

# mDraw User Manual

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# Introduction

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Welcome to the interactive network visualization tool *mDraw*.

*mDraw* is a universal, generic visualization system for automatic generation of high-quality drawings of directed networks.

Networks are frequently used entities that represent objects and relationships between them. They are used to describe complex systems in many types of fields such as: biology, engineering, computer science and sociology.

Networks were found to display network motifs, patterns that appear in the network significantly more than in random networks.

*mDraw* primary objective is to provide a universal visualization tool for directed biological networks and visualization of the network motifs embedded in them. For the task of finding networks motifs *mDraw* uses another application – the [mfinder](#).

*mDraw* is based on *Digraph* an application developed by [Prof. David Harel](#) , [Liran Carmel](#) and [Yehuda Koren](#) , at the [Computer Science Department of Weizmann Institute of Science](#) , Israel. *mDraw* is being developed at the [Molecular Cell Biology](#) Department of the [Weizmann Institute of Science](#) , by **Ehud Baumatz** With the help of **Nadav Kashtan** at [Prof. Uri Alon](#) Lab for System Biology .

## Platform Requirements and Installation

### Platform Requirements

*mDraw* V1.0 is available for all Windows platforms 2000/xp.

The minimal hardware requirement for fast working with *mDraw* on medium to large networks ( 100 – 10000 nodes )are workstation with a performance comparable to a Intel Pentium 4 Processors .

### Installation

#### Instructions:

1. Download MdrawSetup.exe from <http://www.weizmann.ac.il/mcb/UriAlon/NetworkMotifsSW/MdrawSetup.exe>

2. Install mDraw by double clicking the MdrawSetup.exe
3. source code is also available at <http://www.weizmann.ac.il/mcb/UriAlon/NetworkMotifsSW/MdrawSrc.zip>

#### **Installation folders:**

- Networks – this folder holds the sample networks that come with mDraw, it is recommended that all the networks used by the user will be stored in this directory.
- Outputs - all outputs file that are generated by Mfinder and mDraw are stored in this directory.
- Bitmaps - all bitmaps that are being saved by the user are saved by default to this directory.
- Mfinder – directory that hold the mfinder.exe.
- Manual - hold the user manual in .PDF and .Doc formats.

## **Getting started**

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- **Section 1:** [Managing Files and Basic Tasks](#)
- **Section 2:** [Optimizing the Network Layout](#)
- **Section 3:** [Using the Mfinder](#)
- **Section 4:** [Manipulating the network representation](#)

## **Section 1: Managing Files and Basic Tasks**

This tutorial section covers the following exercises:

- [Loading a Network from File](#)
- [Starting the Network Layout Algorithm](#)
- [Saving the Network](#)

## Loading a Network from File

After starting *mDraw*, an empty *base window* will appear ([click here to get an image and more information's about the base window](#)). In the upper part of the window, you have *pull down menus* where you have access to all functions. The *icons* underneath the *pull down menus* are buttons for direct access to frequently used menu operations. We will come to this later.

Now we will load a network for visualization. Networks are simply text files with three numbers in each line, separated by space or tab. First number represents the source vertex, second number represents the target vertex and the 3'rd number represents the edge Weight. This format only defines the structure of a network, but has no layout information's such as the coordinate of a particular node... To load a network, you need the file browser for selecting a file name. You can get a browser by selecting menu **File/Load network...** (I.e. move the mouse pointer to the **File** pull down menu and press the left mouse button which will show the *File menu*. Then move the mouse pointer to the **Load network...** menu entry by still pressing the left mouse button and finally release the mouse button when you are over the **Load...** menu entry). This will pop up file browser for opening a network.

The other way to load network is by simply clicking the folder icon to open the file browser.



**Button of the icon bar to load a *network***

When the mouse pointer is over this button, a message is displayed in the footer area with a short explanation of the button's function. Pressing this button on the icon bar is the same as selecting menu **File/Load network...**

The file browser will automatically open on the folder "Networks "in this folder you have a file name"coli1\_1\_transcription.txt", click it and than click open.

The network will be drawn in the *network area* in a random layout.

## Starting the Network Layout Algorithm

After successfully loading the network "coli1\_1\_transcription.txt" from file, the visualization should immediately appear in the *network area* of the base window.

You can execute a layout algorithm by selecting menu **File/Run** or by the *Run* icon.



**Button of the icon bar to execute a layout algorithm**

## Saving the Network

## **Saving the Layout of a Network**

You might wish to store the current layout of the network in a file. As stated above, a network file does not contain layout information's, so this way your modifications will be lost in a later session. To store the network information about the current layout (node coordinates), you can choose *mDraw's* alternative network storage format, called *layout*.

Again, you need a file browser to save the current layout to a status file. One way to do so is by selecting menu File/Save as File. .

The other way to save *status* is by simply clicking the *Save* icon.



### **Button of the icon bar to save network status**

The browser usually suggests a name for the file you want to save. The filename of the *network* you have loaded before is "*coli1\_1\_transcription.txt*", so the suggested filename is *coli1\_1\_transcription\_LAYOUT.txt*, all *status* files have the same suffix of "*\_LAYOUT.txt*", so it would be easy to identify them later.

**Note :** saving the network status can save a lot of time in drawings large networks .

## **Loading a Layout from File**

Now we will load a *Layout* of a *network*. To load a *layout*, you need to have a network loaded, load the *coli1\_1\_transcription.txt* as shown above and than load "*coli1\_1\_transcription\_LAYOUT.txt*" from the file browser." You can get a browser by selecting menu **File/Load Layout**.

The file browser will automatically open on the folder "*Outputs*" in this folder select the *coli1\_1\_transcription\_Layout.txt* that you made, click it and than click open.

The network will be drawn in the *network area* with the saved node coordinates.

## **Saving the a Network Image**

You might wish to store the current layout of the network as an image for later use.

Again, you need a file browser to save the current layout to an Image file. One way to do so is by selecting menu File/Save as Image.

