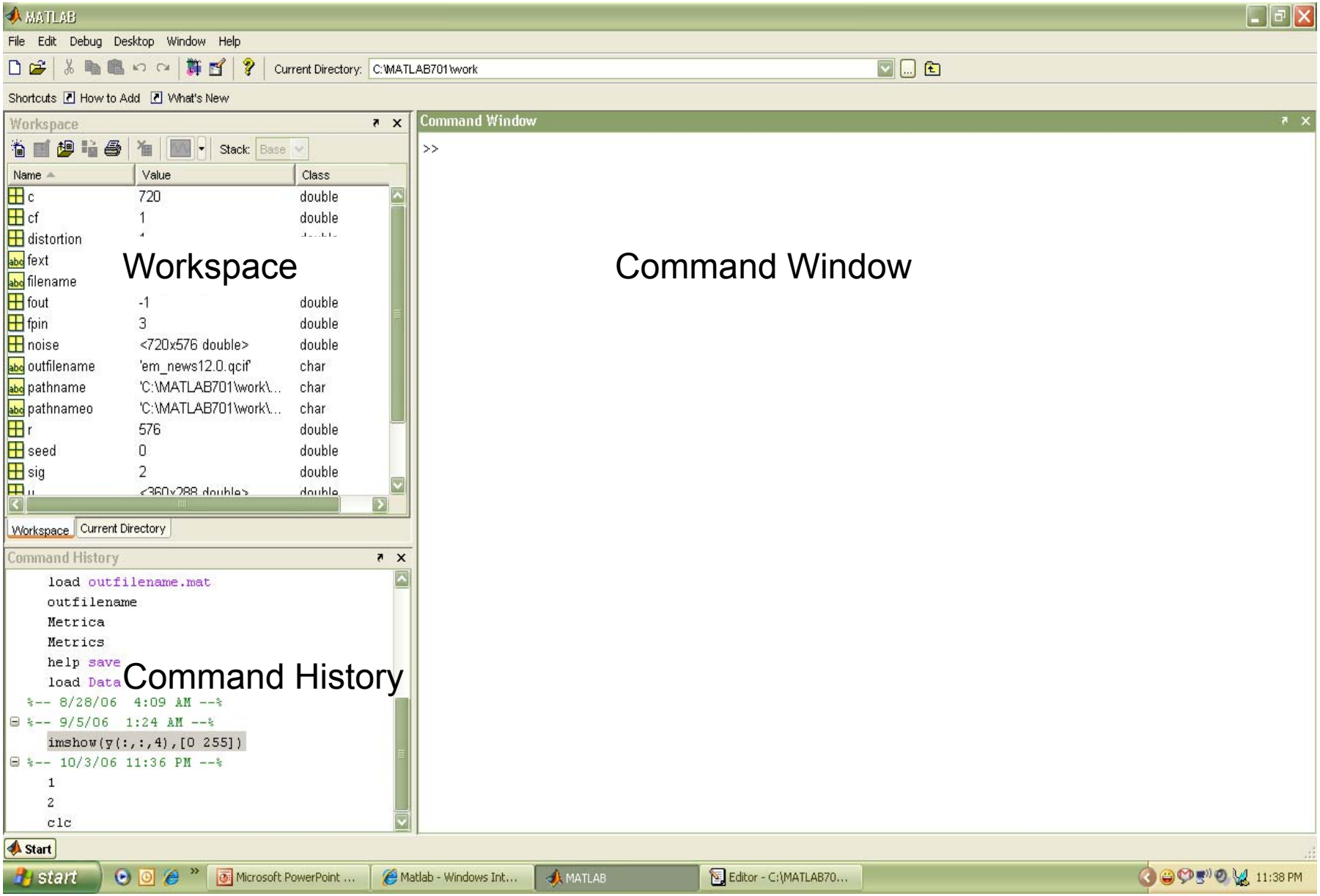
# Matlab Alapok

# Bevezetés

- MatLab : **Mat**rix **Lab**oratory
- Numerikus számítások mátrixokkal
  - *„minden mátrix”*
- Miért a Matlab?
  - Felhasználóbarát(GUI)
  - Könnyen használható, gyors interpreter
  - Széles támogatottság (toolbox-ok)
  - Komplex matematikai számítások


MATLAB
File Edit Debug Desktop Window Help
Current Directory: C:\MATLAB701\work
Shortcuts How to Add What's New
Workspace
Stack: Base
Name Value Class
c 720 double
cf 1 double
distortion
fext
filename
fout -1 double
fpin 3 double
noise <720x576 double> double
outfilename 'em_news12.0.qcif' char
pathname 'C:\MATLAB701\work\... char
pathnameo 'C:\MATLAB701\work\... char
r 576 double
seed 0 double
sig 2 double
Workspace
Current Directory
Command History
load outfilename.mat
outfilename
Metrica
Metrics
help save
load Data
%-- 8/28/06 4:09 AM --%
%-- 9/5/06 1:24 AM --%
imshow(y(:,:,4),[0 255])
%-- 10/3/06 11:36 PM --%
1
2
clc
Command Window
>>
Workspace
Command History
Command Window
Start
start
Microsoft PowerPoint ...
Matlab - Windows Int...
MATLAB
Editor - C:\MATLAB70...
11:38 PM

# Változók

- Az alap változó mátrix

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$$

- “a=7;” egy 1x1 mátrix (skalár)
- “a=[1,2,3;4,5,6];” 2x3 mátrix
- “a=‘array’;” 1x5 karakter mátrix
- a(i,j) az a matrix i. sorának és j. oszlopának eleme
- Az “:” operátor
  - >> 1:3 1 2 3
  - >> 10:-1:5 10 9 8 7 6 5
  - >> a(1:3;j) a(1,j) a(2,j) a(3,j)

# Mátrixok a Matlab-ban

- Mátrix megadása

$$\begin{matrix} 3 & 1 \\ 6 & 4 \end{matrix}$$

```
>> A = [3 1 ; 6 4]

>> A = [3, 1 ; 6, 4]

>> B = [3, 5 ; 0, 2]
```

# Mátrixok

- egy vektor `x = [1 2 5 1]`

```
x =
     1   2   5   1
```

- egy mátrix `x = [1 2 3; 5 1 4; 3 2 -1]`

```
x =
     1     2     3
     5     1     4
     3     2    -1
```

- transzponálás `y = x.'`

```
y =
     1
     2
     5
     1
```

# Mátrixok

- x(i,j) elem

```
y=x(2,3)
y =
     4
```

- teljes sor

```
y=x(3,:)
y =
     3     2    -1
```

- teljes oszlop

```
y=x(:,2)
y =
     2
     1
     2
```

# Alap matematikai operációk

**Összeadás:**

>> C = A + B

**Kivonás:**

>> D = A – B

**Szorzás:**

>> E = A * B  (Mátrix szorzat)

