EE 3TP3 Lab 1

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Question 1

Code

Editor - /Users/fuad/OneDrive/Documents/year3/signalprocessingmatlab/lab1/lab1.m

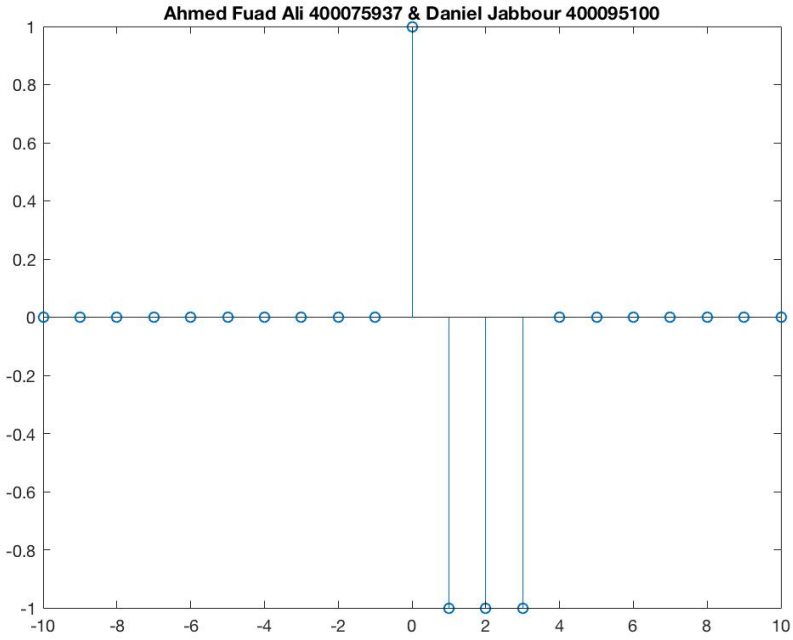
lab1.m | csv_get_averages.m | dirac.m

```
1   %% Question 1
2   % Use matlab to plot the following discrete time signals
3   % our range is from -10 to 10
4
5   n = -10:10;
6
7   % 1a) x[n] = u[n] -2u[n-1] + u[n-4]
8
9   ya = unitstep(n) - 2.*unitstep(n-1) + unitstep(n-4);
10  ya;
11
12  % 1b) x[n] = (n+2)u[n+2] -2u[n] -nu[n-4]
13  yb = (n+2).*unitstep(n+2) - 2.*unitstep(n) -n.*unitstep(n-4);
14  yb;
15
16  % 1c) x[n] = ?[n + 1] ? ?[n] + u[n + 1] ? u[n ? 2]
17  yc = dirac(n+1) - dirac(n) + unitstep(n+1) - unitstep(n-2);
18  yc;
19
20  % 1d) x[n] = e0.8n u[n + 1] + u[n]
21  yd = exp(0.8*n).*unitstep(n+1) + unitstep(n);
22  yd;
23
24  stem(n, ya);
25  %%stem(n, yc);
26  %stem(n, yd);
27  title('Ahmed Fuad Ali 400075937 & Daniel Jabbour 400095100');
```

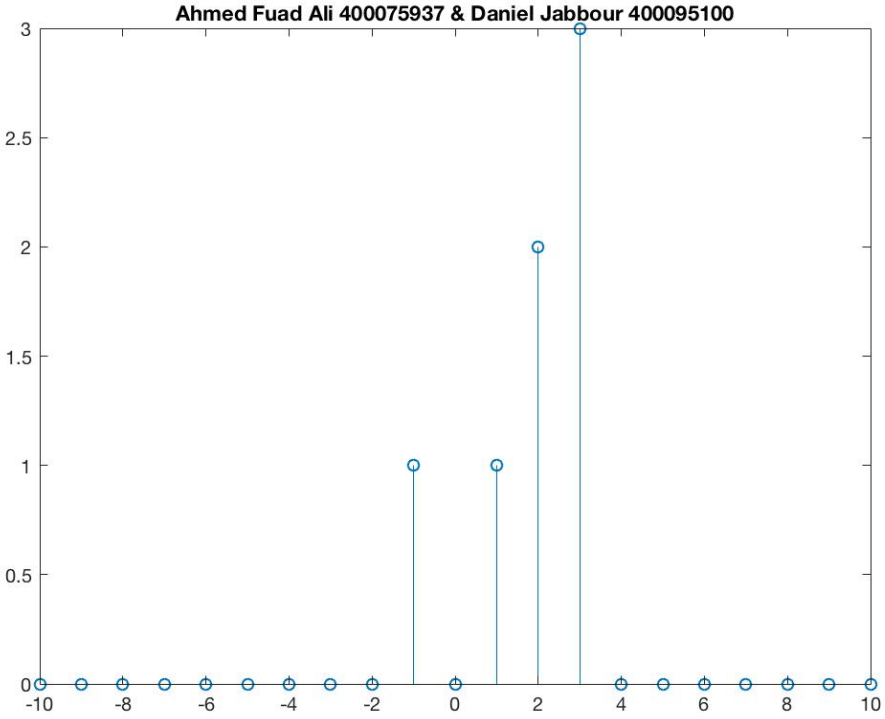
** Comments explain how code works, but essentially used the provided unit step function and saved in a file named unitstep.m. Then modified the unit step function to create the dirac function, and saved as dirac.m. Finally, manipulated functions according to the question specifications to create the graphs shown below. **