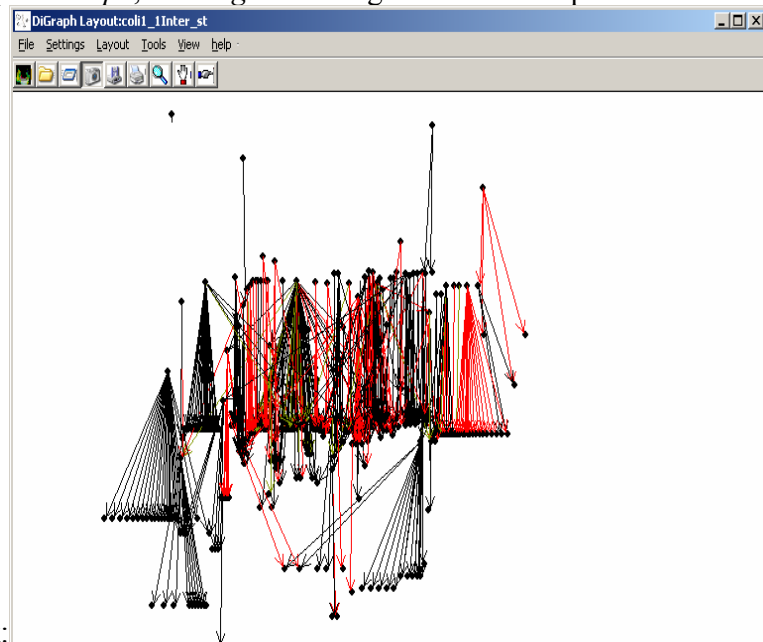
The other way to save network current layout as image is by simply clicking the Save as Image icon.



### **Button of the icon bar to save network as image**

The browser usually suggests a name for the file you want to save. The filename of the network you have loaded before is *coli1\_1\_transcription.txt*, so the suggested filename is

"coli1\_1\_transcription.bmp", all image are being saved as bitmaps. Here is an example



for saved network:

## Printing a Network Visualization

You can print a network on a printer directly from *mDraw* to get the current layout on paper. For this operation the print dialog window is needed which will appear after selecting menu File/Print... (Or by pressing the printer button of the icon bar).



Button of the icon bar to print network

**Note:** it is much more preferable to save image to bitmap and than print the bitmap.

End of section 1

## Section 2: Optimizing the Network Layout

This tutorial section covers the following exercises:

- [Setting the Layout Algorithm parameters](#)
- [Choosing Network Type](#)
- [Set Network Layers](#)

### Setting the Layout Algorithm parameters

First you need to load a network in *mDraw* by using menu File/Load Network... We suggest to use file *coli1\_1\_transcription.txt* in the Networks directory of the *mDraw*

distribution again (refer to section 1). Afterwards, start the network layout parameters with menu Settings [/layout parameters](#).

Now we will modify the parameters of the current network visualization. This can be done with the [layout parameters dialog](#), available after selecting menu Settings/[layout parameters](#).

The layout parameters dialog contains 3 text fields:

1. Repulsive Force – here you can adjust the repulsive force between nodes.
2. Attractive Force – this field represent the force of attraction between neighboring nodes.
3. Attraction of Motif nodes – this field represent the attraction force between neighboring nodes in the same motif.

Play with the values in these fields than press Ok and Run to see changes take effect on the network layout.

The layout parameters dialog also contains 3 buttons , OK, Cancel, and Advanced , the advance button opens another dialog the next section will explain how to set the parameters in this dialog .

In the dialog you can find at the top right six radio buttons to set the current layout algorithm , the button near the MinLa( that is the default layout algorithm) is checked that will be the current layout algorithm ( it usually produces the best results, but you can choose any other layout algorithm). Underneath the radio buttons you will find a check box name "No correlation" leave it checked. Now let's move to the SECOND PHASE, you can see that the check box "*Fruchterman-Reingold*" is checked, uncheck it presses the **OK** button, and than push the **Run** icon in the toolbar to see the changes take effect. Now go back to the layout parameters dialog and check "*Fruchterman-Reingold*" again, this is a layout algorithm that is being executed after the FIRST PHASE algorithm, and usually improve the layout, the parameter **Range** is set to 10, this is the grid size u allow the nodes to find place for themselves, u can change this parameter, but take in consideration that the larger the range is – the longer the algorithm running time will be. Next parameter **Negative Grid** defines the grid size of negative force nodes induce on each other, increasing this parameters would produce a layout that nodes push each other further, the **K<sub>r</sub>** parameter is the repulsive force and the **K** parameter is the spring force which defines the positive force between neighbor vertex's, play with this parameters until you are pleased with the network visualization. The **Init temp**, **Final temp** and **Temp.decrease rate** are all algorithm running time and usually produces good results and should not be tempered with . At this time the network visualization is still the same, because the modification will take effect only after pressing the **Run** push button of the dialog. So press this button now. In the footer area of the base window you can see a message when the new font is loaded. This may take some time. Afterwards the dialog window disappears and the network is redrawn by using the new font size.

## Choosing network type

The power of choosing network type allows the user to automatically aim the layout visualization to a particular network type, that means that the layout algorithm parameters will be automatically configured to give the best layout network visualization, also in some networks type the SetLayers will be automatically be executed, another feature in signal transaction and transcription networks is the ability to use coarse-graining, lets have a go at it.



First thing [load a network from a file](#) load the *coli1\_1\_transcription.txt*, now open the [Network Type dialog](#), available after selecting menu [Settings /Network Type](#). Now check the radio box **Transcription**, now check the check box **SIM** under the **Transcription Layout** now push the OK button. You can see that the network visualization is different , beside the regular nodes , you can notice some hollow rectangle with number in them , those are the SIM structures that have been converted to this one odd looking vertex, this has been done to make the network visualization more readable , when clicking with [Right mouse button](#) on the SIM node, the [Secondary popup menu](#) will appear , select the [Expand](#) menu entry , the SIM node will expand back to the original number of nodes that assembled the SIM node, to assemble the SIM node back to its initial mode, choose the parent of one of the nodes that assemble the SIM node , click with [Right mouse button](#) , select the [Collapse](#) menu entry , that will assemble the SIM node back together .

