

## Fuzzy Logic SC Help Index

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## **File menu commands**

The File menu offers the following commands:

<u>New</u>	Creates a new application.
<u>Open</u>	Opens an existing application.
<u>Close</u>	Closes an opened application.
<u>Save</u>	Saves an opened application using the same file name.
<u>Save As</u>	Saves an opened application to a specified file name.
<u>Print</u>	Prints an application.
<u>Print</u>	Displays the application on the screen as it would appear printed.
<u>Preview</u>	
<u>Print Setup</u>	Selects a printer and printer connection.
<u>Exit</u>	Exits Fuzzy Logic SC.

## **View menu commands**

The View menu offers the following commands:

<u>Toolbar</u>	Shows or hides the toolbar.
<u>Status Bar</u>	Shows or hides the status bar.

## **Window menu commands**

The Window menu offers the following commands, which enable you to arrange multiple views of multiple applications in the application window:

<u>New Window</u>	Creates a new window that views the same application.
<u>Cascade</u>	Arranges windows in an overlapped fashion.
<u>Tile</u>	Arranges windows in non-overlapped tiles.
<u>Arrange Icons</u>	Arranges icons of closed windows.
<u>Window 1,</u> <u>2, ...</u>	Goes to specified window.

## **Help menu commands**

The Help menu offers the following commands, which provide you assistance with this application:


<u>Index</u>	Offers you an index to topics on which you can get help.
<u>Using</u>	Provides general instructions on using help.
<u>Help</u>	
<u>About</u>	Displays the version number of this application.

## **New command (File menu)**

Use this command to create a new application in Fuzzy Logic SC.

You can open an existing application with the Open command.

## **Shortcuts**

Toolbar:   
Keys: CTRL+N

**File New dialog box**


Starts new Fuzzy Logic SC application.

## **Open command (File menu)**

Use this command to open an existing application in a new window. You can open multiple applications at once. Use the Window menu to switch among the multiple open applications. See Window 1, 2, ... command.

You can create new applications with the New command.

## **Shortcuts**

Toolbar:   
Keys: CTRL+O

## **File Open dialog box**

The following options allow you to specify which file to open:

### **File Name**

Type or select the filename you want to open. This box lists files with the extension you select in the List Files of Type box.

### **Drives**

Select the drive in which Fuzzy Logic SC stores the file that you want to open.

### **Directories**

Select the directory in which Fuzzy Logic SC stores the file that you want to open.

### **Network...**

Choose this button to connect to a network location, assigning it a new drive letter.



## Close command (File menu)

Use this command to close all windows containing the active application. Fuzzy Logic SC suggests that you save changes to your application before you close it. If you close an application without saving, you lose all changes made since the last time you saved it. Before closing an untitled application, Fuzzy Logic SC displays the Save As dialog box and suggests that you name and save the application.


You can also close an application by using the Close icon on the application's window, as shown below:



## Save command (File menu)

Use this command to save the active application to its current name and directory. When you save an application for the first time, Fuzzy Logic SC displays the Save As dialog box so you can name your application. If you want to change the name and directory of an existing application before you save it, choose the Save As command.

## Shortcuts

Toolbar:   
Keys: CTRL+S

**Save As command (File menu)**

Use this command to save and name the active application. Fuzzy Logic SC displays the Save As dialog box so you can name your application.

To save an application with its existing name and directory, use the Save command.

## **File Save As dialog box**

The following options allow you to specify the name and location of the file you're about to save:

### **File Name**

Type a new filename to save an application with a different name. A filename can contain up to eight characters and an extension of up to three characters. Fuzzy Logic SC adds the extension you specify in the Save File As Type box.

### **Drives**

Select the drive in which you want to store the application.

### **Directories**

Select the directory in which you want to store the application.

### **Network...**

Choose this button to connect to a network location, assigning it a new drive letter.

### **1, 2, 3, 4 command (File menu)**

Use the numbers and filenames listed at the bottom of the File menu to open the last four applications you closed. Choose the number that corresponds with the application you want to open.

