

The Manual

Overview

Creating a visualisation the user follows a three phase process. First the user prepares and loads a data set. Second the user views the data set by configuring the visualisation, and by navigating it. Finally the user creates useful images.

The first section of the manual deals with preparing the data, the second with navigating the visualisation, the third with configuring the visualisation, and the briefly demonstrates creating an image.

Each phase requires using the menu bar of the window shown after starting the application. Some phases depend on other phases, or do not make sense unless an earlier phase is first completed. Whenever a phase requires an earlier phase, the section treating it will state this.

Preparing Data

Overview

A data set containing information on a number of nodes and their relations must be loaded before anything can be sensibly visualised.

A data set is a directory containing data files on the same set of nodes, and their relations. To load a data file it must first be created. To create the file the desired information is put into a file according to the data file format. The data file format depends on the type of data file.

There are three types of datafile;

- node data files, specifying data on nodes
- relation data files, specifying relation strengths and
- visualisation data files, specifying labels, default locations, default colors etc.

Across these different files the same nodes and relations occur, it is necessary to identify them across these files.

- A node is identified by a unique number.
- A relation is identified by a unique pair of two nodes.

So;

First for each data file,

- its format, and
- its creation must be treated.

Then loading a data set using the application can be treated.

Node Data

Node data files contain information on the nodes in a network. This information takes the form of a series of properties that all nodes have. Each node has value for each property. To create a file containing node data, a format is required by the application. So first the fileformat is described. Then a method for creating it is presented.

To define the fileformat the format of the information chunks used in the file format must first be defined. Two types of information are expressed; properties and values. First a format for properties is presented, then for values, then the file format as a whole is presented.

Finally a quick method for creating a file can be presented.

To create a file it must comply to a set of unviolatable strict restrictions. If these restrictions are not followed the file will not load, or it will load incorrectly. If they are followed the file will load. This cannot be stressed enough.

fileformat

Property format

A property is described with a single word, a couple of words or a phrase.

- A property consists of either one of the following;
 - letters from the basic roman alfabet, either lower or upper case, i.e.;
 - abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ
 - any number of colons ":"
 - any number of tabs or spaces (a space is the character you get by pressing the space bar).

Correct examples

asdf asd afqwer
ASdfdfssaassfdasfasdfASDFASdasdf
ASD asdqer WER ADFwe
asdf:
aweEW:WERasd:wera:ewq:

Wrong examples

ASDf.asdASFD.asd
qweqw-asdfweas!@#

value format

A value is a number. A number has an optional '-', to indicate whether the number is positive or negative. Then it consists of a series of digits, and optionally a single comma, which will act as the decimal point.

- no other characters are allowed. No spaces (entered with the space bar). No tabs. No letters. No special characters. Nothing.
- If a comma is present it is never the last character in the number. It can be the first character though.
- After the comma the fractional part of a number starts

Correct examples

1234
12,456
,2345

Wrong examples

asd234	letters are not allowed
123fs	
,sdfe3234	
1234,	a comma may not end a number
1234 1234	no spaces are allowed within a number
1234.1234.2345,5	no points or other special characters are allowed

Property line format

A property line contains

- a single property
- then either one of the following two options
 - one unused value
 - one unused value, followed by one value for each node
 - all these values are separated by one or more tabs and/or spaces.
 - the first used value corresponds to the node identified with 0, the next 1, the next 2 etc.
- the end of the line (which can be entered using the enter key). This must be entered even if it is the end of the file.

The file format

The file format of a node data file is;

One line containing any character you like. They are all ignored.

For each property a property line (which includes the end of the line, entered with the enter key). Between property lines any number of lines can be present, where each of these lines can contain any combination of spaces and tabs.

All property lines contain either one value, or an ignored value and a value for each node. If any property line contains a number of values that does not equal the number of nodes, then the file is incorrect.

To create a file it must comply to a set of unviolatable strict restrictions. If these restrictions are not followed the file will not load, or it will load incorrectly. If they are followed the file will load. This cannot be stressed enough.

creating the file

The information on nodes can be taken copy pasted from brain wave. (toch Willem? Kijk even anders). Open the screen with text that shows information on nodes. Select all the text.

