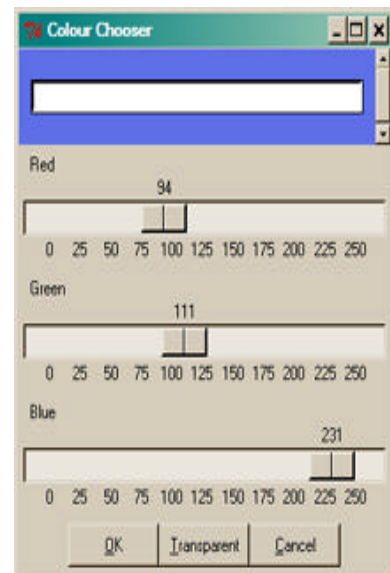
4. **Project Title** – This is an open-text area you can specify the global project title. This information is stored as a META tag in the Jacob’s Ladder VRML output file.



A screenshot of a software interface showing a single horizontal input field with a green header bar above it. The field is labeled 'Project Title'.

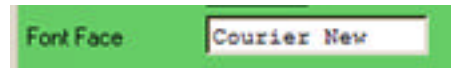
5. **Foreground / Background Color** – These specifications are the colors to use as the primary background of the VRML world and the Foreground (Text) in the same VRML world. They should be contrasting [black on white, white on black, white on red, red on white, etc.] enough for the data to be visible. Black background with White Foreground is recommended.

The color chooser interface show above is used to pick your foreground and background color. You can also use this tool as a reference when determining RGB color codes for the MS Excel™ data sheets.

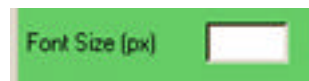


6. **Font Face** – This is the font name to use for displaying the VRML text information and can be *any font that you have*

*local to your PC.* However, if the font is not available to the viewer on other PC's, then they will likely be unable to see the VRML content.<sup>4</sup> Common fonts like "Courier New", "Arial", and "Times New Roman" are recommended for easy cross-platform readability.

A green rectangular button with the text "Font Face" on the left and a text input field containing "Courier New" on the right.

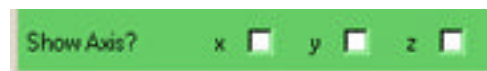
7. **Font Size** – This is the size of the font to use in the display. As you *normalize* your space and view the output you will find that the font size may need to change to fit with your data. Use this field to specify any floating point value greater than zero ( $0 < N$ ).

A green rectangular button with the text "Font Size (px)" on the left and an empty text input field on the right.

8. **Show Axis** – This feature allows you to specify if you want to have the axis displayed when creating the VRML world. Axis provide a reference point for measuring distances between the points in your data, however they are not necessary for the display of your data.

Animation displays will only show the first spreadsheet axis definition and will ignore all other definitions within the data Excel file.

You can specify if you want the X, Y or Z axis or any combination there of.

A green rectangular button with the text "Show Axis?" on the left and three checkboxes labeled "x", "y", and "z" on the right.

9. **Animate Data** – This feature allows you to specify if the data set is an animation or a still. Check this option to animate the data.

A green rectangular button with the text "Animate Data" on the left and an unchecked checkbox on the right.

10. **Normalize To** – This feature allows you to *normalize* your world to any integer size greater than zero ( $0 < N$ ). Leave this value blank if you do not want to normalize your data.

Please see the following chapter on data normalization for more information on the process and how it affects your data.

A green rectangular button with the text "Normalize To" on the left and an empty text input field on the right.

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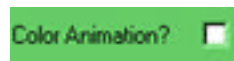
<sup>4</sup> This issue has not been tested and the VRML *may* default to a font or simply report an error on load.



11. **Interval (seconds)** – This feature is used when animating the data and specifies the interval, in seconds, for each period of the animation. So, if you have 30 spreadsheets in your Excel file, and you specify an *Interval* of 5 (seconds), your animation will last 150 seconds [2 minutes 30 seconds] with five second intervals between each spreadsheet of the data.



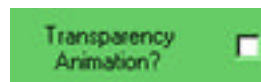
12. **Color Animation** – This feature is the on/off switch for animating the colors when performing an animation of the data. Color settings for spreadsheets 2 through N are ignored when this option is OFF and the colors on the first spreadsheet are used throughout the animation.



13. **Radii Animation** – This feature is the on/off switch for animating the radius sizes for the objects when performing an animation of the data. *This feature is currently disabled for debugging and accuracy review*



14. **Transparency Animation** – This feature is the on/off switch for animating the transparency of the objects when performing an animation of the data. The transparency values are read and converted as per the data file definition previously described.