### **Exit command (File menu)**

Use this command to end your Fuzzy Logic SC session. You can also use the Close command on the application Control menu. Fuzzy Logic SC prompts you to save applications with unsaved changes.

### **Shortcuts**

Mouse: Double-click the application's Control menu button.



Keys: ALT+F4

**Toolbar command (View menu)**

Use this command to display and hide the Toolbar, which includes buttons for some of the most common commands such as File Open. A check mark appears next to the menu item when the Toolbar is displayed.

See [Toolbar](#) for help on using the toolbar.

## Toolbar



The toolbar is displayed across the top of the application window, below the menu bar. The toolbar provides quick mouse access to many tools used in Fuzzy Logic SC ,

To hide or display the Toolbar, choose Toolbar from the View menu (ALT, V, T).

### Click To

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Open a new application.



Open an existing application. Fuzzy Logic SC displays the Open dialog box, in which you can locate and open the desired file.



Save the active application or template with its current name. If you have not named the application, Fuzzy Logic SC displays the Save As dialog box.



Print the active application.



### **Status Bar command (View menu)**

Use this command to display and hide the Status Bar, which describes the action to be executed by the selected menu item or depressed toolbar button, and keyboard latch state. A check mark appears next to the menu item when the Status Bar is displayed.

See [Status Bar](#) for help on using the status bar.

## Status Bar



The status bar is displayed at the bottom of the Fuzzy Logic SC window. To display or hide the status bar, use the Status Bar command in the View menu.

The left area of the status bar describes actions of menu items as you use the arrow keys to navigate through menus. This area similarly shows messages that describe the actions of toolbar buttons as you depress them, before releasing them. If after viewing the description of the toolbar button command you wish not to execute the command, then release the mouse button while the pointer is off the toolbar button.

The right areas of the status bar indicate which of the following keys are latched down:

<b>Indicator</b>	<b>Description</b>
CAP	The Caps Lock key is latched down.
NUM	The Num Lock key is latched down.
SCRL	The Scroll Lock key is latched down.

**New command (Window menu)**

Use this command to open a new window with the same contents as the active window. You can open multiple application windows to display different parts or views of an application at the same time. If you change the contents in one window, all other windows containing the same application reflect those changes. When you open a new window, it becomes the active window and is displayed on top of all other open windows.

**Cascade command (Window menu)**

Use this command to arrange multiple opened windows in an overlapped fashion.

**Tile command (Window menu)**

Use this command to arrange multiple opened windows in a non-overlapped fashion.

**Tile Horizontal command (Window menu)**

Use this command to vertically arrange multiple opened windows in a non-overlapped fashion.

**Tile Vertical command (Window menu)**

Use this command to arrange multiple opened windows side by side.

## **Window Arrange Icons Command**

Use this command to arrange the icons for minimized windows at the bottom of the main window. If there is an open application window at the bottom of the main window, then some or all of the icons may not be visible because they will be underneath this application window.



### **1, 2, ... command (Window menu)**

Fuzzy Logic SC displays a list of currently open application windows at the bottom of the Window menu. A check mark appears in front of the application name of the active window. Choose an application from this list to make its window active.

## **Application menu commands**

The Application menu includes commands that let you develop and control your application:

<u>Edit Linguistic Values</u>	Enables user to add, delete and edit Linguistic values and Membership Functions
<u>Edit Rules</u>	Enables user to add, delete and edit rules
<u>View Linguistic Value</u>	Enables user to select which Linguistic Value to display
<u>Graph Settings</u>	Enables user to select the signals that will be displayed in graph
<u>Method</u>	Enables user to select the MAX Criterion defuzzification method
<u>Stimulus</u>	Enables user to manually assign stimulus values to input signals
<u>Calculation</u>	Runs the calculation on stimulus assigned to signals
<u>File Export</u>	Enables exporting signal values to ASCII file
<u>Show Rules List</u>	Shows all existed rules in separate window

## **Edit Linguistic Values (Application menu)**

Edit Linguistic Values menu selection displays dialog box that enables user to manipulate with Linguistic Values and Membership Functions.