### Set Network Layers

The last exercise of this chapter deals with setting the network layers, as mentioned above *mDraw* uses a novel approach for *assigning the y-coordinates*, but a simple quantization process will produce the more common hierarchical layout, were all edges are pointing downwards, that are usually implemented in directed networks.

Ok, enough explanation. Just do it: load the good old "*coli1\_1\_transcription.txt*", and push the **Run** button. Now click [Right mouse button](#) any ware in the network area, choose the [SetLayers](#) menu entry , 2 option are available for you, choose the **Manually** option and witness the [Layers Dialog](#) appear , in the **Number of Layers** : edit box you will notice a number , that number is the default number of layers calculated topologically by the application ( in this case 5 ), you can either leave it as is , or change it to a different number , now push the **OK** button and watch changes take effect .

You must be wondering now what the *automatically* option means, well it just orders the layers with the default number with out asking your permeation ;-).

**Note:** in some cases you will notice that there are more layers than you have asked for, it happens because nodes are not allowed to point at others nodes in the same levels, so some of those nodes go a lower level to prevent this from happening.

**End of section 2**

## Section 3: Using the Mfinder

- [Setting Mfinder parameters](#)
- [Choosing motifs](#)

**Important Note:** only basic operations with Mfinder will be discussed in this section, [click here to learn more about the mighty Mfinder](#).

## Setting Mfinder parameters

First thing you need is the [Mfinder dialog](#) , get it by either clicking **Right mouse button** on the Mfinder icon in the toolbar, or by selecting [Tool/Mfinder](#) .

First thing you need is to load an mfinder.exe file , that is being done automatically by the application , you can see the path in the **MFinder Executable** edit box is already set , if the path is incorrect you can use the **browse** button to create the path to the mfinder.exe yourself .

Now we need a network, will use *coli1\_1\_transcription.txt*, and get it by clicking the **browse** button near the **Input File Name** edit box, notice that by filling this edit box the **Output File Name** was filled as well.

Next we need to set the **Motif Size Low**, and **Motif Size high** fields, these parameters set the size of motifs to look for ([read more in here](#)), they are set as default to 3 and 4 respectively. If you want only High motifs to be displayed (only motifs size 4), just delete 3 from **Motif Size Low** edit box, the same can be done if you only looking for Smaller motifs (delete 4 from **Motif Size high**), also different sizes of motifs can be asked for, but take in consideration that finding motifs of size larger than 4 takes time.

That's it we are ready to run mfinder, click the **RUN** button and move to next section to figure out how to select and draw motifs.

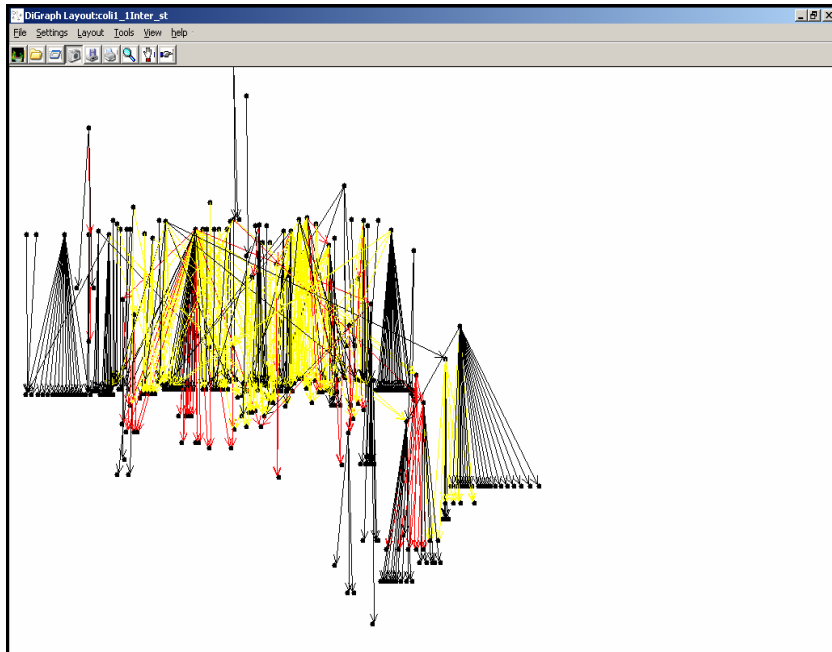
**Important note:** once you run mfinder on a network, member's files are created, so the next time you will use mfinder on that network, the [motifs dialog](#) will appear immediately.

## Choosing motifs

**Important Note:** to learn more about network motifs, [click here](#).

You don't need to do anything to open the [motifs dialog](#) , it will be opened automatically after the mfinder run.

In the [motifs dialog](#) you will notice number of sub networks in two sizes (number of nodes in network) 3 in the **Low Motifs** section and 4 at the **High Motifs** section , all you need to do is to check the check box's near the motifs you want to display, its that simple ! . you can see each motif relevant information written under the window the motif is drawn in , lets pick 2 motifs, motif **Id: 38** from the **Low Motifs** section, and motif **Id: 204** from the **High Motifs** section, now click the **OK** button in see the network motifs that you have checked appear on the network it should look like this :



Now let's say you want to see a different motif, you don't need to run mfinder again just open the [motifs dialog](#) by clicking [Tools/motifs](#), and choose a new set of motifs, click **OK**, and it's on!!!

**Important note:** after running mfinder and selecting motifs for a network, you can continue using all other features of *mDraw*, like changing the layout algorithm, settings Network Type, settings layers, and all other operations just like you would in the regular network.

**End of section 3**

## Section 4: Manipulating the network representation

- [Using the Network dialog](#)
- [Playing with nodes](#)

### Using the Network dialog

To start this exercise, first follow the steps in section 3, what you have now in the network area is the visualization of "*coli1\_1\_transcription.txt*", now we can start playing with it.

First open the Network dialog box by selecting the menu entry [Layout/Network](#) .