## Normalization – Post Input Data Augmentation

Data normalization is the process of altering all values of a given set of data equally to grow or shrink the VRML space. This is achieved by reading in each value of data, determining the maximum value, and creating a multiplier that alters that maximum value to the normalization value. The multiplier is then used to alter all values in the data set.

### Example:

Data Set = [1, 5, 7, 32, 64, 29, 80]

Normalization = 10

Largest Value = 80

Multiplier =  $10/80 = .125$

New Data Set = [0.125, 0.625, 0.875, 4, 8, 3.625, 10]

In Jacob's Ladder 10.0 **all** dimensions of space are normalized with this procedure. Any dimensions used for radii, transparency or color are normalized AFTER the radii, transparency or color values are obtained as these features normalize on a different scale.

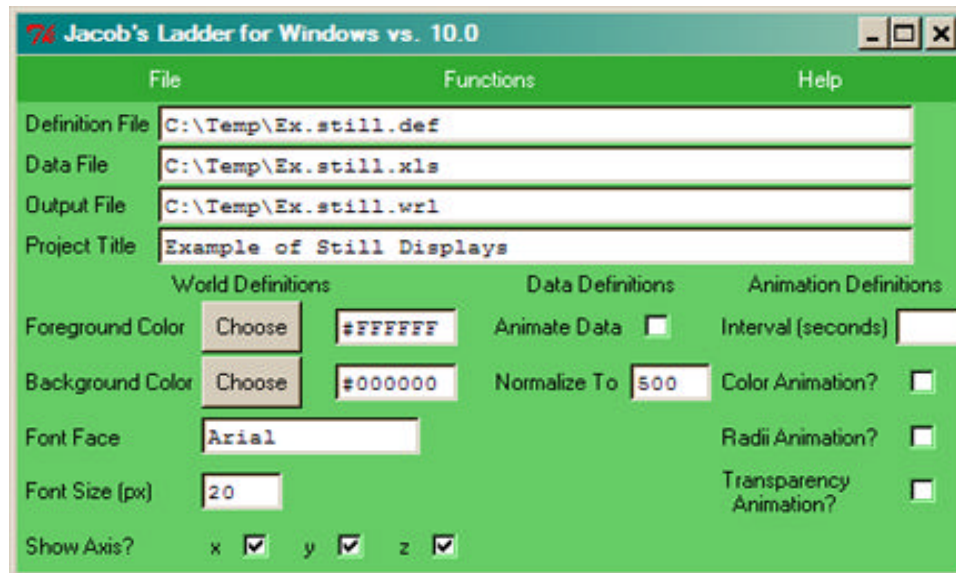
Transparency is normalized to a value of zero to one (  $0 \leq N \leq 1$  ) and Colors are normalized to RGB values (  $0 \leq N \leq 255$  ).

Radii Normalization is planned for the next release, where you can specify the normalization value (maximum radius) you want to use. The reason radii are not normalized as per the overall space is the fact that radii can be proportionally larger or smaller as compared to the space and may require augmentation for visibility that differs from the normalization used on the space.

## Example Files

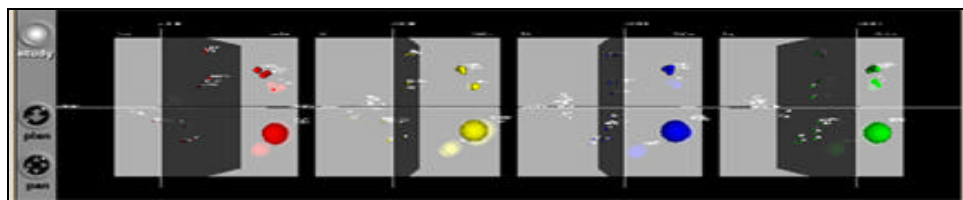
The examples use data provided by Dr. George Barnett of the State University of New York, at Buffalo. Special thanks to Dr. Barnett for his assistance in the development of Jacob's Ladder. All example files provided have been keyed to the C:\Program Files\JacobsLadder\ directory structure even though the examples show the C:\Temp\ directory usage.

### ***Static Coordinate System***



This example uses the Ex.still.def and Ex.still.xls files and produces the Ex.still.wrl file.

The final results are four (4) coordinate spaces that represent the four seasons – summer (Red), fall (Yellow), winter (Blue) and spring (Green). Each coordinate space has three (3) specific time periods shown for the given quarter.