### **To add new Linguistic Value:**

1. Type the name of your Linguistic Value (i.e.  $p(\bar{a})$ ) in the combo box in Linguistic Values section
  2. Click Add LV button
- New Linguistic Value with the name  $p(\bar{a})$  will be added to the list of Linguistic Values.

### **To delete existed Linguistic Value:**

1. Select the existed Linguistic Value from the list of Linguistic Values in combo box in Linguistic Values section
  2. Click Delete LV button
- The selected Linguistic Value will be removed from the list and also deleted from memory.

### **To use Linguistic Value for adding, deleting and editing Membership Functions:**

1. Select the existed Linguistic Value from the list of Linguistic Values in combo box in Linguistic Values section
  2. Click Accept LV button
- The selected Linguistic Value is ready for adding, deleting and editing belonging Membership Functions

### **To add Membership Function:**

1. Type the name of your new Membership Function (i.e. large) in the combo box in Membership Functions section
2. Fill edit fields  $x_1$ ,  $x_2$ ,  $x_3$  and  $x_4$  with the values of your new Membership Function, like:  
     $x_1$ : 5.85  
     $x_2$ : 7.55  
     $x_3$ : 9.25  
     $x_4$ : 10.00

what means that this Membership Function will have the following shape:

$T_1(5.85,0)$ ;  $T_2(7.55,1)$ ;  $T_3(9.25,1)$ ;  $T_4(10.00,0)$

where  $T_1$ ,  $T_2$ ,  $T_3$  and  $T_4$  are corners of trapeze

3. Click Add MF button

New Membership Function with the name large will be added to the list of Membership Functions.

### **To delete Membership Function:**

1. Select the name of Membership Functions from the list in combo box in Membership Functions section
2. Click Accept MF button
3. Click Delete MF button

Membership Function with the name will be removed from the list of Membership Functions and also deleted from memory.

### **To edit Membership Function:**

1. Select the name of Membership Functions from the list in combo box in Membership Functions section
2. Click Accept MF button
3. Edit values for  $x_1, \dots, x_4$
4. Click Edit MF button

## **Note**

You can not edit Membership Function name. In this case, you must first delete existed Membership Function and then add new one with the new name.

When you finish with this dialog box, press OK button. Remember that you cannot undo changes you made, because this dialog box does not have a Cancel button. All values are changed in the lists directly when you press buttons for adding, deleting and editing values.

## **Edit Rules (Application menu)**

Edit Rules menu selection displays dialog box that enables user to manipulate with rules.

### **To add new rule:**

1. Enter new rule in the form

IF lv1=mf11 AND lv2=mf21 AND ... THEN lvn=mfn1

in the edit field below the text Enter new rule or edit selected':

2. Click Save Rule button

New rule will be added to the list of all existed rules (if any). Remember that all rules must have the same format. When first rule has the form IF lv1=mf11 AND lv2=mf21 THEN lv3=mf31 then all other rules must have the same form: IF lv1=mf1x AND lv2=mf2y THEN lv3=mf3z, where mfn are Membership Functions corresponding to the existed Linguistic Values respectively.

### **Note**

When calculating output, program automatically takes the last Linguistic Value in rules (in section ...THEN lvn=mfnr) as output signal!

### **To edit existed rule:**

1. Select the rule from the list of existed rules and click Edit Rule button

2. Edit Linguistic Values or Membership Functions section of the rule

2. Click Save Rule button

Changed rule will be moved to the end of the list of existed rules.

### **To delete existed rule:**

1. Select the rule from the list of existed rules

2. Click Delete Rule button

Selected rule will be removed from the list of rules and also deleted from the memory.

### **To copy rule:**

1. Select the rule from the list of existed rules

2. Click Copy Rule button

Selected rule will be copied to the edit field on the top of the dialog box, where you can edit it.

### **View Linguistic Value (Application menu)**

View Linguistic Value menu selection enables user to select which one from the existed Linguistic Values wants to be displayed on the screen.

#### **To select existed Linguistic Value:**

1. From the list of existed Linguistic Values select the one you want to display on the screen
2. Click OK button

## **Graph Settings (Application menu)**

Graph settings menu selection enables user to select which signals (Linguistic Values) will be displayed in graph. Graph graphically presents input signals and results of calculations.