First will draw only the motifs in the network, do that by checking the check box **Show Only Motifs** in the [Network Dialog](#) , click the **OK** button. now is a good time to play with edges colors, open the ColorMap dialog by selecting **Layout/ColorMap** entry, the [ColorMap dialog](#) will open, in the **Change Color** line choose one of the colors appear in the network (only one color can be change at a time), and than select a different color in the **To Color** line, push the **OK** button to change color.

Go back to the [Network Dialog](#) , and uncheck the **Show Only Motifs** check box, than check the **Use Full Window** check box, and click the **OK** button, the network visualization should use the whole network area .

Last operation that will do with the [Network Dialog](#) , will be **Use Doubling** check the appropriate check box, click the **OK** button, and than click the [Run](#) icon. Changes have been taking effect, in order to see those changes, click the **View/Labels** menu entry, an open dialog box will appear, click the **cancel** button, you will notice that every node is label by a number now, if you will look closer you will see that the node labeled “66”, and the node labeled “143”, appears twice in the network, those 2 nodes were doubled in order of avoiding very long edges in the network. Move to next chapter to learn how to do more cool things with the network representation.

## Playing with nodes

To start this exercise, first follow the steps in section 3, what you have now in the network area is the visualization of "*colil\_1\_transcription.txt*", now we can start playing with it.

First thing to do is labeling the nodes, click the **View/Labels** menu in the open dialog box choose the file *colil\_1\_transcription\_LIST.txt* will appear in the file name edit box, click the **OPEN** button, notice that all nodes have been labeled.

Next will use the Focus option, click the [Focus](#) icon in the toolbar to open the [Focus dialog](#), now click [Right mouse button](#) and choose the [Focusing](#) menu entry, now click any node with [Right mouse button](#), notice that the vertex you choose appear along with its neighbors in the **Focused Network** area , and the vertex info appears in the **Vertices Info** window .now you can switch windows if you want to see the focused network in the main network area , do that by clicking the right mouse button and picking " Switch window " .

Our next assignment is to drag a vertex click [Right mouse button](#) and choose the [Dragging](#) menu entry. Now select one vertex, and while holding [Right mouse button](#) down move the cursor to a desired place in the network area, after releasing [Right mouse button](#) you will notice that the vertex you have selected is in his new placement.

## End of section 4

**Note: that’s the end of the getting stated tutorial; to deepen your familiarity with mDraw move on to read the User Interface guide.**

# User Interface

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This chapter covers information about the *mDraw* user interface. The following subtitles are available:

- [Using the Mouse](#)
- [Base Window](#)
- [Pop-Up Menu](#)
- [File Menu](#)
- [Settings Menu](#)
- [Layout Menu](#)
- [Tools Menu](#)
- [View Menu](#)
- [Help Menu](#)

## Using the Mouse

In *mDraw* V1.0, the three buttons of the mouse are used as follows:

- The *left* mouse button is used for selection.
- The *right* mouse button is used for menu operations.

### Left mouse button

In Window applications, this mouse button is used for selection, activation, and setting the location cursor. In an *mDraw* network area; this button can also be used to select nodes for *Drag* and *Focus*, for drawing the *Zoom* Rectangle, and for *panning* the whole network.

The *Drag* operation is carried out by clicking on a node in the network area with *Right mouse button* and hold down this mouse button. Then move the mouse by still pressing *Right mouse button*. You can see the node moving with the cursor. After releasing the mouse button, the selected node will be placed where you released the mouse button.

The *Focus* operation is carried out by clicking on a node in the network area with *Right mouse button*.

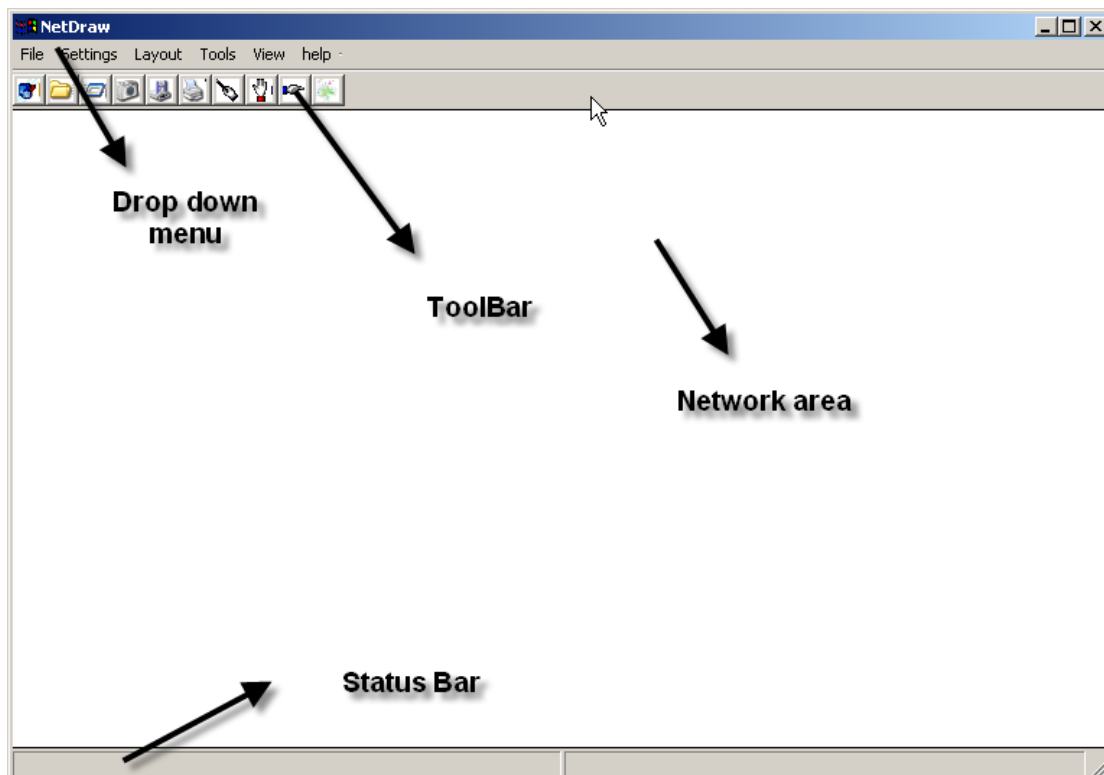
The *Zoom* operation is carried out by clicking on any part of the network area with *Right mouse button* and hold down this mouse button. Then move the mouse by still pressing *Right mouse button*. You can see a moving rectangular area on the screen (*rubber-band*). After releasing the mouse button, all nodes are selected that lie completely inside this rectangle, and will be represented in a larger scale.

