

## Outline

- Announcements
  - Homework I due Wed. 5PM by e-mail
    - Subject: CIS 402 Homework 1
    - Plain text
    - Not allowed to use errorbar
    - Try to do plotCI without looking at it
      - Honor system applies
  - Today is last day to add/drop 402!
- Printing and saving
- Summary so far
- More 1D functions
- bar: 1D function, 2D objects

---

---

---

---

---

---

---

---

## Criticisms of subplot

- Numbering is consistent with English, but not with Matlab
- Too much white space--gets ugly if m or n are big
- [fax,ax]=multiplot(m,n,{limits}) is a "flexible, hands-on" alternative to subplot
  - Fax=handle to invisible axes encompassing whole figure
    - useful for annotating figure
  - ax=m-by-n matrix of handles to the m\*n subplots
    - numbered "correctly"
  - limits allows you to control space around axes

1 (1,1)	4 (1,2)
2 (2,1)	5 (2,2)
3 (3,1)	6 (3,2)

---

---

---

---

---

---

---

---

## Printing and Saving

- Print through GUI or command line
  - print -depsc fname.eps will save gcf to an EPS file
  - print -djpeg fname.jpg will save gcf to a JPEG
  - Can also save figure to a .fig file from the GUI
    - Opening the file (from GUI) will recreate the figure

---

---

---

---

---

---

---

---

## Printing and Saving

- Can save figure to a .fig file from the GUI
  - Opening the file (from GUI) will recreate the figure
  - The figure will contain same objects as before
    - can add to the figure or edit objects
- Print through GUI or command line
  - print by itself will send(gcf) to default printer

---

---

---

---

---

---

---

---

## Exporting graphics

- Can save figures to several standard graphics formats using print
  - print -djpeg fname.jpg will save(gcf) to a JPEG file
    - JPEG (Joint Photographic Experts Group) file is a standard raster file
    - a raster file is a matrix of pixels
    - This means that they have a fixed resolution
      - if you blow up a JPEG, the quality will decline (you will begin to see the pixels)
      - can control the resolution using -r<pixels/inch>
    - JPEGs are extremely portable (can view them in a web browser) and compact
    - Good if your figure is very complex (lots of 2D objects and color)

---

---

---

---

---

---

---

---

## Exporting Graphics

- print -depsc fname.eps will save(gcf) to an EPS file
  - EPS (encapsulated post script) is standard format for saving vector graphics
  - Vector graphics are made up of mathematical objects-- lines, Bezier curves, polygons, text.
  - The objects have properties such as line weights, fonts, & colors
  - Because the objects are represented mathematically, EPS files can be scaled without losing resolution
  - They are less portable than JPEGs (need special software like Illustrator, or ghostscript)
  - However, you can edit the file easily

---

---

---

---

---

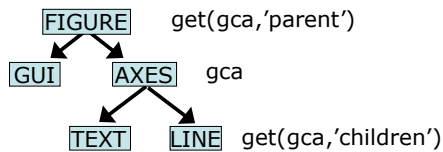
---

---

---

## Handle Graphics Summary

- We've only learned about 3 graphics objects
- But, we now know how Matlab's graphics are organized and how to manipulate them:



## Handle Graphics Summary

- Objects have properties (like fields in a database or a Java object)
- Each object has a handle (like a name or pointer)
- We can use the handle to examine properties and change them using set and get
- Other objects have new properties, but how we work with them is the same

handle=h

type	line
color	[0 0 1]
marker	none
linestyle	:

## A Demonstration

- To prove that we understand handle graphics, I will show some specialized 1D plots, and we will try to figure out how they are implemented in Matlab
- For each one, we will answer:
  - What objects are created?
  - What are their properties?

## Demo

Name	Descrip.	Objects Created	Properties
spy	matrix structure	figure, axes, line	axes: ydir=reverse line:marker='.'
semilogy	Log-scale	figure, axes, line	axes: yscale=log
polar	polar coordinates	figure, axes, line, (patch, line, text)	axes: visibility=off
plotyy	plot against 2 y-scales	figure, 2x(axes,line)	axes2:yaxislocation=right, color=none
bar	bar plots	figure, axes, patch	patch: facecolor='b'

## What about bar?

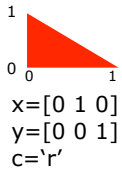
- bar represents a 1D function using 2D objects--rectangles
- the rectangles are represented in Matlab as a patch object
  - Patches are polygons
  - Patches can have complicated colors
  - Patches (or related surface objects) are used by all higher-order functions

## Key properties of patch objects

- edgecolor--color of the edges
- facecolor--color inside the the patch
- Both of these can be set to a specific color (or none)
- Or, we can prescribe another dimension of data at each vertex and let it control the color

## Drawing patches

- Lots of functions produce patches
- patch is the lowest level function (followed closely by fill)
  - patch(x,y,c)--x and y specify vertex coordinates, c controls the color
  - patch(X,Y,C)--Each column of X, Y, and C is a separate patch



x=[0 1 0]  
y=[0 0 1]  
c='r'

---

---

---

---

---

---

---