### **To select which signal (Linguistic Value) to display:**

1. From the list of existed signals (Linguistic Values) select the signal you want to be displayed in graph.
2. Click Select button
3. If you want, you can repeat steps 1. to 2. to select maximum of three signals to be displayed in graph.
4. If you want to change your selection, then click Delete button. This will remove all signals from the list of selected signals. After that, you can select new group of signals to be displayed in graph.

### **Method (Application menu)**

Method menu selection enables user to select one of three allowable Max Criterion defuzzification methods:

a.) MAX METHOD - left

The most left maximum value on abscise is selected as output

b.) MAX METHOD - right

The most right maximum value on abscise is selected as output

c.) MAX METHOD - average

Performs Center of Gravity calculation on all maximum values on abscise

#### **To select the method:**

1. Click radio button before the name of method you prefer
2. Click OK button



## **Stimulus (Application menu)**

This menu selection enables user to manually enter temporary signal values for calculation.

### **To enter signal values (stimulus):**

1. From the list of existed signals (Linguistic Values) select the one you want to assign a value.
2. Enter signal value in the edit field
3. Click <- Set button

### **To view temporary signal (stimulus) values:**

1. From the list of existed signals (Linguistic Values) select the one you want to check a value.
2. Click Get -> button
3. Value for selected signal will be displayed in edit field

### **Note**

Stimulus is not saved when you choose File - Save or File - Save As menu command!

### **Calculation (Application menu)**

This menu selection has no options, it just performs calculation according to the Linguistic Values, rules, stimulus and method entered by user. The result of calculation will be displayed in graph, if the output signal (Linguistic Value) was selected in Graph Settings Application menu command and in the graph in the middle of the screen.

### **File Export (Application menu)**

This menu selection displays standard File-OpenSave dialog box that enables user to enter filename for exporting temporary signal values in external ASCII file. One record is made after each calculation performed. Record has the following form:

date time,value of signal1,value of signal2,...value of signaln, like

13.07.95 20:15:58,1.25,8.66,12.50 ... ,5.55,

Note that you can not select which signal values (values of Linguistic Values) will be exported in this file. Program automatically exports temporary signal values of all Linguistic Values from active application in the same order as they have been entered (look Edit Linguistic Values menu command).

**Show Rules List (Application menu)**

This menu command displays a separate window containing a list of all rules the application developer has entered by using Edit Rules menu command. By activating this window the list of rules can be printed on a system printer.

## **Fuzzy Logic SC (Fuzzy Logic Software Controller)**

Fuzzy Logic SC is a simple software tool with the aim to represent the possibility of fuzzy logic control. It is multi-input and single-output application. Although its simplicity it could be useful for testing and developing fuzzy logic control applications before the developer finally develops it in its own software or hardware application specific product (see [Sample Application](#)) or for combining it with users data acquisition or control engineering application (see [OLE 2.0 Support](#)).

This program calculates output according to the rules by using Min - Max operator for fuzzification according to formula

$$U_{\text{MinMax}} = g \cdot \min(x, y) + (1-g) \cdot \max(x, y), \text{ where } g=1$$

and Max Criterion Method for defuzzification. User can decide how to interpret output from the set of all calculated maximum values by selecting the most left value, most right value or the value calculated from all maximum values according to the Center Of Gravity method. Program uses dynamically expanding lists and arrays for storing Linguistic Values, Membership Functions and rules and therefore the only limit for the number of elements is available system memory.

If you have encountered any problems when using this program or if you have any comments, then please contact the author on address:

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## OLE 2.0 Support

Fuzzy Logic SC is an OLE Automation Server and therefore supports communication between application - specific MS Windows application (Application) that supports OLE 2.0 and the application the user has developed by using Fuzzy Logic SC. The Application can use the Fuzzy Logic SC capabilities of calculating output based on Linguistic Values, Membership Functions, rules, method and stimulus by using three methods that Fuzzy Logic SC exposes to other MS Windows based applications. Here is a short description of these methods:

### BOOL SetValue(LPCSTR lvName, float inSignal)

- this method sets the temporary signal value of lvName Linguistic Value (signal) to the value specified by inSignal. It returns TRUE in all cases.