The *Pan* operation is carried out by clicking *Right mouse button* on any part of the network area and hold down this mouse button. Then move the mouse by still pressing *Right mouse button*. You can see a the hole network drawing moving with the cursor.

## Right Mouse Button

In Window applications, this mouse button is used for the pop up menus. With *right mouse button*, the user is able to open up the pop up menus of *mDraw*.

## Base Window



The base window is the central place where networks are visualized.

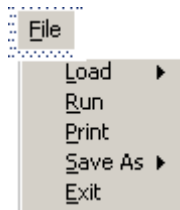
After loading a network from file, it will be displayed in the **network area** of the base window. *mDraw* can draw very large networks in fairly small rectangle, so scrollbars aren't implemented.

The **pull down menus** is used to start operations in *mDraw*. Menus can either be selected with the mouse. The following menus are available in *mDraw* V1.0:

- [File Menu](#)
- [Settings Menu](#)
- [Layout Menu](#)
- [Tools Menu](#)
- [View Menu](#)

- [Help Menu](#)

## File Menu



### Load From

Loading a network, or a network layout from a file .After selecting this entry from the file menu an Open Dialog Box will appear, in it you can select your network. Loading network status can be done only after you have opened a network.

### Save As...

Image - This option stores the network image as a bitmap, a Save Dialog Box will appear, with the name of the network with a .BMP extension to it, you can select the path for the saved image.

File – This option stores the network coordinates to a file, a Save Dialog will appear, with the name of the network and an extension of "\_LAYOUT.txt", this is the network coordinates that can be loaded later for drawing the network without using layout algorithm, in-order of saving time.

### Run

This option operates a selected layout algorithm for the network; any algorithm parameters that where chosen will take effect after this entry.

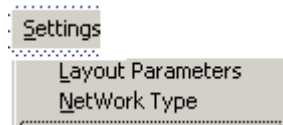
### Print

Sending the current network in PostScript format to a printer or storing it in a PostScript file. After selecting this menu entry, a print dialog window will appear to specify the parameters.

### Exit

Exiting an *mDraw* session. **Note:** The user is not asked to confirm before quitting, so be sure to save the status for all networks if you want to keep the layout for a later session.

# Settings Menu



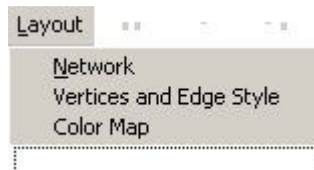
## Layout parameters

Used to set the parameters for controlling the network layout algorithm and fine tuning. After selecting this menu entry, a layout parameters dialog window will appear to specify the options.

## Network Type

Used to set the parameters for the type of network to be drawn and his settings. After selecting this menu entry, a Network Type dialog window will appear to specify the options.

# Layout menu



## Network

Used to set drawing options for the selected network. After selecting this menu entry, a Network Style dialog window will appear to specify the options.

## Vertices and Edge Style

Used to set drawing options for the selected network nodes. After selecting this menu entry, a Node Style dialog window will appear to specify the options.

## Color Map

Used to set color options for the selected network edges. After selecting this menu entry, a Color Map dialog window will appear to specify the options.

# Tools Menu





### **Mfinder**

Used to set the parameters and path to network for executing the Mfinder application. After selecting this menu entry, an Mfinder dialog window will appear to specify the options.

### **Motifs**

Used to pick motifs in network , this can be done only after running the mfinder. After selecting this menu entry, a Motif dialog window will appear to specify the options.

### **Focus**

Used for opening the Focus window and Info window . After selecting this menu entry, a Focus window will appear to specify the options, and show the Focus window and Info window.

### **Goto**

Used for marking a specified node in the network, and drawing the network around the node.

## **View Menu**



### **Labels**

Used to draw labels for nodes . After selecting this menu entry, an Open dialog window will appear to specify the path for labels file , if no file was selected all nodes would be labeled with there input integers .

### **Network Stat**

After selecting this menu entry, a message box window with info about the network.

## Algorithm Stat

After selecting this menu entry, a message box window with info about algorithm running time .

# Help

## Tutorial

Open user manual from application.

## Updates

Open *mDraw* home page for update checking.

## About

About the application creators.

# Popup menus



## **Main popup menu**

### **Move**

Used to move the whole network, After selecting this popup menu entry, be aware that mouse handle in the network area will be change to a "cross", then drag the mouse to move the whole network. **Note** : until releasing this entry by clicking it again , or

choosing a different popup menu entry, all *Right mouse button* operations are dedicated to Move .

## Goto

See Goto

## Reset

Used to draw network back to its initial layout .

## ZoomIn

To zoom in the detail of the network, the user can draw a rectangular over the interested region as shown in the following .

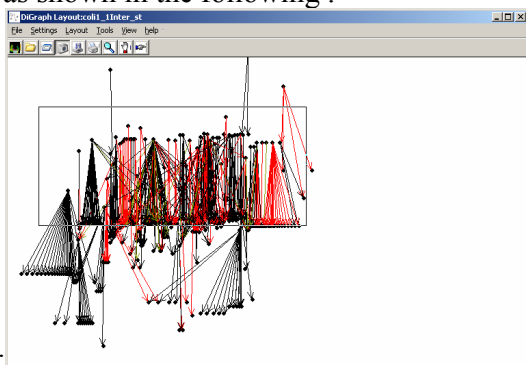


Figure:

## Zoom Back

Allows unlimited zoom back of each steps of zoom in activities .

## ZoomOut

Enables quick zoom out by pre-determined steps .