>> E = A .* B (Elemenkénti szorzat)

**Osztás:**

*Bal- és jobboldali osztás*

>> F = A . / B (Elemenkénti osztás)

>> F = A / B (A * inverz B)

>> F = A . \ B (Elemenkénti osztás)

>> F = A \ B (inverz A * B)

# Alap mátrix generálások

**Null mátrix:**

>> Z = ZEROS (r, c)

**Mátrix egyesekkel:**

>> O = ONES (r, c)

**Egység mátrix:**

>> I = EYE (r, c)

r → sorok

c → oszlopok

zeros, ones, eye → Matlab *függvények*

# Komplex számok

- Valós és imaginárius rész
  - **real** % a komplex szám valós része
  - **imag** % a komplex szám imaginárius része
- Magnitudó és fázis
  - **abs** % a komplex szám magnitúdója
  - **angle** % a komplex szám fázis

# Grafikonok

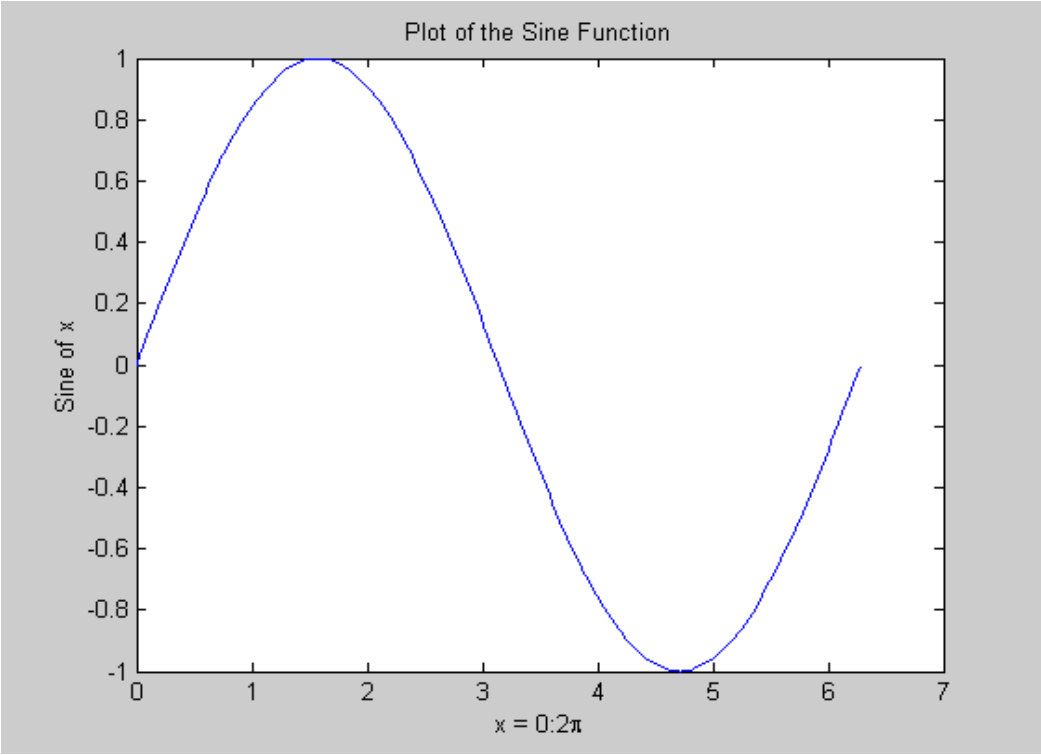
- PLOT(x,y)
  - y kirajzolása x függvényében .
  - XLABEL(‘label’)
  - YLABEL(‘label’)
  - TITLE(‘title’)
- IMAGE(x)
  - kép megjelenitése

## 3D grafikonok:

- MESH
  - 3D háló
- MESHGRID
  - rács kirajzolása
- SURF
  - 3D színes felszin

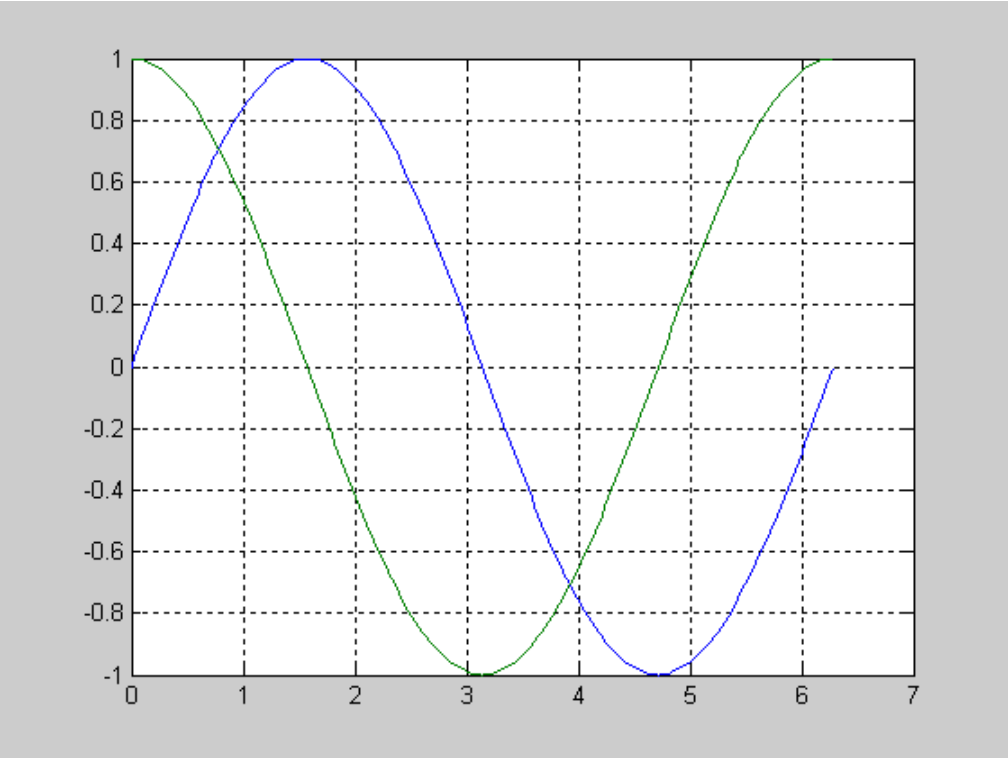
# Grafika példa

```
x = 0:pi/100:2*pi;
y = sin(x);
plot(x,y)
xlabel('x = 0:2\pi')
ylabel('Sine of x')
title('Plot of the
   Sine Function')
```