### float GetValue(LPCSTR lvName)

- this method gets the temporary signal value of lvName Linguistic Value (signal). It returns the float value of the signal.

### BOOL DoCalculation()

- this method performs the calculation according to the Calculation application menu selection.

Here are the main steps in implementing a communication between Application and the application developed by using Fuzzy Logic SC.

#### STEP 1:

- build a Fuzzy Logic SC application (see Sample Application). Save your work (remember the name of your application with full path, that is c:\fuzzy\sample.fld) and let Fuzzy Logic SC runs with your Fuzzy Logic SC application file (\*.fld) opened.

#### STEP 2:

- build an MS Windows based application (in example below this is a Visual Basic application):

a.) in the main form place edit controls with the name p, dp and Result

b.) in the main form place button named Command1 and add the following Visual Basic code (code is displayed in blue color) to its method Click:

#### Sub Command1\_Click ()

Dim FLSC As object

FLSC is now an object

Set FLSC = GetObject("c:\fuzzy\sample.fld")

object FLSC is now connected to the Fuzzy Logic SC application file sample.fld. We can use methods that are exposed by Fuzzy Logic SC object (in this example FLSC)

a = FLSC.SetValue("p(bar)", Val(p.Text))

a = FLSC.SetValue("dp(bar/s)", Val(dp.Text))

By using SetValue(..) exposed method, p(bar) and dp(bar/s) Linguistic Values in sample.fld application now have temporary signal values (stimulus) according to the ones contained in p and dp edit fields of Visual Basic application

a = FLSC.DoCalculation()

Fuzzy Logic SC performs a calculation on values (stimulus) entered before by using DoCalculation() exposed method

y = FLSC.GetValue("output(V)")

By using GetValue(..) exposed method we can get the temporary signal value of

output(V) Linguistic Value (in this case the output signal)

```
Result.Text = Str$(y)  
End Sub
```

c.) build your Application

- STEP 3:

- run your Application. Fill the edit fields with the values for p(bar) and dp(bar/s) and click on Command1 button. You will see that Fuzzy Logic SC performs the calculation as it would be activated directly by using Fuzzy Logic SC menu commands, but the main window of it remains hidden.

The OLE Automation Server capability of Fuzzy Logic SC is useful when the user develops its own SCADA application that supports OLE 2.0 and wants to add some fuzzy logic capabilities to it but has no time to write and test the code that is specific to fuzzy logic calculations.

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## Sample Application

### Control of pressure in Waterworks

#### Problem:

With the help of Fuzzy Logic SC we want to control the pump in some waterworks station (see Figure 1. below). We know that the optimum pressure at the outlet of the station (  $p_0$  ) is approximately 4 bar and that is the value we want to keep all the time (if possible). We also know that in some periods of the day the pressure (  $p_t$  ) can oscillate around the optimum value because of different reasons (changes in demand, unexpected events such as broken pipe, etc.). The aim of the application is to set the voltage on the output of the controller so that the pump will keep the pressure in the optimum limits.

#### Solution:

We can build three Linguistic Values (see [Edit Linguistic Values](#)):

1.  $p(\text{bar})$  - pressure as difference between pressure measured at the outlet of the station and the optimal pressure (set value):

$$p(\text{bar}) = p_t - p_0; p_0 = 4 \text{ bar}$$

2.  $dp(\text{bar/s})$  - change of the pressure from the last measurement made - shows the trend of pressure changing

3.  $\text{output}(\text{V})$  - output from the controller in the range of 0 - 10 V; 0 V means that pump must stop operating, and 10 V means that pump must operate with the maximum frequency (U/f characteristic is controlled by external frequency converter)