## Set Layers



### Manually

Used for quantization of the layers in network. After selecting this menu entry, a Layers dialog window with the number of layers in network (topologically) , the user can keep this number , or choose different number of layers for network .

### Automatically

Used for automatically quantizes layers in network .

## **DragVtx**

The DragVtx operation is carried out by clicking on a node in the network area with *Right mouse button* and hold down this mouse button. Then move the mouse by still pressing *Right mouse button*. **Note** : until releasing this entry by clicking it again , or choosing a different popup menu entry, all *Right mouse button* operations are dedicated to DragVtx.

## **Focusing**

Used for getting the selected node close selected neighbors and node info, all will be displayed in the Focus Window, after selecting this menu entry, just click the selected node by pressing *Right mouse button*. **Note**: until releasing this entry by clicking it again, or choosing a different popup menu entry, all *Right mouse button* operations are dedicated to Focusing.

## **Switch Windows**

This option is enabled only after focusing has been made. Used for switching the image that is being displayed in the focus window, with the image being displayed in the main drawing area. **Note**: after switching windows focusing is disabled (until closing and opening the focus window again).

## **Undo Goto**

This option is enabled only after Goto operation has been made. Clear the Goto operation .

## ***Secondary popup menu***

**Note**: this menu is available only in transcription and signal-transaction network types.

## **Expand**

Used for the revealing of all nodes that were "hidden" in a coarse structure, The Expand operation is carried out by clicking on a coarse structure in the network area with *Right mouse button* after selecting Expand.

## **Collapse**

Used for creating a coarse structure, The Collapse operation is carried out by clicking on a node that can be a part of coarse structure PARENT in the network area with *Right mouse button* after selecting Collapse.

## Focus

Used for revealing all of the nodes that were "hidden" in a coarse structure within the Focus Window, The Focus operation is carried out by clicking on a coarse structure in the network area with *Right mouse button* after selecting Focus.

# Dialogs

## Mfinder

Opened by : Tool bar →run mfinder ,or by Tools / Mfinder .

Run MFINDER

Mfinder Executable: D:\Ud\curr\_project\Release\mfinder\mfinder.exe Browse

Input File Name: Browse

Status File Name: Browse

Motif Size Low: 3 Motif Size High: 4

Number of random networks to generate: 10

Network Type:  Directed  Non-directed

Input File Format:  Source->Target  Target->Source

Sampling:  Number of samples: 0

Uniqueness:  Threshold: 4

Triadic-Census in Random Networks:  Don't Preserve  Preserve

MEMBERS File:  Generate

Output File Name: Browse

Additional Flags:

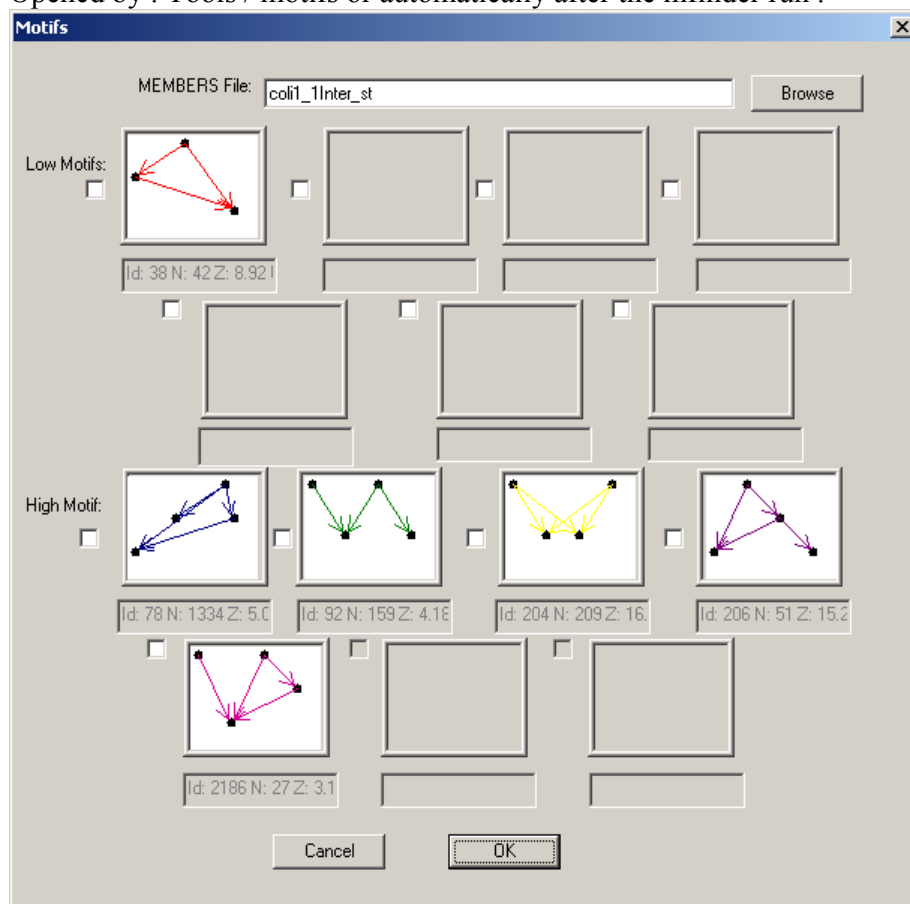
Cancel Run

- Mfinder Executable: path to mfinder.exe. **Note** the application automatically find this path .
- Input File Name: browse for network file .
- Status File Name : browse for network status file .
- Output File Name : path for saving the Mfinder Out file . **Note:** once network file is chosen the application automatically find this path .
- Motif Size Low : Use to determent the size of smaller motifs to look for . Default set to 3 .

- Motif Size High : Use to determine the size of smaller motifs to look for . Default set to 4 .
- Number of random networks to generate: Use to determine the number of random networks mfinder should create while running . Default set to 10 .
- Network Type : choose directed or non-directed . Default set to Directed . **Note** : These parameters do not affect the layout ,and are used only for the mfinder .
- Input File Format : : Use to determine whether the network nodes have source to target relations ,or target to source relations , Default set to source to target .
- Additional Flags: additional flags for the mfinder
- Run : execute mfinder .