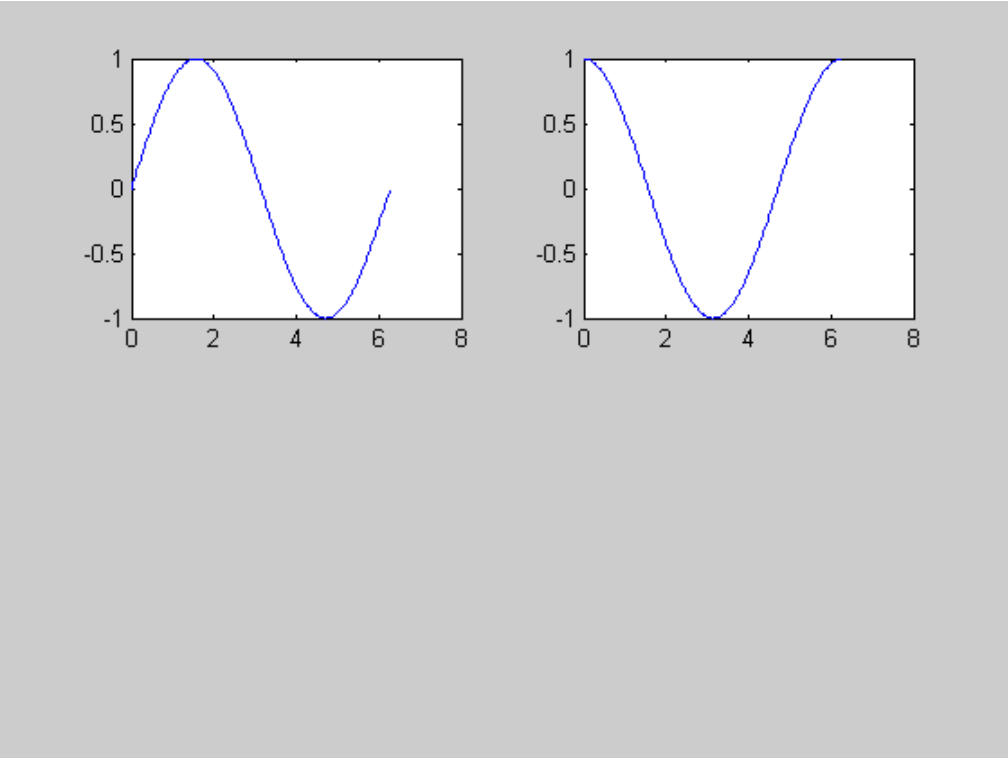
# Több garfikon

```
t = 0:pi/100:2*pi;
y1=sin(t);
y2=sin(t+pi/2);
plot(t,y1,t,y2)
grid on
```



# Több grafikon

```
t = 0:pi/100:2*pi;
y1=sin(t);
y2=sin(t+pi/2);
subplot(2,2,1)
plot(t,y1)
subplot(2,2,2)
plot(t,y2)
```



# Függvények a Matlab-ban

function return values = *function_name* (arguments)

- function kulcsszóval kezdődik
- A file első sora!
- Menteni mint “function_name.m”
- Pontosvessző (;) a kefejezések végén

- Project Function:

```
function  showGrayIm (im)
% show 8bits/pixel gray scale image
% Zhou Wang, Sept. 2006
colormap(gray(256));
image(im);
axis('image', 'off');
```

Kulcsszó

Arguments

Function_name

» **gray(256)** : Generates a *256 x 3* matrix containing *grayscale* color map

» **colormap(gray(256))** : Transforms / changes the *current image color map* to *new color map* generated by *gray(256)*

# Feltételes és ciklus utasítások

## if, elseif, else

```
if A > B
    s=‘A greater‘;
elseif A < B
    s=‘A less'
elseif A == B
    s=‘A,B equal'
else
    s='Unexpected situation‘
end
```

## switch

```
switch (int(A-B))
    case -1
        s=‘A less‘;
    case 0
        s=‘A,B equal'
    case 1
        s=‘A greater'
    otherwise
        s='Unexpected situation‘
end
```

## for

```
for i=1:5
    sum=sum+i;
end
```

# Feltételes és ciklus utasítások

## Óvakodj a *for*-tól!

Kód 1:

```
count_1 = 0;
for i = 1 : length(A)
        if A(i) == 1
                count_1 = count_1 + 1
        end
end
```

Kód 2:

```
ct_1 = sum(A==1)
```

Az egyes és kettes kód eredménye azonos!

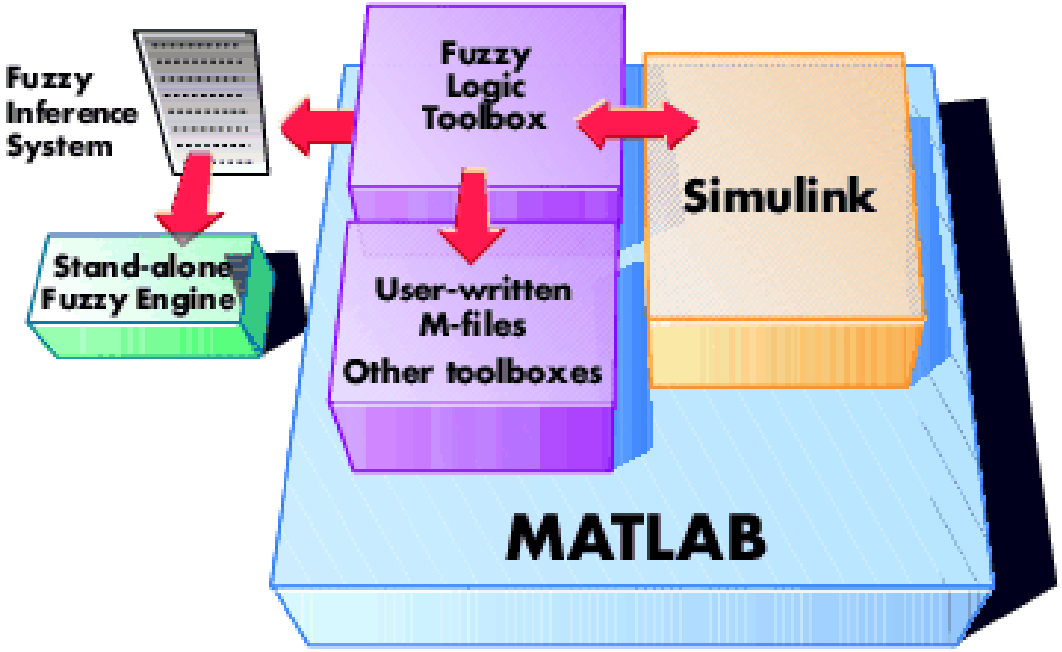
# Input és Output (I/O)

- **Írás a képernyőre**
  - disp([‘Variable x has value: ‘ num2str(x)]);
  - x (with no “;” will print x)
- **Írás file-ba**
  - Speciális Matlab függvények (pl. csvwrite(‘matrix.txt’,M))
  - File megnyitása: fid=fopen(‘file.txt’,w);
  - Írás a file-ba: fprintf(fid,'%f\n',x);  (c style formatting)
  - File lezárása: fclose(fid); (must do this to have it write)
- **Olvasás file-ból**
  - Speciális Matlab függvények (pl. M = csvread('filename'))
  - C stílusban: a = fscanf(fid,'%g %g',[m n]); visszatérés egy m x n mátrix-al.