Press Ctrl + C on Linux and Windows, or Command + C on Macintosh. Now open a basic text editor; textedit on Linux or Macintosh, notepad on Windows, create a new file and press Ctrl + P on Linux and Windows or Command + P on MacOSx. Now save the file in the directory of your data set using .nd at the end of the file name.

To create a file it must comply to a set of unviolatable strict restrictions. If these restrictions are not followed the file will not load, or it will load incorrectly. If they are followed the file will load. This cannot be stressed enough.

Relation Data

A relation data file contains the values of a single property of the relations between all nodes. The value format used is equivalent to the value format of

value format

A value is a number. A number has an optional '-', to indicate whether the number is positive or negative. Then it consists of a series of digits, and optionally a single point, which will be the decimal point.

- no other characters are allowed. No spaces (entered with the space bar). No tabs. No letters. No special characters. Nothing.
- If a point is present it is never the last character in the number. It can be the first character though.
- After the point the fractional part of a number starts

Correct examples

1234
12.456
.2345

Wrong examples

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1234 1234	no spaces are allowed within a number
1234,1234,2345.5	no commas or other special characters are allowed

fileformat

The file contains the values of each relation, separating them by either spaces, tabs. Any line is allowed to end anywhere, except in a value, because then the value would no longer be a correct value anymore.

Relation property values must be written into the file in a strict order.

If all relation values were in a "from-to" matrix, where the rows and columns were indexed by the unique number of the nodes, and the values were read from the matrix and wrote to the file in the conventional way a book is read, first going left to right, then the next line left to right, then the values are entered in the correct order.

creating the file

Using your favorite spreadsheet application (Excel, Numbers or OpenOffice Calc) select the relationship values from the topleft corner to the bottom right corner. Press Ctrl + C on Linux and Windows, or Command + C on Macintosh. Now open a basic text editor; textedit on Linux or Macintosh, notepad on Windows, create a new file and press Ctrl + P on Linux and Windows or Command + P on MacOSx. Now save the file in the directory of your data set using .rd at the end of the file name.

Visualisation Data

label format

A label can contain any sequence of characters, as long as it does not contain a tab.

value format

A value is a number. A number has an optional '-', to indicate whether the number is positive or negative. Then it consists of a series of digits, and optionally a single point, which will be the decimal point.

- no other characters are allowed. No spaces (entered with the space bar). No tabs. No letters. No special characters. Nothing.
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1234,1234,2345.5	no commas or other special characters are allowed

Node Visualisation Line format

A node visualisation line contains;

a label,	followed by a tab, followed by
a value for X	followed by a tab, followed by
a value for Y	followed by a tab, followed by
a value for Z	followed by a tab, followed by
a value for red	followed by a tab, followed by
a value for green	followed by a tab, followed by
a value for blue	followed by a tab, followed by
a value for size	followed by a tab, followed by
a value for shape	followed by a tab, followed by
a value for transparency	followed by a tab, followed by the end of the line.

Visualisation data format

For each node a node visualisation line is written into the file. The first line contains node 0, the next node 1 the next node 2 etc. untill all nodes are entered.

creating the file

Open a basic text editor; textedit on Linux or Macintosh, notepad on Windows, create a new file and start typing according to the format above. Sorry!

Now save the file in the directory of your data set using .vd at the end of the file name.

Loading a data set directory

Click File -> Open

Navigate to the directory containing the data set directory. Select the data set directory, but *do not double click it*. Click choose.

Navigating the visualisation

The visualisation can be navigated in two ways; flying through the visualisation and rotating the visualisation around its axes;

Flying

Using the keyboard it is possible to fly through the visualisation.

u	move forward
i	move up
o	move backward
j	move left
k	move down
l	move right

alt + u	turn anticlockwise
alt + i	turn up
alt + o	turn clockwise
alt + j	turn left
alt + k	turn down
alt + l	turn right

Rotating the visualisation

Using the keyboard it is possible to rotate the visualisation around its axes. Not that rotating the visualisation along one of its axes will rotate the other axes too.