## Motifs

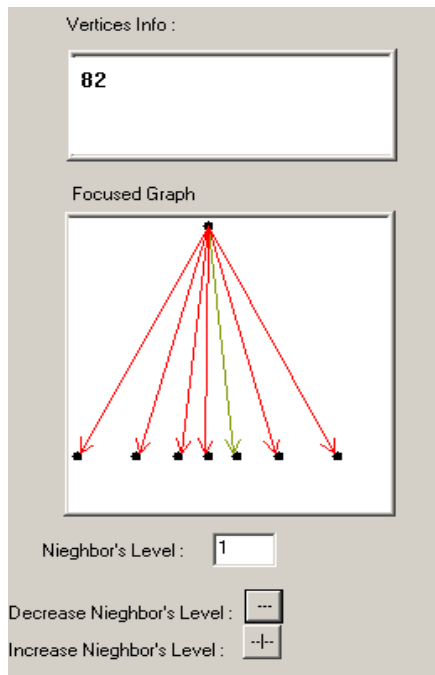
Opened by : Tools / motifs or automatically after the mfinder run .



- MEMBERS File: browse for members created by mfinder . **Note** : this edit box is filled by the application .
- Ok : draws selected motifs .

## Focus

Opened by : Tools / Focus or by Tool bar / Focus .

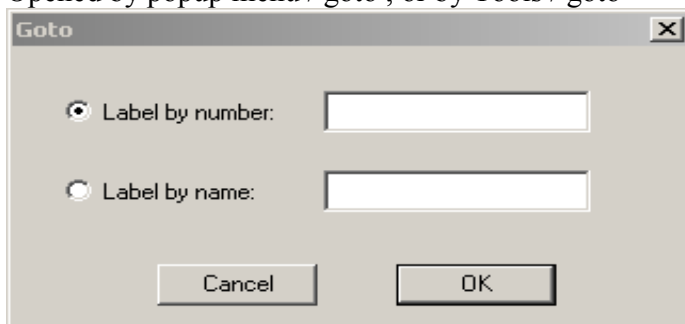


- Vertices Info : window that present vertices info .
- Focused network : window that present vertices and its neighbors .
- Neighbors Level : : Use to determine the level of neighbors that would be drawn in the focused network . for example if the level is one , only neighbors that have only one edge between them and the selected node would appear in network .
- Decrease Neighbors Level : clicking the minus icon the decrease the level of neighbors that are being drawn in the focused network.
- Increase Neighbors Level : clicking the plus icon the increase the level of neighbors that are being drawn in the focused network.

**Note :** to close this window simply click Tools / Focus , or Tool bar / Focus again .

## Goto

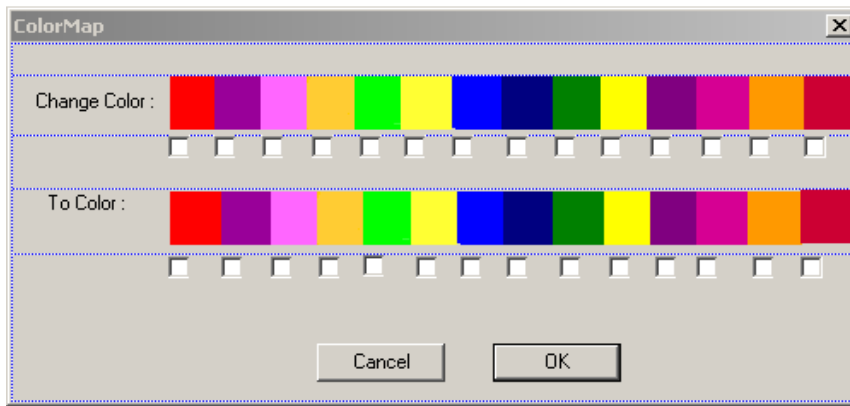
Opened by popup menu / goto , or by Tools / goto



- Label by number : write the nodes label number in the edit box and click ok.
- Label by name : write the nodes label name in the edit box and click ok .

## Color - Map

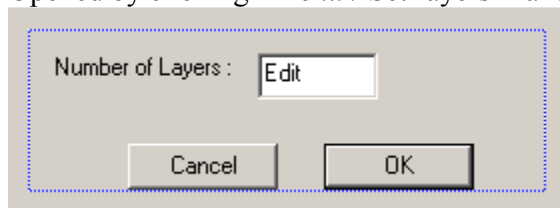
Opened by popup Layout / ColorMap .



- Change color – pick the edge color to change .
  - To Color – pick the color to change edge color to .
- Note :** only one color can be changed each time .

## Layers

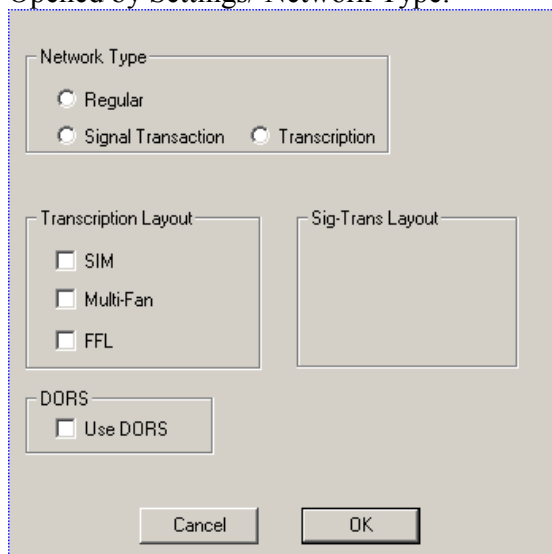
Opened by clicking *BMenu* / SetLayers Manually .



- Number of layers – decide number of layers y-coordinate will be divided to.

## Network Type

Opened by Settings/ Network Type.



- Network type – choose what kind of network you to draw, default are regular.

