

MATLAB for Beginners

MATLAB Graphics

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- To access the updated lecture notes, please click on the following link:
<https://yasirbhutta.github.io/matlab/docs/graphics.html>

2D Plots

Printing Labels

The `xlabel()` and `ylabel()` functions are used to label the x and y axes in a figure in MATLAB. The labels should describe the data that is being plotted on each axis.

The `title()` function is used to add a title to a figure in MATLAB. The title should provide a brief description of the plot.

Grid and Axes Box

The `grid()` function is used to add grid lines to a figure in MATLAB. Grid lines can help to make it easier to interpret the data in a plot.

Entering Text in a Plot

Axis Control

The `axis()` function is used to set the limits of the axes in a figure in MATLAB. The axes are the horizontal and vertical lines that extend across the figure window.

Axis Aspect Ratio

Multiple Plots

Using plot Command

The `plot()` function is used to create a line plot in MATLAB. A line plot is a graphical representation of a set of data points connected by a line.

Using hold Command

The `hold` function is used to prevent MATLAB from overwriting existing plots when creating new ones. By default, MATLAB overwrites existing plots when creating new ones. However, if you use the `hold` function before creating a new plot, MATLAB will add the new plot to the existing plot instead of overwriting it.

Using line Command

Style Options

Example

```
x = 1:1:10;  
  
y1 = sqrt(x.^2+1);  
y2 = 2 * x + 20;  
y3 = 3 * x + 3;  
  
plot(x,y1,'r*:');  
line(x,y2);  
line(x,y3);
```

Example: Plotting Two Functions on the Same Graph in MATLAB

```
x = 1:1:10;  
  
y1 = sqrt(x.^2+1);  
y2 = 2 * x + 20;  
  
plot(x, y1, 'r', x, y2, 'bo');  
axis([0 12 0 45]);
```

LEGEND

The `legend()` function is used to create a legend for a figure in MATLAB. A legend is a key that explains which line or curve corresponds to which data set.

Example

```
% Real world data example  
% Global average temperature data from NASA  
% https://data.giss.nasa.gov/gistemp/graphs/  
  
% Load the data  
data = load('global_average_temperature.csv');  
  
% Extract the years and temperatures  
years = data(:, 1);  
temperatures = data(:, 2);  
  
% Create a line plot of the data  
figure;  
plot(years, temperatures);
```

```
% Add a legend
legend('Global average temperature');

% Set the axis labels and title
xlabel('Year');
ylabel('Temperature (°C)');
title('Global Average Temperature from 1880 to 2022');
```

SUBPLOTS

Specialized 2D plots

Logarithmic Plot Functions

polar

area

bar

barh

hist

rose

pie

stairs

stem

compass

3D Plots

plot3

bar3

bar3h

pie3

stem3

meshgrid

mesh

surf**contour and contour3**

True/False (Mark T for True and F for False)

- The MATLAB plot function plots data points as connected line segments. **True**
- The MATLAB bar function plots the relationship between two variables. **False**
- The xlabel() and ylabel() functions are used to label the X-axis and Y-axis of the current plot, respectively. **True**.
- The clf() function clears the current plot. **True**
- The xlabel, ylabel, and title functions in MATLAB are used to add labels to a plot. **True**
- You can customize the appearance of a plot in MATLAB by specifying various properties like line color, line style, and marker type. **True**

Multiple Choice (Select the best answer)

Which of the following functions is used to create a plot of a line?

1. ☒ plot()
2. ☐ stem()
3. ☐ bar()
4. ☐ pie()

Which of the following functions is used to create a plot of a bar graph?

1. ☐ plot()
2. ☐ stem()
3. ☒ bar()
4. ☐ pie()

Which of the following functions is used to create a plot of a pie chart?

1. ☐ plot()
2. ☐ stem()
3. ☐ bar()
4. ☒ pie()

Which of the following is NOT a valid MATLAB graphics command?

1. ☐ plot()
2. ☐ subplot()
3. ☒ log1pp()
4. ☐ title()

What is the purpose of the title() function?

1. ☐ To label the axes of a plot
2. ☐ To create a new figure window
3. ☒ To add a title to a plot

4. ☐ To change the color of a plot

How can you create a subplot in MATLAB?

1. ☒ Use the subplot() function.
2. ☐ Use the figure() function.
3. ☐ Use the plot() function.
4. ☐ Use the title() function.

What is the difference between a bar plot and a histogram?