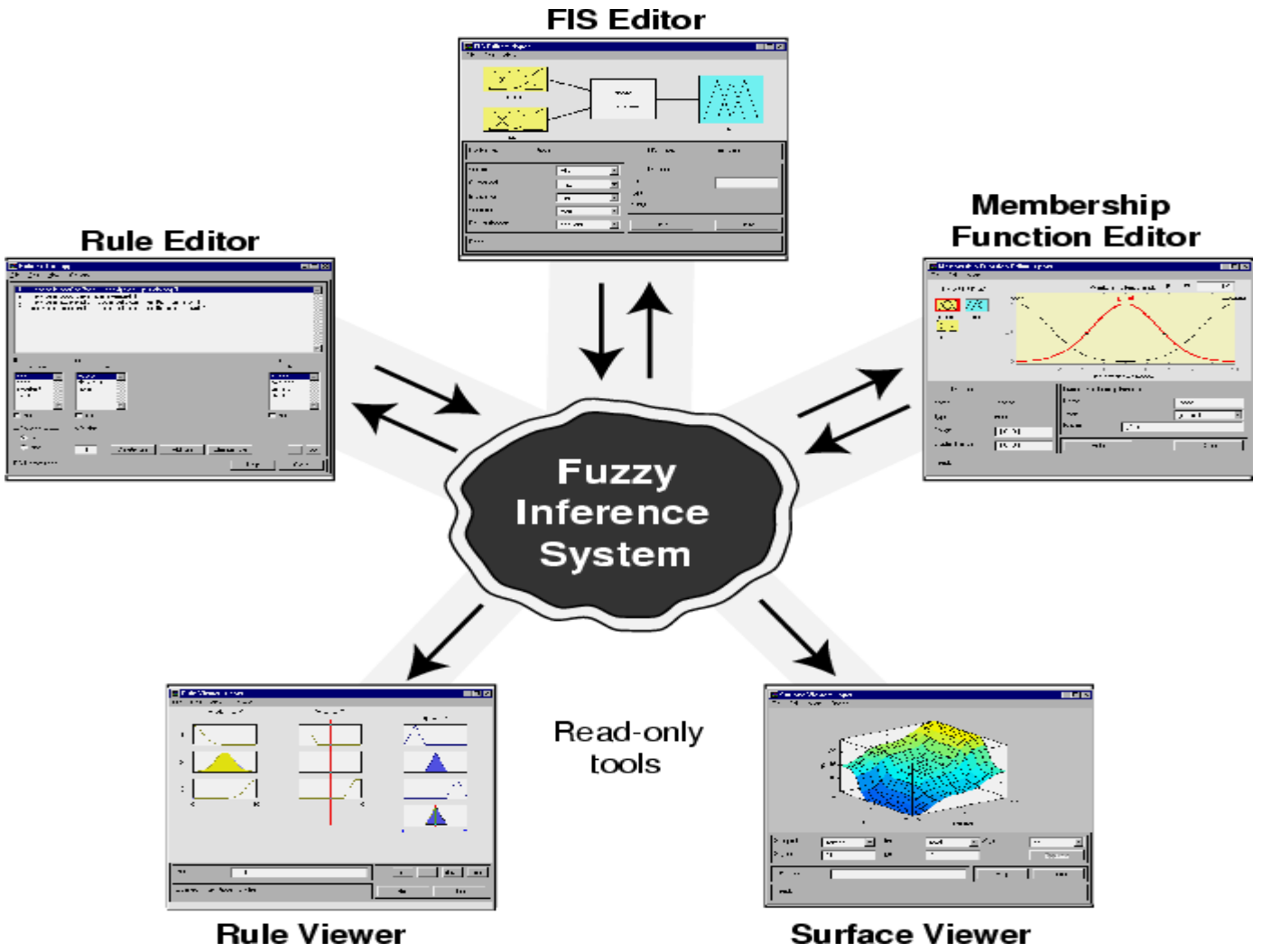
# Help!!

- Help Browser használata(.html, .pdf)
  - getstart.pdf, graphg.pdf, using_ml.pdf
- Parancs sorban
  - `help`
  - `help` *`function`*, e.g. `help plot`
- Demok
  - type `demos`
  - type `help demos`