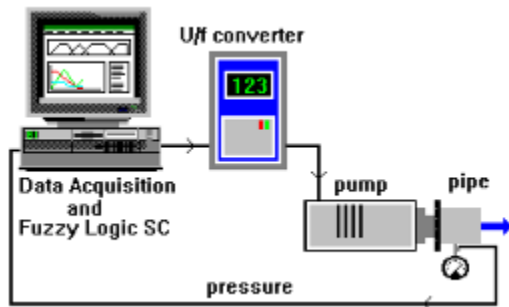


Figure 1. - controlling the pressure in waterworks

After we have built Linguistic Values, we must add Membership Functions to each Linguistic Value:

$p(\text{bar})$  has five Membership Functions:

- nl: T1(-4,0); T2(-4,1); T3(-3,1); T4(-2,0)
- ns: T1(-3,0); T2(-2,1); T3(-1,1); T4(0,0)
- z: T1(-1,0); T2(0,1); T3(0,1); T4(1,0)
- ps: T1(0,0); T2(1,1); T3(2,1); T4(3,0)
- pl: T1(2,0); T2(3,1); T3(6,1); T4(6,0)

$dp(\text{bar/s})$  has three Membership Functions:

- negative: T1(-2,0); T2(-2,1); T3(-0.5,1); T4(0,0)
- zero: T1(-0.5,0); T2(0,1); T3(0,1); T4(0.5,0)
- positive: T1(0,0); T2(0.5,1); T3(2,1); T4(2,0)

$\text{output}(\text{V})$  has four Membership Functions:



- zero: T1(0,0); T2(0,1); T3(0,1); T4(0,0)
- small: T1(0,0); T2(1,1); T3(3,1); T4(4,0)
- middle: T1(3,0); T2(4,1); T3(6,1); T4(7,0)
- large: T1(6,0); T2(7,1); T3(10,1); T4(10,0)

Now we must get some information about the behavior of the system in different situations. For this phase of application development we can observe the operating of the system or get information from operator who used to manually drive this station. Finally we present this knowledge in the form of rules (see [Edit Rules](#)) as follows in example:

IF p(bar)=z AND dp(bar/s)=negative THEN output(V)=small

what means: if pressure is in the limits of optimal and trends to fall, then we should start to run pump. Then we will wait to see what happens next.

### Here is the collection of all rules:

IF p(bar)=nl AND dp(bar/s)=negative THEN output(V)=large  
 IF p(bar)=nl AND dp(bar/s)=zero THEN output(V)=large  
 IF p(bar)=nl AND dp(bar/s)=positive THEN output(V)=middle  
 IF p(bar)=ns AND dp(bar/s)=negative THEN output(V)=large  
 IF p(bar)=ns AND dp(bar/s)=zero THEN output(V)=large  
 IF p(bar)=ns AND dp(bar/s)=positive THEN output(V)=small  
 IF p(bar)=z AND dp(bar/s)=negative THEN output(V)=small  
 IF p(bar)=z AND dp(bar/s)=zero THEN output(V)=zero  
 IF p(bar)=z AND dp(bar/s)=positive THEN output(V)=zero  
 IF p(bar)=ps AND dp(bar/s)=negative THEN output(V)=zero  
 IF p(bar)=ps AND dp(bar/s)=zero THEN output(V)=zero  
 IF p(bar)=ps AND dp(bar/s)=positive THEN output(V)=zero  
 IF p(bar)=pl AND dp(bar/s)=negative THEN output(V)=zero  
 IF p(bar)=pl AND dp(bar/s)=zero THEN output(V)=zero  
 IF p(bar)=pl AND dp(bar/s)=positive THEN output(V)=zero

Now we select the Linguistic Value to display on the screen (usually output signal, so we select output(V) - see [View Linguistic Value](#)) and signals that will be displayed in graph (maximum number of signals to be displayed is three, so we can select p(bar), dp(bar/s) and output(V) - see [Graph Settings](#)). After we have completed defining visualization, we can choose [File Export](#) utility that enables archiving of signal values in ASCII files. After that we can select [Method](#) to select calculation method, enter stimulus values for our system (see [Stimulus](#)) as shown in examples and select [Calculation](#) menu selection to perform calculation:

#### Example 1:

pt= 3 bar => p(bar) = pt - p0 = 3 - 4 = -1  
 dp(bar/s) = -0.25  
 => output(V) = 8.25

what means: because pressure is less than optimal and it trends to fall, the controller has to start running the pump.