1. ☒ A bar plot is used to compare categorical data, while a histogram is used to visualize continuous data.
2. ☐ A bar plot is used to represent frequencies, while a histogram is used to represent probabilities.
3. ☐ A bar plot is used to show the distribution of data, while a histogram is used to compare means.
4. ☐ A bar histogram is used to show the relationship between two variables, while a plot is used to show the distribution of a single variable.

Which of the following is NOT a valid MATLAB graphics function?

1. ☐ plot()
2. ☐ bar()
3. ☐ pie()
4. ☒ histrogram()
5. ☐ stem()

Which of the following is the correct syntax for plotting a line graph of the function $y = x^2$?

1. ☐ plot(x, y=x^2)
2. ☒ plot(x, x.^2)
3. ☐ plot(y, x^2)
4. ☐ plot(x^2, y)
5. ☐ plot(y^2, x)

What is the purpose of the legend() function?

1. ☐ To label the x-axis of a graph
2. ☐ To label the y-axis of a graph
3. ☐ To add a title to a graph
4. ☒ To add a legend to a graph
5. ☐ To change the color of a line on a graph

What is the purpose of the xlabel() and ylabel() functions?

1. ☒ To label the x-axis of a graph
2. ☒ To label the y-axis of a graph
3. ☐ To add a title to a graph
4. ☐ To add a legend to a graph
5. ☐ To change the color of a line on a graph

Which of the following commands would you use to change the title of the current figure to 'My Figure'?

1. ☒ title('My Figure')
2. ☐ sets(gcf, 'Title', 'My Figure')
3. ☐ title(figure, 'My Figure')
4. ☐ sets(figure, 'Title', 'My Figure')

What is the command to create a 2-D line plot of x and y vectors in MATLAB?

1. ☒ plot(x,y)
2. ☐ line(x,y)
3. ☐ graph(x,y)
4. ☐ draw(x,y)

What is the command to create a pie chart of a vector x in MATLAB?

1. ☐ pie(x)
2. ☐ pie3(x)
3. ☐ piechart(x)
4. ☒ pie(x) and pie3(x)

Which MATLAB function is used to label the axes of a figure?

1. ☐ title()
2. ☐ legend()
3. ☒ xlabel()
4. ☒ ylabel()

What is the command to show the box outline around the axes in MATLAB?

1. ☐ box off
2. ☐ box show
3. ☒ box on
4. ☐ box hide

What is the command to show the grid in a MATLAB figure?

1. ☐ box on
2. ☒ grid on
3. ☐ grid off
4. ☐ box show
5. ☐ box hide

Which MATLAB function is used to add text to a plot?

1. ☒ text()
2. ☐ label()
3. ☐ title()
4. ☐ legend()

How can you change the font color of the text in a plot?

- ☒ Use the color property of the text() function.
- ☐ Use the Color property of the current axes.
- ☐ Use the Color property of the figure window.
- ☐ Use the Color property of the current figure.

Code snippet:

```
x = 1:10;  
y = 1:10;  
plot(x, y);  
text(6, 5, 'string', 'color', 'red');
```

How can you position text relative to a specific data point in a plot?

- ☒ Use the x and y coordinates of the data point.
- ☐ Use the DataPoints property of the text() function.
- ☐ Use the handle property of the data point object.
- ☐ Use the Position property of the text object.

What is the primary purpose of the hold function in MATLAB plotting?

- ☐ To clear the current plot window
- ☐ To temporarily pause the execution of a plot command
- ☒ To prevent subsequent plot commands from overwriting existing plots
- ☐ To adjust the scaling of the plot axes

Which of the following statements correctly describes the behavior of the hold function when used in conjunction with the plot function?

- ☐ The hold function must be called before the plot function for it to have any effect.
- ☐ The hold function must be called after the plot function for it to have any effect.
- ☒ The hold function remains active until it is explicitly turned off using the hold off command.
- ☐ The hold function only affects the current plot window and has no effect on subsequent plot windows.

Which of the following scenarios would require the use of the hold function?

- ☐ Plotting two different line graphs of separate data sets on the same axes
- ☐ Plotting multiple curves representing different functions in the same plot window
- ☐ Creating a scatter plot of data points along with a trend line
- ☒ All of the above

What are the two basic arguments required for the plot() function?

- ☒ x-coordinates and y-coordinates
- ☐ x-axis label and y-axis label
- ☐ figure window and axes labels

4. ☐ title and legend

What is the default line style used by the `plot()` function?