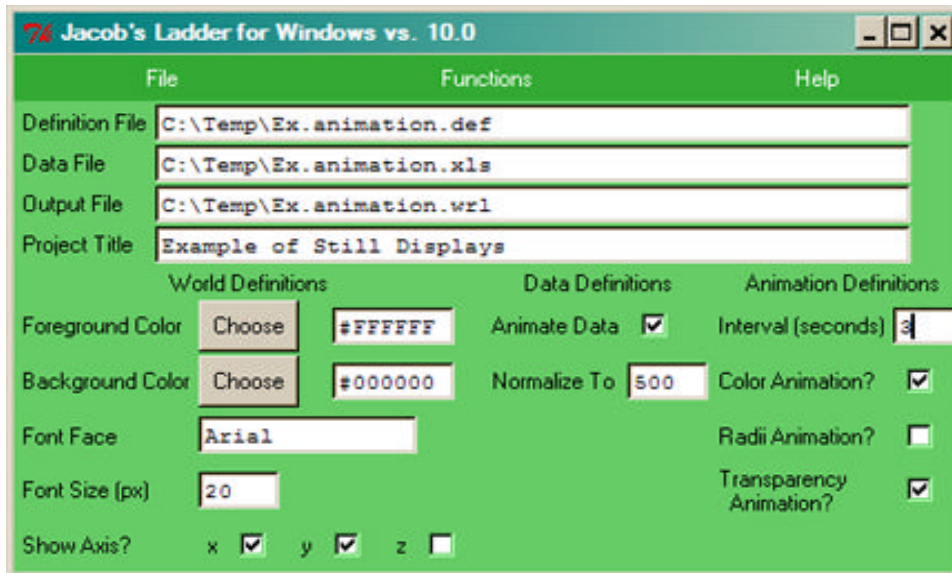


Display of Ex.still.wrl contents.

Notice the following in the data file (Ex.still.xls):

- Each quarter contains a specific ORIGIN definition that forces the display to be. These origins happen to be -1100,0,0 0,0,0 1100,0,0 and 2200,0,0.
- The colors, transparencies and radii are all hard defined in this example.
- The data is spread over an enormous space and is hard to read when looking at the entire space at one time. One might try reducing the space to 100 vs. 500 and making the origins -240,0,0 0,0,0 240,0,0 and 480,0,0 respectively.
- An axis transparency of .3 is used making the axis VERY visible. One might experiment with the transparency rating making it more transparent (closer to a value of 1) to see how it affects the display.

## Animated Coordinate System



This example uses the Ex.animation.def and Ex.animation.xls files and produces the Ex.animation.wrl file.

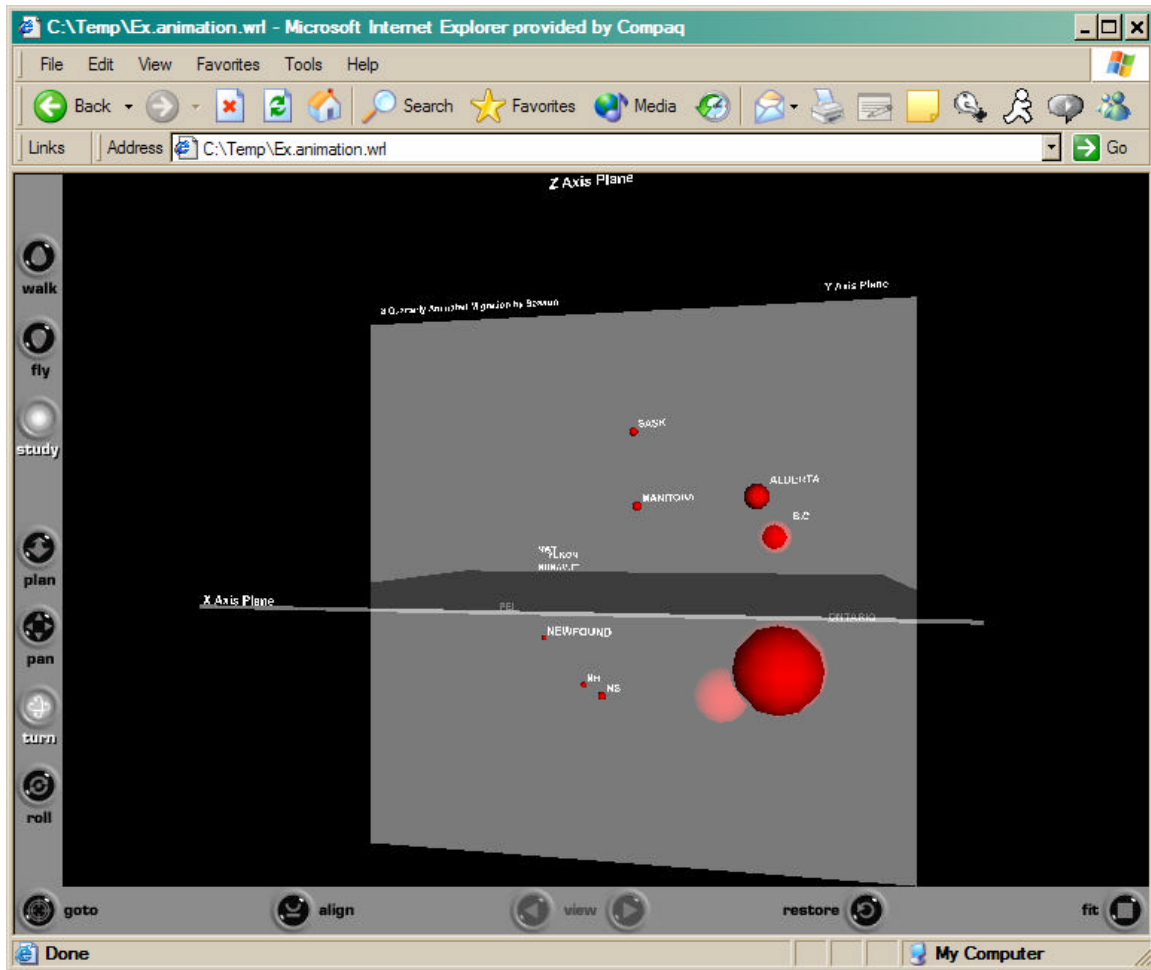
The final result is a single coordinate system that contains the base orientation and position of the initial time period provided in the data file (Ex.animation.xls). To animate, simply click on one of the spherical objects.