#### Example 2:

pt= 4 bar => p(bar) = pt - p0 = 4 - 4 = 0  
 dp(bar) = 0.7  
 => output(V) = 0.0

what means: because pressure is in the range of optimal and it is to be on the rise, the controller has to stop the pump.

**Note:** this sample application is only for the purpose to show the user how to work by using Fuzzy Logic SC program. User has to edit Linguistic Values, Membership Functions and rules to build some more applicable and real - world application.

### **Index command (Help menu)**

Use this command to display the opening screen of Help. From the opening screen, you can jump to step-by-step instructions for using Fuzzy Logic SC and various types of reference information.

Once you open Help, you can click the Contents button whenever you want to return to the opening screen.

## **Using Help command (Help menu)**

Use this command for instructions about using Help.

**About command (Help menu)**

Use this command to display the copyright notice and version number of your copy of Fuzzy Logic SC software.

## **Context Help command**



Use the Context Help command to obtain help on some portion of Fuzzy Logic SC. When you choose the Toolbar's Context Help button, the mouse pointer will change to an arrow and question mark. Then click somewhere in the Fuzzy Logic SC window, such as another Toolbar button. The Help topic will be shown for the item you clicked.

### **Shortcut**

Keys:      SHIFT+F1

## **Title Bar**

Fuzzy Logic SC

The title bar is located along the top of a window. It contains the name of the application and application.

To move the window, drag the title bar. Note: You can also move dialog boxes by dragging their title bars.

A title bar may contain the following elements:

- Application Control-menu button
- Application Control-menu button
- Maximize button
- Minimize button
- Name of the application
- Name of the application
- Restore button

**Scroll bars**

Displayed at the right and bottom edges of the application window. The scroll boxes inside the scroll bars indicate your vertical and horizontal location in the application. You can use the mouse to scroll to other parts of the application.



## **Size command (System menu)**

Use this command to display a four-headed arrow so you can size the active window with the arrow keys.



After the pointer changes to the four-headed arrow:

1. Press one of the DIRECTION keys (left, right, up, or down arrow key) to move the pointer to the border you want to move.
2. Press a DIRECTION key to move the border.
3. Press ENTER when the window is the size you want.

Note: This command is unavailable if you maximize the window.

### **Shortcut**

Mouse: Drag the size bars at the corners or edges of the window.

### **Move command (Control menu)**

Use this command to display a four-headed arrow so you can move the active window or dialog box with the arrow keys.



Note: This command is unavailable if you maximize the window.


### **Shortcut**

Keys: CTRL+F7

### **Minimize command (application Control menu)**

Use this command to reduce the Fuzzy Logic SC window to an icon.


### **Shortcut**

Mouse: Click the minimize icon  on the title bar.  
Keys: ALT+F9

## **Maximize command (System menu)**

Use this command to enlarge the active window to fill the available space.

### **Shortcut**

Mouse: Click the maximize icon  on the title bar; or double-click the title bar.  
Keys: CTRL+F10 enlarges an application window.

### **Next Window command (application Control menu)**

Use this command to switch to the next open application window. Fuzzy Logic SC determines which window is next according to the order in which you opened the windows.

#### **Shortcut**

Keys: CTRL+F6

### **Previous Window command (application Control menu)**

Use this command to switch to the previous open application window. Fuzzy Logic SC determines which window is previous according to the order in which you opened the windows.

#### **Shortcut**

Keys:      SHIFT+CTRL+F6

## **Close command (Control menus)**

Use this command to close the active window or dialog box.

Double-clicking a Control-menu box is the same as choosing the Close command.



Note: If you have multiple windows open for a single application, the Close command on the application Control menu closes only one window at a time. You can close all windows at once with the Close command on the File menu.

### **Shortcuts**

Keys:      CTRL+F4 closes an application window  
              ALT+F4 closes the window or dialog box

**Restore command (Control menu)**

Use this command to return the active window to its size and position before you chose the Maximize or Minimize command.