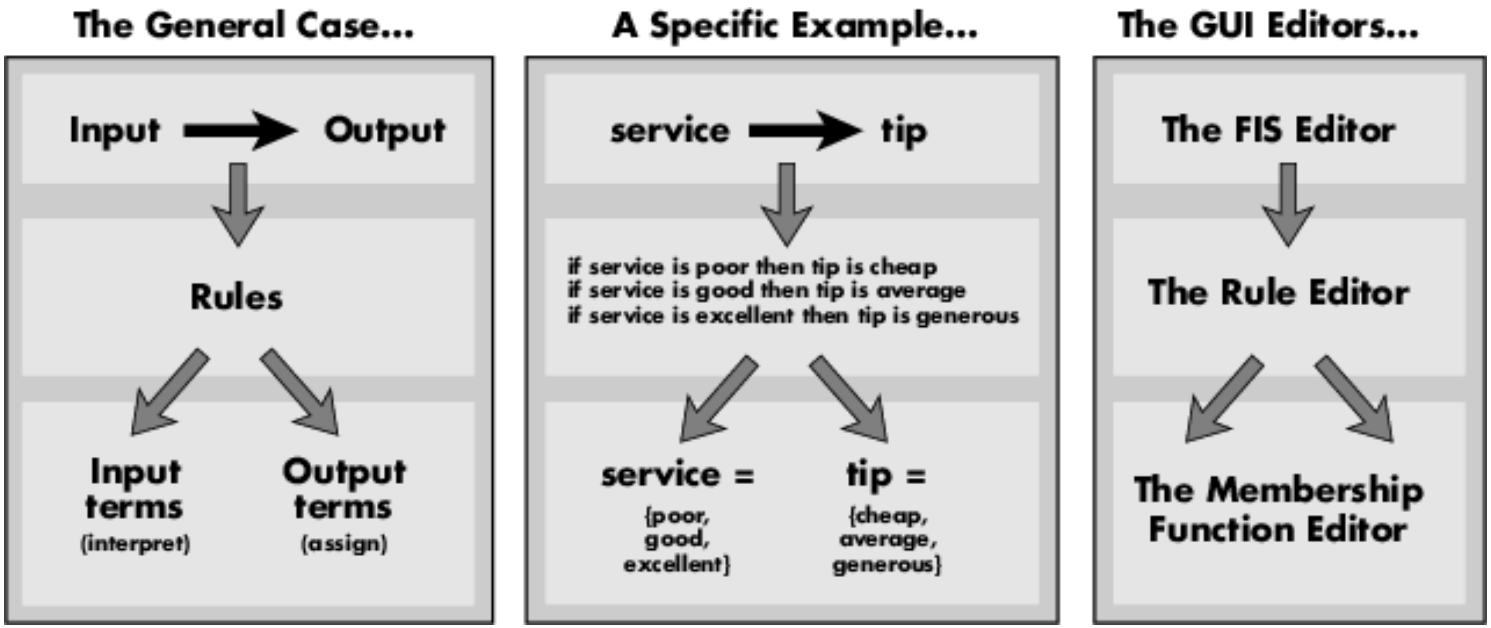
# Matlab Fuzzy Logic Toolbox



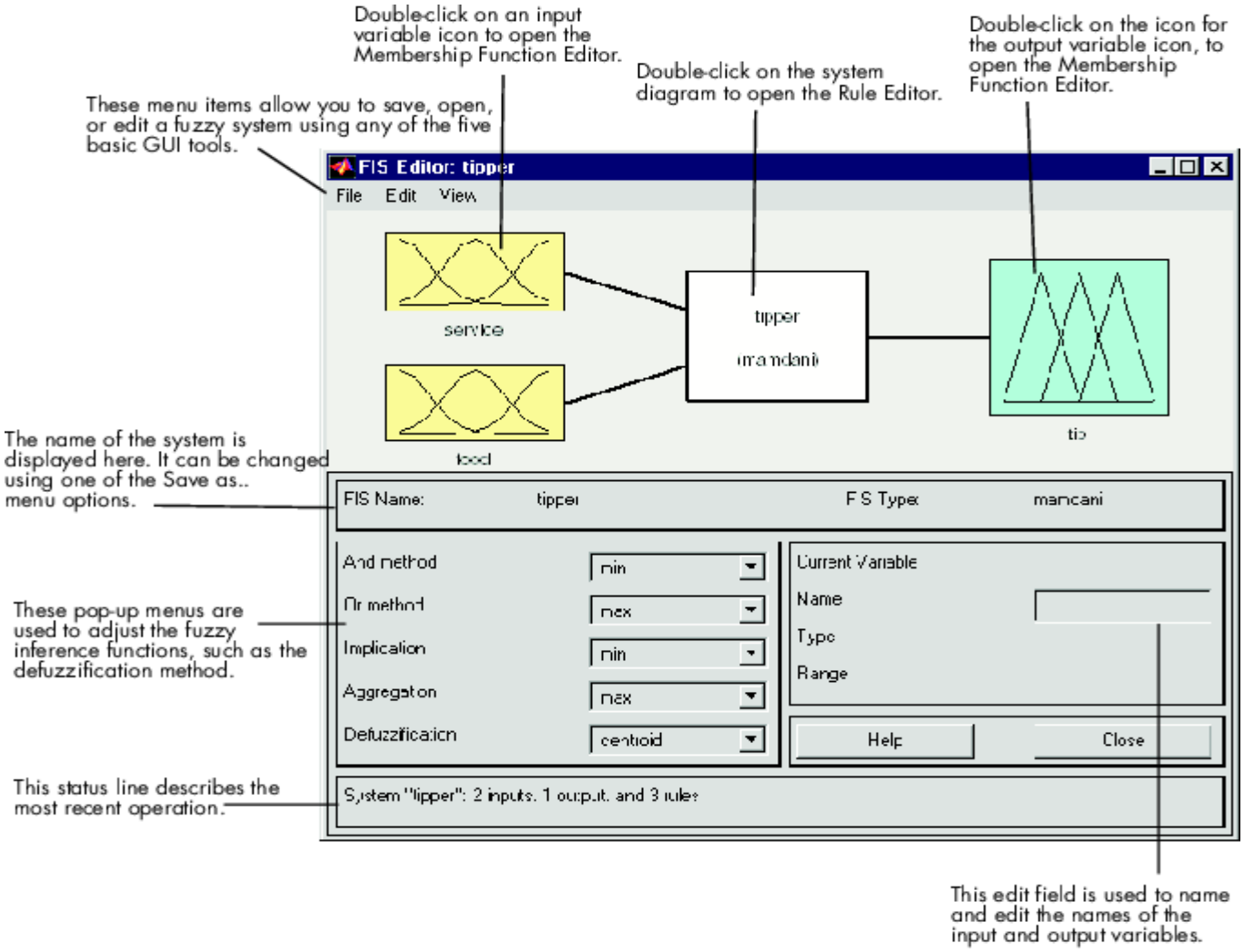
# Matlab Fuzzy Logic Toolbox



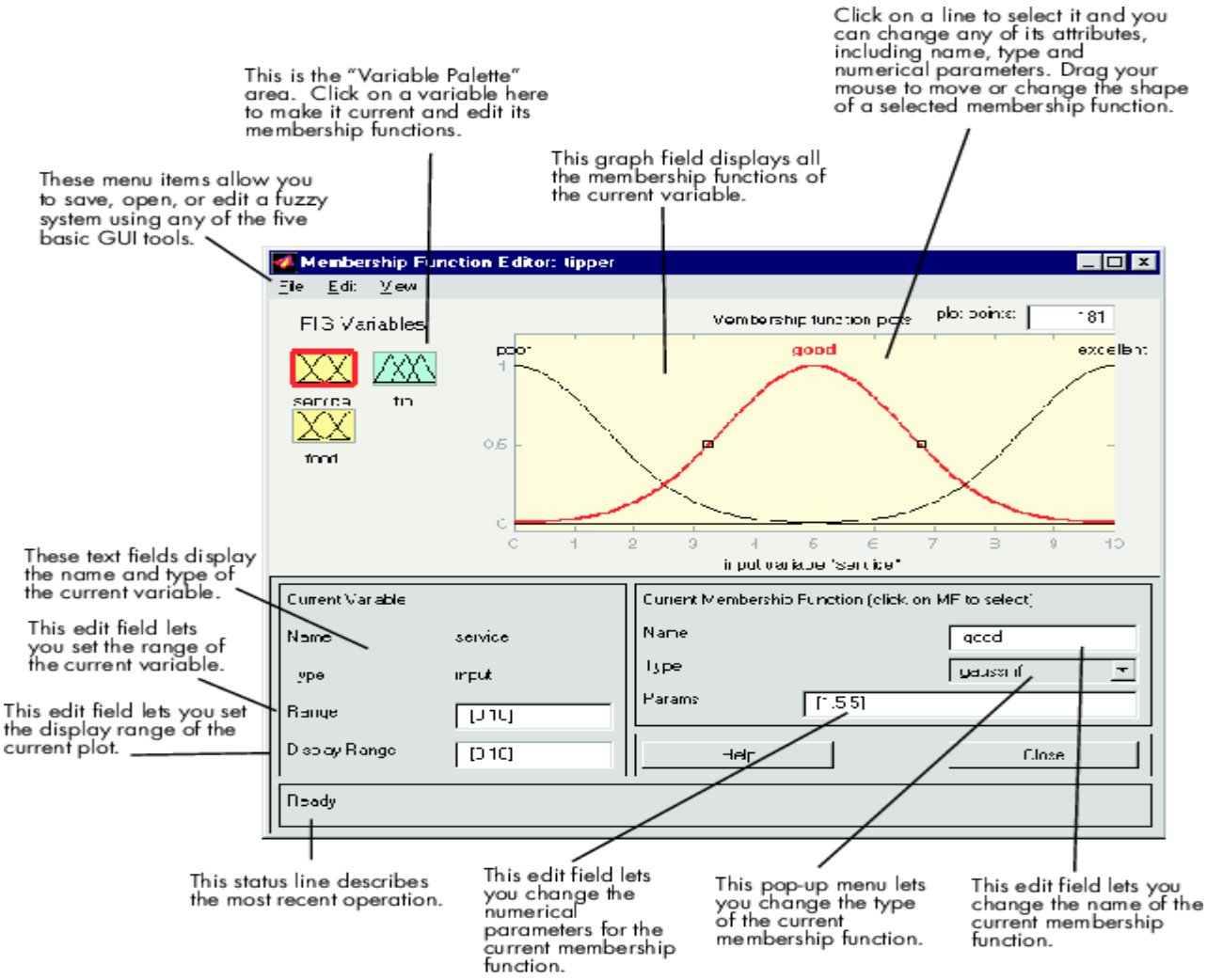
# Matlab FIS építés koncepciója



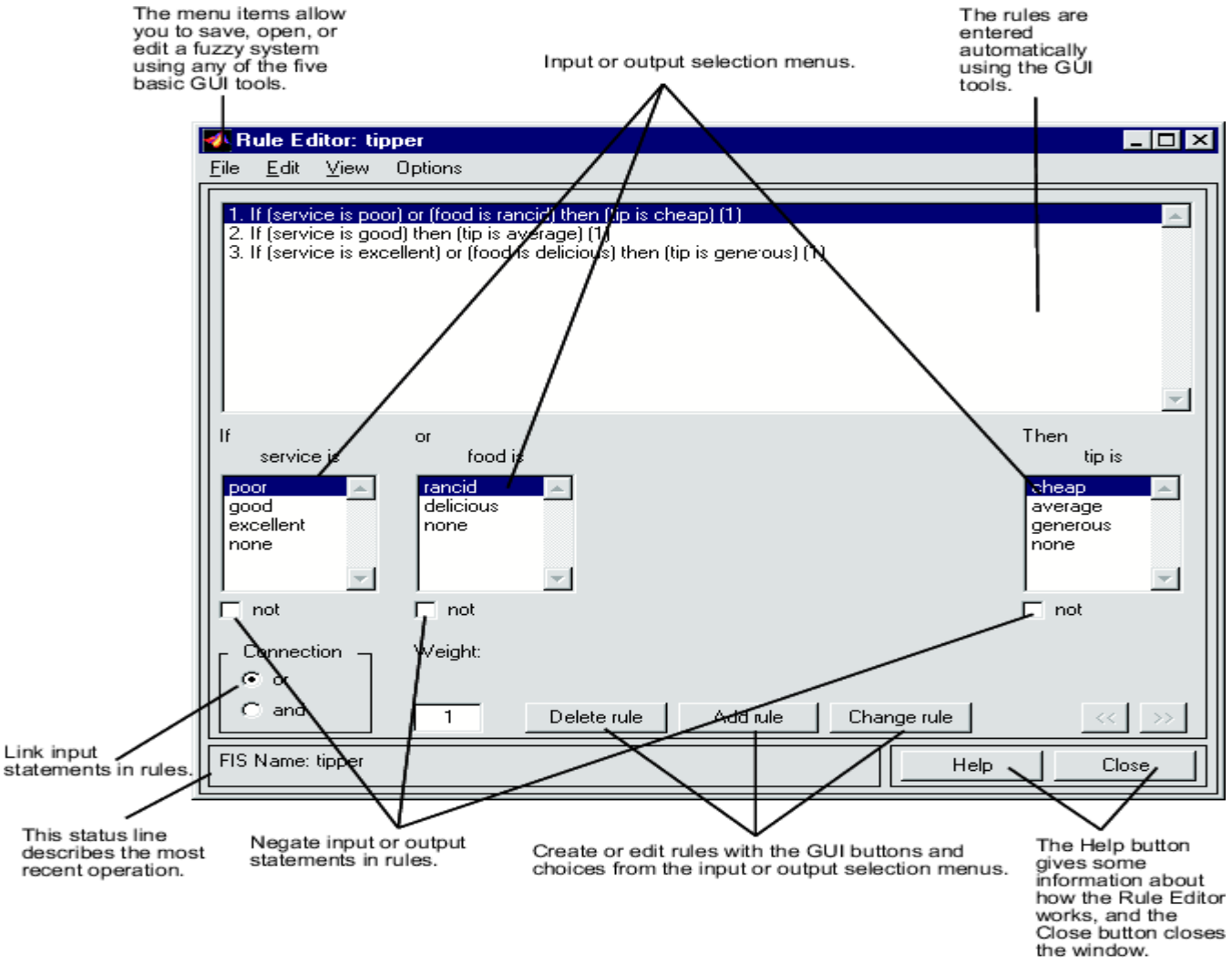
# A FIS editor


Double-click on an input variable icon to open the Membership Function Editor.
Double-click on the system diagram to open the Rule Editor.
Double-click on the icon for the output variable icon, to open the Membership Function Editor.
These menu items allow you to save, open, or edit a fuzzy system using any of the five basic GUI tools.
FIS Editor: tipper
File Edit View
service
food
tipper
(mamdani)
tip
The name of the system is displayed here. It can be changed using one of the Save as.. menu options.
FIS Name: tipper
FIS Type mamdani
These pop-up menus are used to adjust the fuzzy inference functions, such as the defuzzification method.
And method min
Or method max
Implication min
Aggregation max
Defuzzification centroid
Current Variable
Name
Type
Range
Help
Close
This status line describes the most recent operation.
System "tipper": 2 inputs, 1 output, and 3 rules
This edit field is used to name and edit the names of the input and output variables.