THESE SPECS COULD MISTAKE CLOCKWISE FOR ANTI CLOCKWISE, TOP FOR BOTTOM, LEFT FOR RIGHT AND FRONT FOR BACK

u	rotate clockwise around z axis
i	rotate clockwise around x axis
o	rotate anticlockwise around z axis
j	rotate clockwise around y axis
k	rotate anti clockwise around x axis
l	rotate anti clockwise around y axis

alt + u	front view
alt + i	top view
alt + o	back view
alt + j	left view
alt + k	bottom view
alt + l	right view

Making a Visualisation

Overview

A visualisation represents data because the properties of the data in some way determine the properties of the visual form.

The application offers several ways to base visual properties on data properties. When some visual property isn't used it should be possible to set it to some practical value, that doesn't hinder the user when looking at visual properties that are used. For this purpose a mapping editor is used. There is a mapping editor for both the nodes, and the links. They can be found at;

Window -> Node Mapping

Window -> Link Mapping

To allow the user to highlight specific aspects of the visualisation specific visualisation properties can be manually set for particular nodes or links. Each node and each link can be clicked. This brings up its override editor, that allows setting its individual visual properties.

Finally several options for background features are available.

The first subsection explains the mapping editor, the second subsection explains the override editor, and the final subsection explains the background options.

The Mapping Editor

The mapping editor allows the user to define how visual properties are determined by data properties.

Visualising labels

The first option is presented at the top of the window is "show labels?". To select a set of labels from the drop down menu click on the white square, and select the file that contains the labels you wish to visualise.

Hiding of showing overridden properties

As stated visual properties could be overridden for specific nodes or links. The next enables or disables all overrides of these nodes or links.

Selecting a new visualisation component

Constants

Select constant to set all values of the visualisation to a constant value.



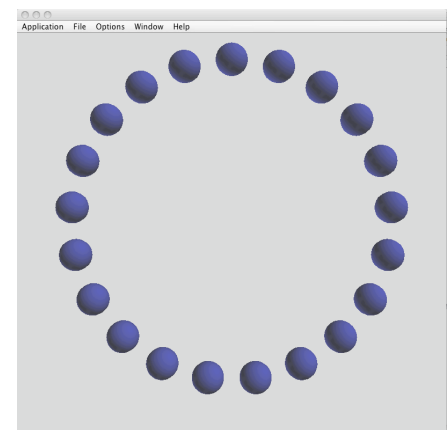
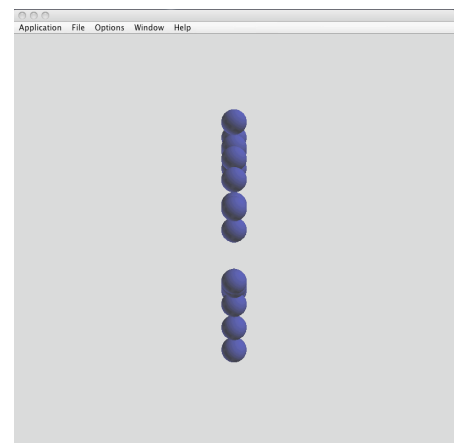
Select visual property by clicking on the white square with a view property and add the desired value in the textbox next to it. Values must be between 0 and 1.

Click the X button to remove the constant.

Circular

Select circular to set all two visual properties of the visualisation to follow a circle function. When the two visual properties for nodes are selected as x and y, all the nodes will align along a circle on the x y plane.

Click the X button to remove the circular mapping.



Property

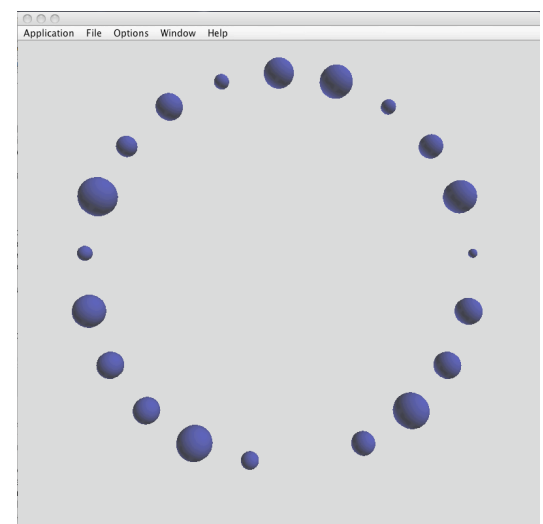


Select property to show the information of one data property on one visual property.