## **Switch to command (application Control menu)**

Use this command to display a list of all open applications. Use this "Task List" to switch to or close an application on the list.

### **Shortcut**

Keys: CTRL+ESC

### **Dialog Box Options**

When you choose the Switch To command, you will be presented with a dialog box with the following options:

#### **Task List**

Select the application you want to switch to or close.

#### **Switch To**

Makes the selected application active.

#### **End Task**

Closes the selected application.

#### **Cancel**

Closes the Task List box.

#### **Cascade**

Arranges open applications so they overlap and you can see each title bar. This option does not affect applications reduced to icons.

#### **Tile**

Arranges open applications into windows that do not overlap. This option does not affect applications reduced to icons.

#### **Arrange Icons**

Arranges the icons of all minimized applications across the bottom of the screen.

**Ruler command (View menu)**

**Choose Font dialog box**

**Choose Color dialog box**






## **Print command (File menu)**

Use this command to print a document. This command presents a Print dialog box, where you may specify the range of pages to be printed, the number of copies, the destination printer, and other printer setup options.

## **Shortcuts**

Toolbar:   
Keys: CTRL+P

## **Print dialog box**

The following options allow you to specify how the document should be printed:

### **Printer**

This is the active printer and printer connection. Choose the Setup option to change the printer and printer connection.

### **Setup**

Displays a Print Setup dialog box, so you can select a printer and printer connection.

### **Print Range**

Specify the pages you want to print:

**All** Prints the entire document.

**Selectio** Prints the currently selected text.

**n**

**Pages** Prints the range of pages you specify in the From and To boxes.

### **Copies**

Specify the number of copies you want to print for the above page range.

### **Collate Copies**

Prints copies in page number order, instead of separated multiple copies of each page.

### **Print Quality**

Select the quality of the printing. Generally, lower quality printing takes less time to produce.



## **Print Progress Dialog**

The Printing dialog box is shown during the time that <<YourApp>> is sending output to the printer. The page number indicates the progress of the printing.

To abort printing, choose Cancel.

**Print Preview command (File menu)**

Use this command to display the active document as it would appear when printed. When you choose this command, the main window will be replaced with a print preview window in which one or two pages will be displayed in their printed format. The print preview toolbar offers you options to view either one or two pages at a time; move back and forth through the document; zoom in and out of pages; and initiate a print job.

## **Print Preview toolbar**

The print preview toolbar offers you the following options:

### **Print**

Bring up the print dialog box, to start a print job.

### **Next Page**

Preview the next printed page.

### **Prev Page**

Preview the previous printed page.

### **One Page / Two Page**

Preview one or two printed pages at a time.

### **Zoom In**

Take a closer look at the printed page.

### **Zoom Out**

Take a larger look at the printed page.

### **Close**

Return from print preview to the editing window.

**Print Setup command (File menu)**

Use this command to select a printer and a printer connection. This command presents a Print Setup dialog box, where you specify the printer and its connection.

## **Print Setup dialog box**

The following options allow you to select the destination printer and its connection.

### **Printer**

Select the printer you want to use. Choose the Default Printer; or choose the Specific Printer option and select one of the current installed printers shown in the box. You install printers and configure ports using the Windows Control Panel.

### **Orientation**

Choose Portrait or Landscape.

### **Paper Size**

Select the size of paper that the document is to be printed on.

### **Paper Source**

Some printers offer multiple trays for different paper sources. Specify the tray here.

### **Options**

Displays a dialog box where you can make additional choices about printing, specific to the type of printer you have selected.

### **Network...**

Choose this button to connect to a network location, assigning it a new drive letter.

**Page Setup command (File menu)**

<< Write application-specific help here. >>

### **Update command (File menu)**

<< Write a topic here that discusses the Update command. >>

## **Save Copy As... command (File menu)**

<< Write a topic here that discusses the Save Copy As... command. >>



## **Embedded Object Resize Bar**

<< Write a topic here that discusses the embedded object resize bar. >>



