ENGINEERING 5

Lecture 6:
Hints on Matlab2 Q9; Matlab "eval" function;
Matlab mouse/keyboard control

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Course web page:
http://www.swarthmore.edu/NatSci/ceverba1/Class/e5/E5Index.html

Remember…

- Friday 10/8: 2nd MatLab Q9 is due along with posting of Word worksheet for 3rd Matlab
- Next week is Fall Break: no homework over break!
- After break: 4th Matlab involving simulation of your robot's movements; neural networks and genetic algorithms to optimize complex behavior
- Robot races on November 9: cookies to the winner(s)
- Today: Professor Tali Moreshet speaking on her teaching and research in computer engineering

Hints on Matlab 2, Question 9

Make a surface plot of sse

$$sse = \sum_{i=1}^{5} \left(y(t_i) - y_i \right)^2 = \sum_{i=1}^{5} \left(a_1 + a_2 t_i - y_i \right)^2$$

with the two axes being a1 and a2. Make sure the axes are labeled. The MatLab command "surfc" also plots a contour plot and can make the minimum of the surface easier to find.

9) Post on your website the plot and show that the minimum is where you expected it according to your calculations above. Note: the minimum can be hard to see because the error gets large very quickly. To accentuate the minimum, you can plot the logarithm of the surface. This tends to de-emphasize large values relative to the smaller (minimum) value.

Start with innermost loop:

- ti=[2.5 5.0 7.0 11.0 12.0]; yi=[1.2 2.2 4.0 10.0 13.8];
- Calculate sse via either a loop:
- for i=1:5 or for i=1:length(ti)
- g = a1 + a2*ti(i) – yi(i); % calc intermediate result
- accum = accum + g^2; % accumulate squares
- end
- Remember to zero out accumulation variable before loop!

Or use Matlab's vectorization:

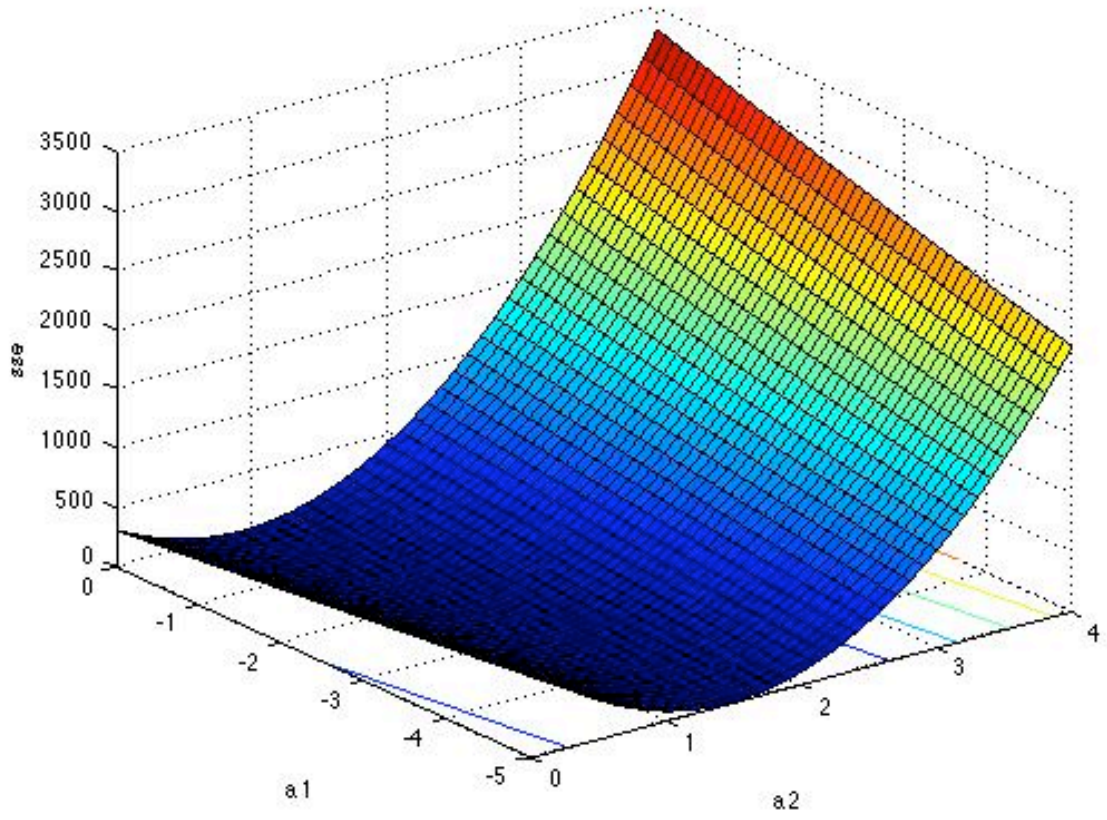
- sse = sum((a1 + a2*ti - yi).^2);
- Note: no loop needed, no accumulation variable, no zeroing out
- Problems: need a1 and a2 to change; need to save sse's calculated for later plotting as a surface
- Solution: two loops surrounding the above line, one to vary a1 and the other to vary a2
- for a1 = -5:0.1:0 since $a1_{best}$ (the intercept) is -3.5569
- for a2 = 0:0.1:4 since $a2_{best}$ (the slope) is 1.3063