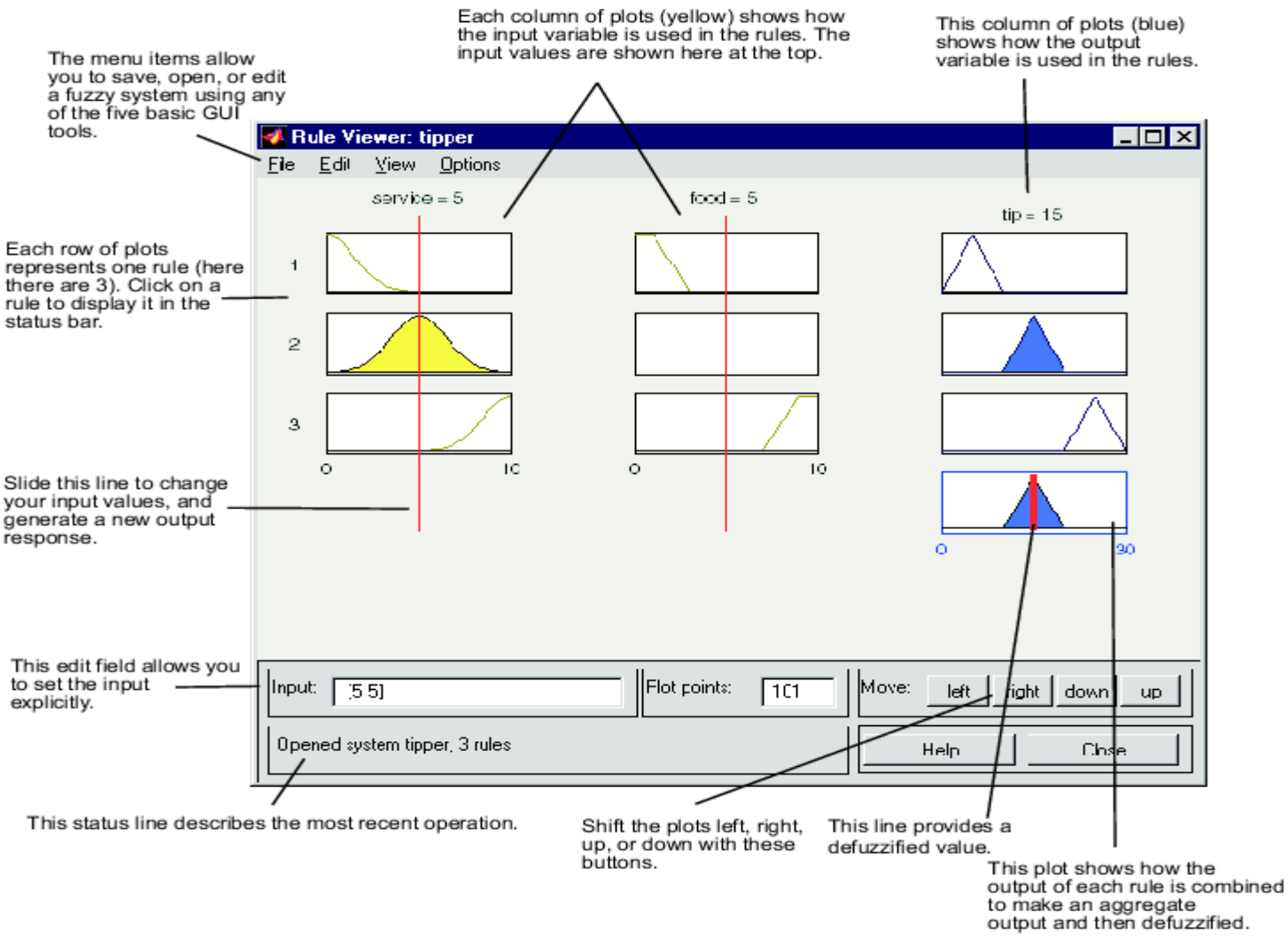
# Az MF editor


Click on a line to select it and you can change any of its attributes, including name, type and numerical parameters. Drag your mouse to move or change the shape of a selected membership function.
This is the "Variable Palette" area. Click on a variable here to make it current and edit its membership functions.
These menu items allow you to save, open, or edit a fuzzy system using any of the five basic GUI tools.
This graph field displays all the membership functions of the current variable.
Membership Function Editor: tipper
File Edit View
FIS Variables
service
tip
food
Membership function plots
plot points:
poor
good
excellent
input variable "service"
These text fields display the name and type of the current variable.
This edit field lets you set the range of the current variable.
This edit field lets you set the display range of the current plot.
Current Variable
Name service
Type input
Range [0 10]
Display Range [0 10]
Current Membership Function (click on MF to select)
Name good
Type gaussmf
Params [1.5 5]
Help
Close
Ready
This status line describes the most recent operation.
This edit field lets you change the numerical parameters for the current membership function.
This pop-up menu lets you change the type of the current membership function.
This edit field lets you change the name of the current membership function.