Notice the following about the Jacob's Ladder interface:

- Time interval is 3 seconds.
- Normalization is STILL 500 as per the stills.
- Color and Transparency Animation are active.
- The X and Y axis will show, but the Z axis is removed.

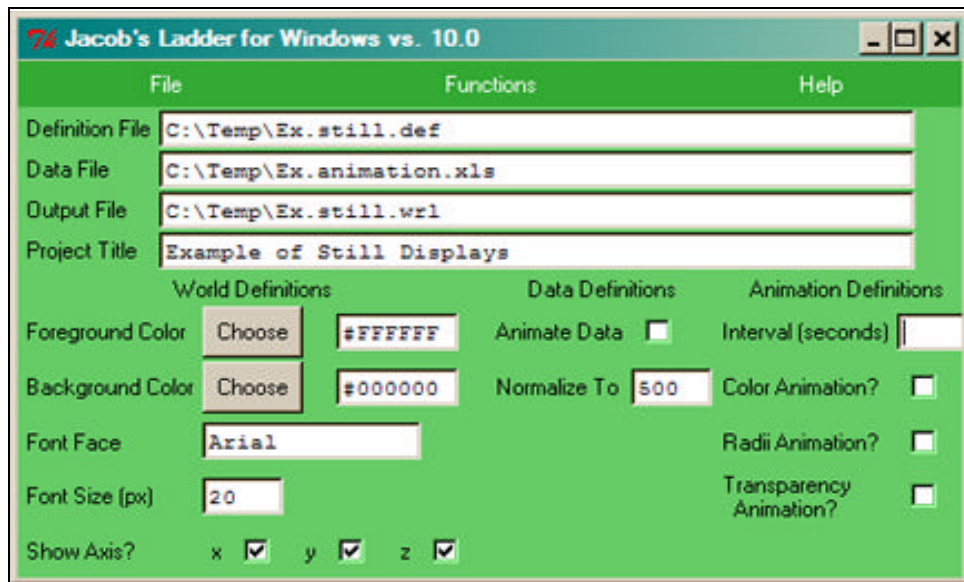
Notice the following in the data file (Ex.animation.xls):

- Each spreadsheet contains the same origin for the data.
- The colors, transparencies and radii are all hard defined in this example.
- The data is more easily readable compared to the still example because it only uses one (1) coordinate space vs. four (4).
- An axis transparency of .5 is used making the axis less visible. One might experiment with the transparency rating making it more transparent (closer to a value of 1) to see how it affects the display.



Display of Ex.animation.wrl contents.

## Still Coordinate System from Animated Data Set



This example uses the animated data file (Ex.animation.xls) with the still definition file (Ex.animation.as.still.def) to show how the data can be shared, exchanged and interchanged in the output format based on the Jacob's Ladder interface definitions. The Ex.animation.as.still.def is the same file contents as the Ex.still.def definition file except for the output file name.

Notice that the data retained its colors and positions and has clustered together.