- To save sse values, use:
  sse(i,j) = sum((a1 + a2*ti - yi).^2);
  where we must have counting variables i and j
- Remember to zero counting variables outside each loop, and to increment them inside each loop:
  i = 0;
  for a1 = -5:0.1:0
  i = i + 1;
- Finally, use meshgrid to create 2-D grid

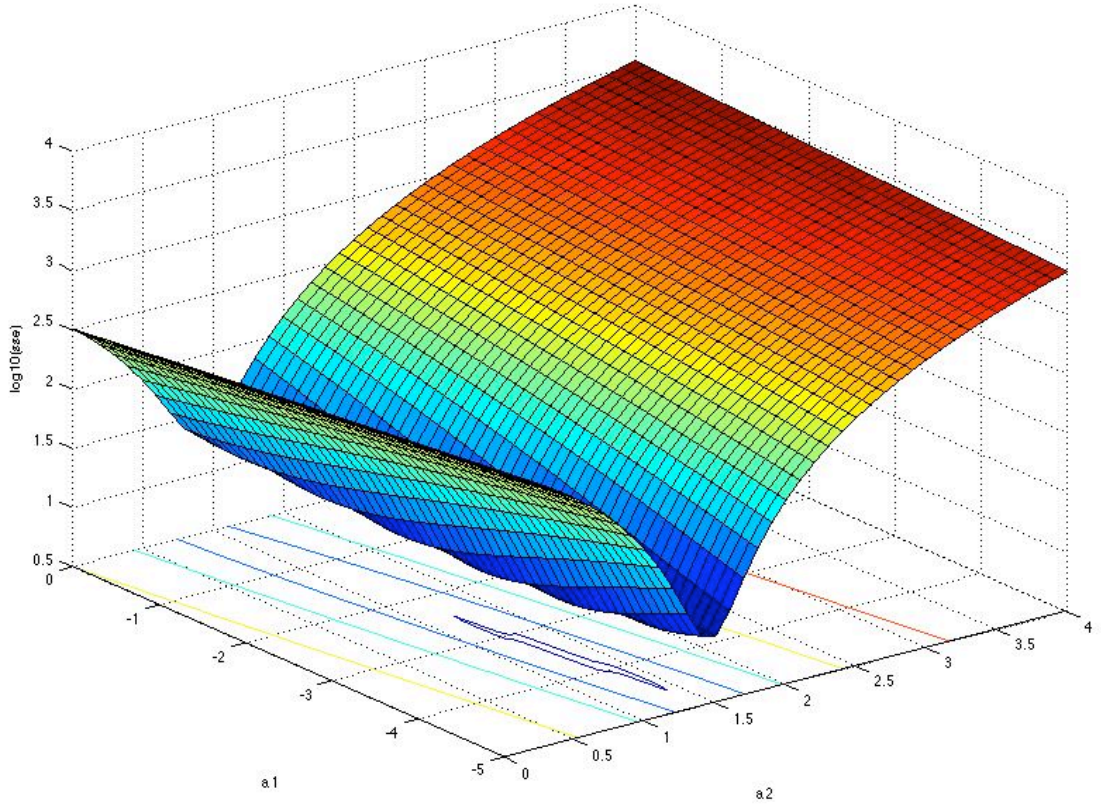
[x,y] = meshgrid(0:0.1:4,-5:0.1:0);

Use surf or surfc to plot sse or even log10(sse)

sse as a1 and a2 are varied



taking log10 of sse:



eval and feval commands

- How to obtain user input such as filenames and include that input in a programmed command?
- fname = input('Enter name of file: ', 's'); % get filename
- filestring = ['save ', fname, ';']; % form command string
- eval(filestring); % do the formed command

This is like

```
ch=1;  pw=900;  T=300;
num2str(pw)                %convert a number to a string
cmd = ['#' num2str(ch) 'P' num2str(pw) 'T' num2str(300)]
```