To select the information that is represented select the data source by clicking on the data source property selector. Select the visual property with its property selector to decide with what visual property it will be represented.

The min/max textfields scale the values of the data property to match the range of sensible values of the view property. The value entered in the min field states the data property value that will correspond to 0, and the max field value states which data property will set the visual property to 1. All possible data values between min and max will be represented on a proportional location between 0 and 1.

This done by subtracting min from the node/links data source value, and scaling the remaining value by dividing it by the difference of min and max.



v = visual property

d = data property

min = min

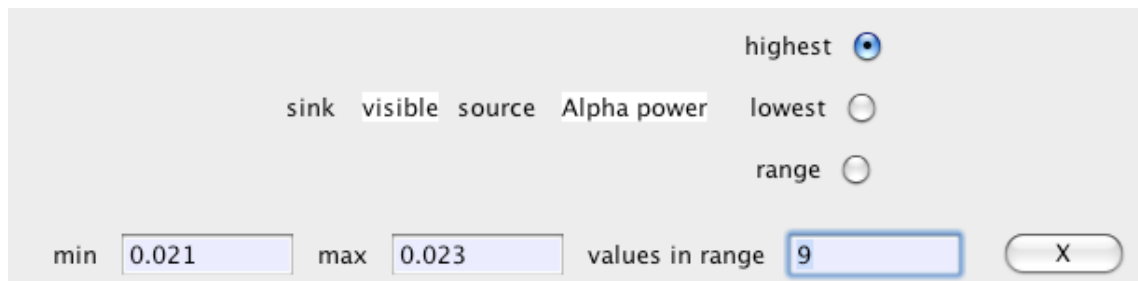
max = max

$$v = (d - \text{min}) / (\text{max} - \text{min})$$

Whenever a data source is selected, by default the lowest value in the network for that particular data source property will be shown in the textfield of min and the highest in the textfield form max. This will convert the lowest data value to a visual property value of 0, and the highest value to visual property value 1, and display all the other values proportional to their size using the full range of the visual property.

Click the X button to remove the property mapping.

Range

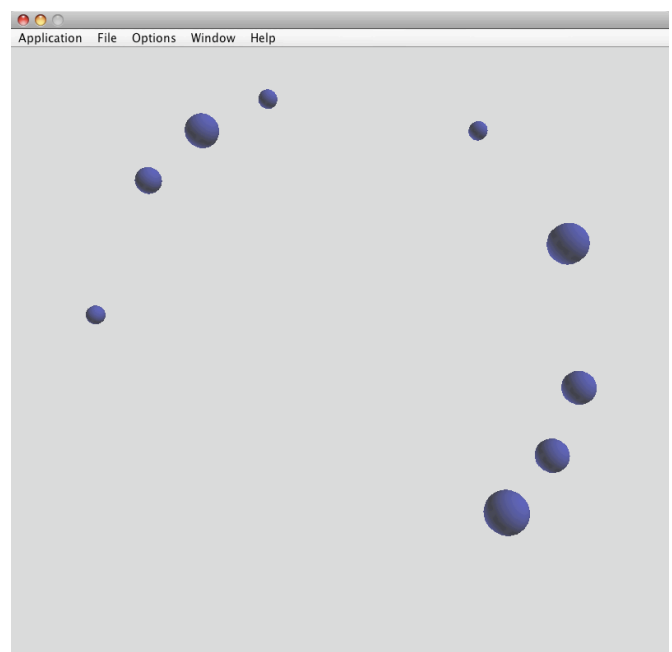


A range sets a visual property to either 1 or 0. The visual property is set to 1 if the selected data property is between the values specified in min and max, and it is set to 0 if it lies outside these values.

The visual property and the data property can be selected with their respective drop down menus and the min value and the max value can be entered in their own respective fields. When such a value is entered or when either the visual property or the data property are selected, the “values in range” field, will illustrate how many actual nodes’ visual properties are set to 1.

When values are entered in the values in range field, and the selected mode is range, then the application sets the mode to highest. It then sets max to the highest data value and picks the lowest value such that at least the number of values entered in the in range field are visible.