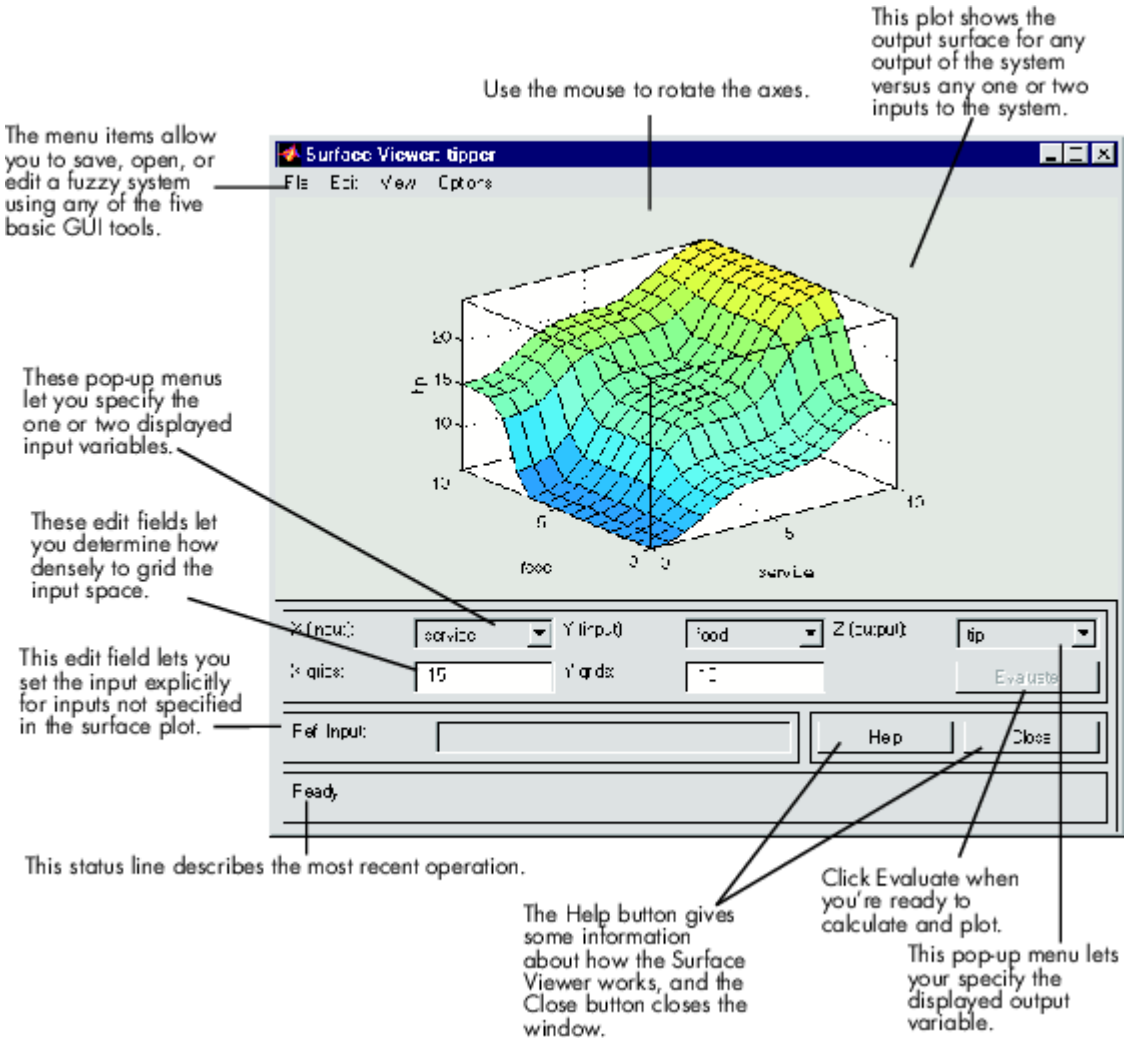
# A szabálybázis szerkesztő

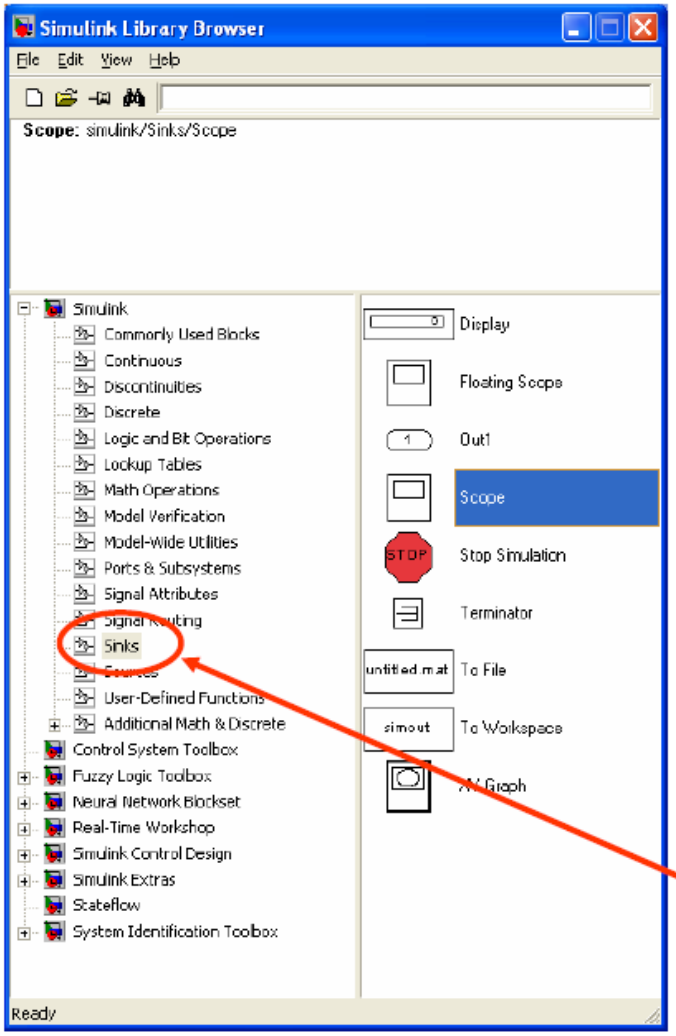


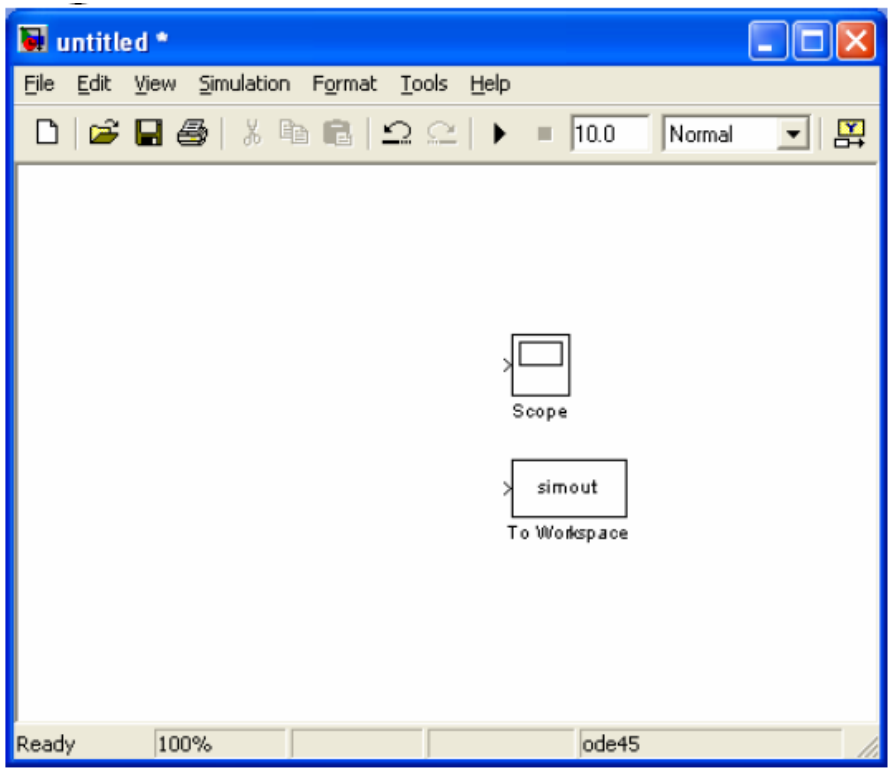
# A szabálybázis néző



# A következtetési felület néző






Se
Drag any block you want to use into the model.