1. ☒ Solid line (-)
2. ☐ Dashed line (--)
3. ☐ Dotted line (⋯)
4. ☐ Dot-dash line (-.)

What is the default line color used by the `plot()` function?

1. ☐ Blue
2. ☐ Red
3. ☐ Green
4. ☒ Black

Which line style is represented by the string '-. '?

1. ☐ Solid line
2. ☐ Dashed line
3. ☐ Dotted line
4. ☐ [x] Dash-dotted line

What is the purpose of using different line styles in a plot?

1. ☐ To make the plot more visually appealing
2. ☐ To distinguish between different data sets in a plot
3. ☐ To increase the readability of the plot
4. ☒ All of the above

How would you set the line style of a plot to be dashed?

1. ☒ `plot(x, y, '--')`
2. ☐ `line(x, y, '--')`
3. ☐ `get(plot(x, y), 'LineStyle', '--')`
4. ☐ `style(plot(x, y), '--')`

How would you create a plot with two lines, one solid and one dashed?

1. ☐ `plot(x1, y1, '-', x2, y2, '--')`
2. ☐ `line(x1, y1, '-', x2, y2, '--')`
3. ☐ `figure(plot(x1, y1), 'LineStyle', '-'), plot(x2, y2), 'LineStyle', '--')`
4. ☐ `style(plot(x1, y1), '-'), plot(x2, y2), 'LineStyle', '--')`

What is the default marker style for a line plot in MATLAB?

1. ☒ No marker
2. ☐ Circle (o)
3. ☐ Plus sign (+)
4. ☐ Asterisk (*)

Exercises

Review Questions

- What is the syntax for adding text to a plot using the `text()` function?
- What is the purpose of the `plot()` function in MATLAB?
- What is the purpose of the `grid()` function in MATLAB?
- What is the purpose of the `axis()` function in MATLAB?
- What is the purpose of the `xlabel()` and `ylabel()` functions in MATLAB?
- What is the purpose of the `title()` function in MATLAB?
- What is the purpose of the `legend()` function in MATLAB?
- What are some of the different line styles that can be used in MATLAB?
- What are some of the different marker styles that can be used in MATLAB?
- What is the difference between the hold on and hold off functions in MATLAB?
- How do you use the line function in MATLAB?

Answer:

The line function is used to create a line plot in MATLAB. The syntax for the line function is as follows:

```
line(x, y)
```

where x is a vector of x-coordinates and y is a vector of y-coordinates.

- How do you plot a line in MATLAB using `plot` function?

Answer:

To plot a line in MATLAB, you can use the `plot()` function. The `plot()` function takes two vectors as arguments: the x-values and the y-values. For example, the following command will plot a line with x-values from 1 to 10 and y-values from 1 to 10:

```
x = 1:10;  
y = 1:10;  
plot(x, y);
```

- How do you change the color of a line in MATLAB?

Answer:

To change the color of a line in MATLAB, you can use the Color property. For example, the following command will change the color of the line to red:

```
x = 1:10;  
y = 1:10;  
plot(x, y, 'Color', 'red');
```

- How do you add a **title** to a figure in MATLAB?

Answer:

To add a title to a figure in MATLAB, you can use the `title()` function. For example, the following command will add the title "My Line Plot" to the figure:

```
x = 1:10;
y = 1:10;
plot(x, y);
title('My Line Plot');
```

- How do you add labels to the axes in a figure in MATLAB?

Answer:

To add labels to the axes in a figure in MATLAB, you can use the `xlabel()` and `ylabel()` functions. For example, the following commands will add the labels "X-Axis" and "Y-Axis" to the x-axis and y-axis, respectively:

```
x = 1:10;
y = 1:10;
plot(x, y);
xlabel('X-Axis');
ylabel('Y-Axis');
```

- How do you add a grid to a figure in MATLAB

Answer:

To add a grid to a figure in MATLAB, you can use the `grid()` function. For example, the following command will add a grid to the figure:

```
x = 1:10;
y = 1:10;
plot(x, y);
grid on;
```

- What is the difference between a 2D and 3D plot in MATLAB?

Answer:

A 2D plot is used to visualize data that has two dimensions, such as height and weight. A 3D plot is used to visualize data that has three dimensions, such as height, weight, and depth.

- What does the hold function do in MATLAB?

References

- [MATLAB Graphics](#)
- [MATLAB: Plotting - tutorialspoint](#)

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