When the mode is set to lowest and a number N is entered into the “values in range” field, then the visual property of the nodes/links with the lowest N values for the selected data property are set to



1 and the rest is set to 0, setting a threshold value for the data such that precisely the lowest values are now visible. Should this not be possible, because there are several values precisely on that threshold value, then all nodes/links who have the selected data property on the threshold will have the selected visual property set to 1.

Click the X button to remove the range mapping.

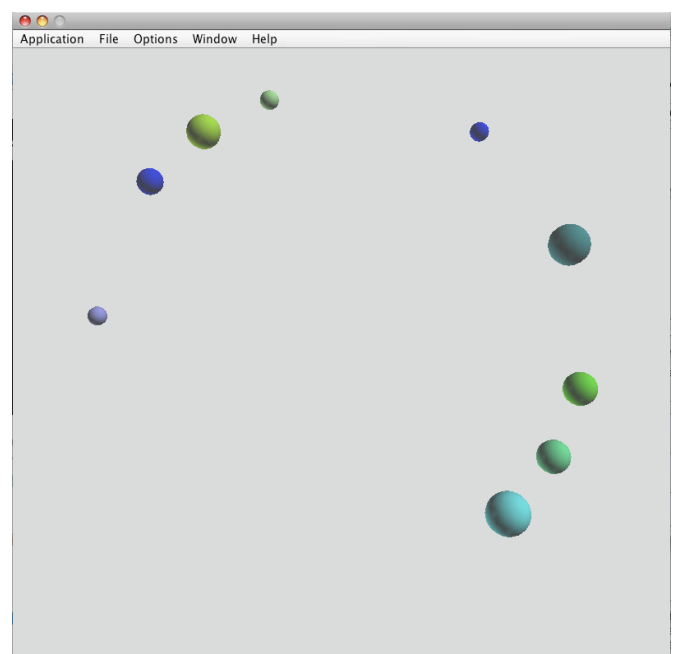
Module

The 'Module' window displays a table with the following data:

module id	red	green	blue
1.0	0.0	0.0	0.0
2.0	0.0	0.0	0.33333334
16.0	0.0	0.0	0.66666667
4.0	0.0	0.33333334	0.0
5.0	0.0	0.33333334	0.33333334
6.0	0.0	0.33333334	0.66666667

Module takes one data source, identifies all different values that occur for this source within the network, and represents each distinct value with its own combination of visual properties. The module mapping attempts to maximize the difference between the different combinations of visual properties. If for instance the default values of red, green and blue are used, this will cause the module mapping to try and set the most different colors possible.

A good way to understand how the values are assigned, is by taking the node mapping window and simply selecting it, setting the visual properties to x y, with a constant z. The nodes will form a part of a square, attempting to fill the space evenly. Next remove the constant z and take the values x, y and z for the module mapping. The nodes will form a part of a cube,



again attempting to fill the space evenly. Taking another module mapping with colors, while keeping the module mapping with x y z will clearly illustrate how colors are assigned and how the program attempts to make the colors as different as possible. Explaining this in words is quite difficult but illustrating it with this example will clarify what takes place in a single glance so the reader is urged to just have a look.

Click the X button to remove the module mapping.

The Override Editor

The override editor allows the user to manually define visual properties of specific nodes and links. The override editor of a specific link or node can be opened by clicking on it.

Override labels

Enter a text in the textbox next to description, and click the “show description?” checkbox to override the label of the mapping editor. Pressing enter in the textbox will show the new label, and clicking the “show description?” checkbox.

Adding an override property

Click add property to override a visual property.

Select visual property by clicking on the white square with a view property and add the desired value in the textbox next to it. Values must be between 0 and 1.

Removing an override property

Click the X button to remove the override.

Background Options

Changing the background color

To change the background color click window -> background color.

Enter appropriate values between 0 and 1 for a mix of red, green and blue. Press enter.

The keyboard can also be used.

r	more red
t	more green
y	more blue
f	less red
g	less green
h	less blue

Showing a Brain

To show a reference brain;

click Options -> Show Brain

To hide the reference brain again;

click Options -> Show Brain

Creating an Image of a Visualisation

Click File-> Create Image