

A bit more on plotting

Review following commands:

1. subplot
2. plotting two things at once, hold on command
3. adding titles, axis labels ...

Structuring a program in MATLAB

1. Identify code with comments
2. if necessary, load data
3. define given parameters
4. perform computation
5. process the result, if required
6. check or plot
7. save data

Example 1: average temperatures in 3 locations

Given: file temperatures.dat.

Goals:

1. compute average temp. in each location
2. plot temp. vs. day in each location
3. plot avg. temp. in each location (all in same figure)

Code:

```
temperatures_average_and_plot.m
```

```
%loads the file temperatures.dat
%each col is temperature in a different place
%computes average temperature, plots

load temperatures.dat

moon_temps = temperatures(:,1) ;
chicago_temps = temperatures(:,2) ;
seattle_temps = temperatures(:,3) ;

number_of_temps=size(temperatures,1);

summed_moon_temp=0 ;
summed_chicago_temp=0 ;
summed_seattle_temp=0 ;

for j=1:number_of_temps
    summed_moon_temp=summed_moon_temp+moon_temps(j) ;
    summed_chicago_temp=summed_chicago_temp+chicago_temps(j) ;
    summed_seattle_temp=summed_seattle_temp+seattle_temps(j) ;
end
```

```
average_moon_temp=summed_moon_temp/number_of_temps
average_chicago_temp=summed_chicago_temp/number_of_temps
average_seattle_temp=summed_seattle_temp/number_of_temps
```

```
figure
```

```
plot(1:number_of_temps,moon_temps,'-','Linewidth',2) ; hold on
plot(1:number_of_temps,chicago_temps,':','Linewidth',2)
plot(1:number_of_temps,seattle_temps,'--','Linewidth',2)
```

```
plot(1:number_of_temps,average_moon_temp*ones(1,number_of_temps),'-',
plot(1:number_of_temps,average_chicago_temp*ones(1,number_of_temps),'
plot(1:number_of_temps,average_seattle_temp*ones(1,number_of_temps),'
```

```
legend('moon temps','chicago temps','seattle temps')
xlabel('day','FontSize',12)
ylabel('temperature','FontSize',12)
```

```
save chicago.dat average_chicago_temp -ascii
```


Example 2: Fibonacci Numbers

Follows supplementary text **Numerical Computing in MATLAB, sec. 1.2** (without writing a function).

Leonardo Pisano Fibonacci poses question in 1202:

A man put a pair of rabbits in a place surrounded on all sides by a wall. How many pairs of rabbits can be produced from that pair in a year if it is supposed that every month each pair begets a new pair which from the second month on becomes productive?

```
%Fibonacci sequence

clear all

%number of months to simulate
N=20;

%make ``blank" list of pairs in sequential months
f=zeros(1,N) ;

%initial conditions
f(1) = 1;
f(2) = 2;

%iterate
for n=3:N
    f(n) = f(n-1) + f(n-2);
end

figure
subplot(311)
plot(1:N,f,'-','Linewidth',2) ; hold on
```

```
ylabel('f','FontSize',18)
xlabel('n','FontSize',18)

subplot(312)
plot(1:N,log(f),'-','Linewidth',2) ; hold on
ylabel('log f','FontSize',18)
xlabel('n','FontSize',18)

%analyze !

%ratio of successive fibonnaci numbers
ratios=zeros(1,(N-1)) ;

for n=1:N-1
    ratios(n) = f(n+1)/f(n) ;
end

subplot(313)
plot(1:N-1,ratios,'-','Linewidth',2) ; hold on
ylabel('ratios','FontSize',18)
xlabel('f','FontSize',18)
```

```
%find first month where number of rabbits exceeds 1500
for n=1:N
    if f(n) > 1500
        break
    end
end

disp('first month where number of rabbits exceeds 1500 is')
n

save critical_fibonacci_month.dat n -ascii
```

A new command above:

- zeros

Note: are other ways to do some of the commands:

dot divide (also called rdivide): `ratios=f(2:N) ./f(1:N-1)`

Type `help rdivide`