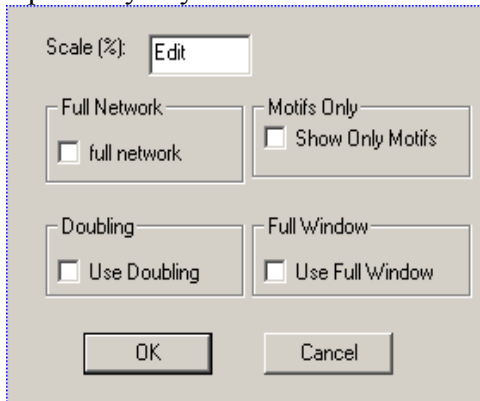


- SIM – create coarse structure of SIM .(only in transcription network)
- Multi-fan– create coarse structure of Multi-fan .(only in transcription network)
- FFL – create coarse structure of FFL .(only in transcription network)
- DORS – divide network into DORS parts.

**Note:** all network type option is available even after loading network, but than you should click Run to execute changes.

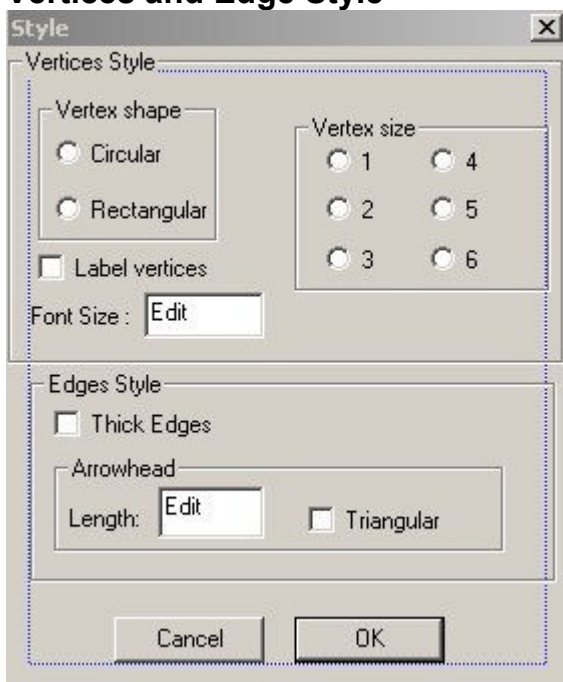
## Network

Opened by Layout/ Network .



- Full Network – draw the whole net , ( by default only the network largest component is being drawn ) .
- Motifs Only – draw only edges and vertex that are in a Motif .
- Doubling – double vertex with a large number of out-edges .
- Use Full Window – uses all of the network area to draw network .( by default the network is being drawn in a square).
- Scale – scale to draw the network.

## Vertices and Edge Style

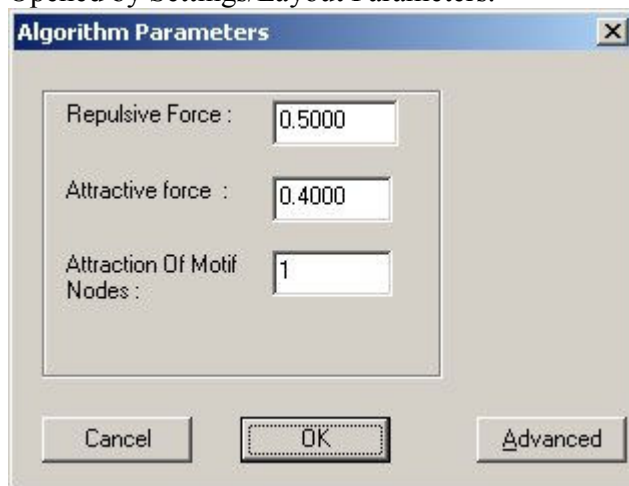


Opened by Layout/Vertices and Edge Style.

- Vertex shape – Circular or rectangular decide the shape of the vertex to be drawn .
- Vertex size – decide on the vertex size .
- Label vertices – draw label for each node .
- Thick Edges – draws edges in a thick pen .
- Arrowhead – decide on the size and shape of the edge arrowhead.
- Font size - decide the font size – default is 12.

### Layout Parameters

Opened by Settings/Layout Parameters.



- Repulsive Force – repulsive force between nodes.
- Attractive Force – Attractive Force – this field represent the force of attraction between neighboring nodes.
- Attraction of Motif nodes – this field represent the attraction force between neighboring nodes in the same motif.

### Advanced Layout Parameters

The screenshot shows a dialog box with the following sections and parameters:

- Linear arrangement:**
  - M.S. Iterations: 10
  - K1: 40
  - K2: 10
  - Decrease: 2
  - Interval: 6
- Conjugate gradients:**
  - Tolerance: 0.0010
- ACE:**
  - Tolerance: 0.0010
  - Compute 3rd eigenvector
- GSM:**
  - Len: 10
  - Wieht: 1
- X-coordinates:**
  - First phase:**
    - MinLA
    - Fiedler
    - Embedder
    - Stress
    - CMDS
    - Sifting
  - No correlation
  - Second phase:**
    - Fruchterman-Reingold
    - Range: 10
    - Crossings: 0
  - Layer height: 0.5000
  - Force undirected drawing
- Fruchterman-Reingold:**
  - k<sub>r</sub>: 0.5000
  - k: 0.4000
  - Init. temp.: 0.5000
  - Final temp.: 0.001000
  - Temp. decrease rate: 0.9200

Buttons: OK, Cancel

### X-coordinates

- First phase – choose layout algorithm, default is MinLa .
- Second phase – use Fruchterman-Reingold , default – Use .

### Fruchterman-Reingold

- K<sub>r</sub> – decide on the repulsive power between nodes.
- K – Decide the strength of the spring connected neighbor's nodes.
- Init temp, final temp and Temp decrease rate are all parameters to decide on the length of algorithm running time.

### Linear arrangement

- M.S Iterations – number of Iterations in the MinLa algorithm.
- K1 and K2 – forces that are being used in MinLa algorithm.
- Decrease and Interval - parameters to decide on the length of MinLa algorithm running time.

Reset of the parameters in the Advanced Algorithm Parameters is not to be played with.

**END**