Graphs

1a)


Ahmed Fuad Ali 400075937 & Daniel Jabbour 400095100
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-10
-8
-6
-4
-2
0
2
4
6
8
10

1b)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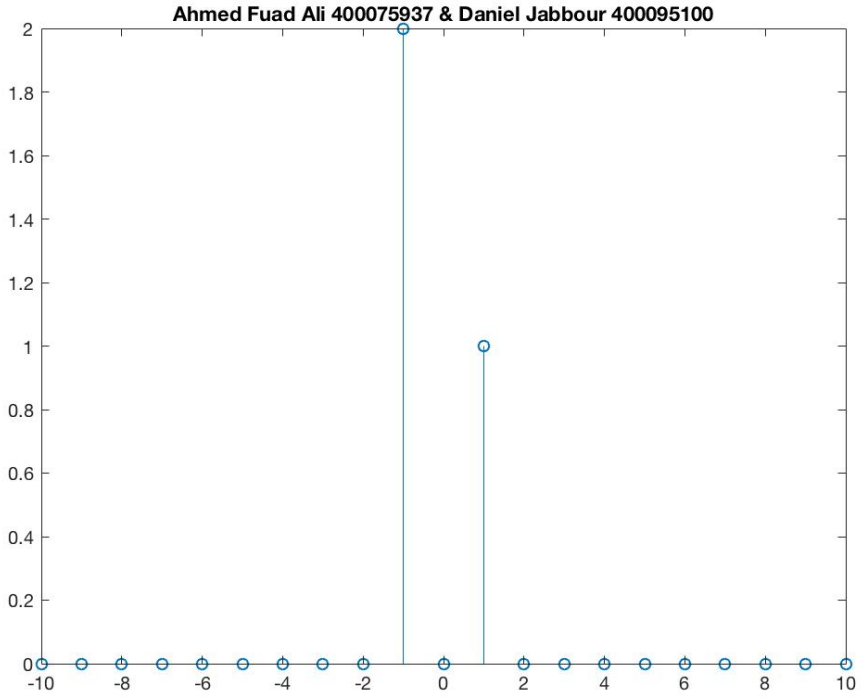
3
2.5
2
1.5
1
0.5
0
-10
-8
-6
-4
-2
0
2
4
6
8
10

1c)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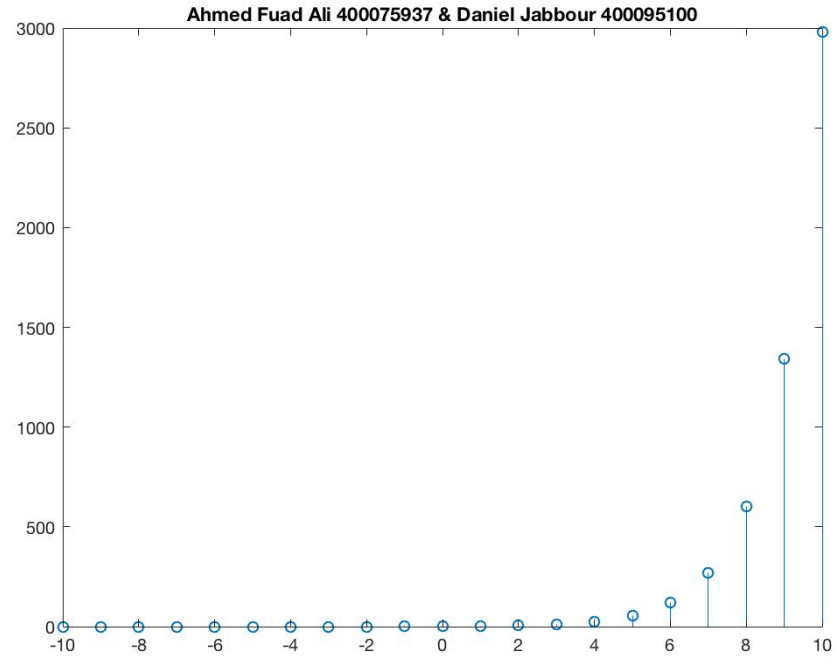
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-10
-8
-6
-4
-2
0
2
4
6
8
10

1d)


Ahmed Fuad Ali 400075937 & Daniel Jabbour 400095100
3000
2500
2000
1500
1000
500
0
-10
-8
-6
-4
-2
0
2
4
6
8
10

Question 2

Code

Editor – /Users/fuad/OneDrive/Documents/year3/signalprocessingmatlab/lab1/lab1.m

lab1.m | csv_get_averages.m | dirac.m

```
%% Question 2
% process student grade records using matlab from a CSV file
% use matrix operations rather than matlab program loops

% 2a) write a matlab that accepts a set of students as a matrix, max grade
%     vector, and vector of column indices, generate vector of avg grades,
%     one for each, associated w the right column index

marks = csvread('course_grades_2018.csv', 1, 0);

max_marks = csvread('course_grades_2018.csv', 0, 1, [0, 1, 0, 11]);
```

Editor – /Users/fuad/OneDrive/Documents/year3/signalprocessingmatlab/lab1/lab1.m

lab1.m | csv_get_averages.m | dirac.m

```
marks = csvread('course_grades_2018.csv', 1, 0);

max_marks = csvread('course_grades_2018.csv', 0, 1, [0, 1, 0, 11]);

% Extracting the appropriate data from the matrix
exam_col = (6:11);
midterm_col = (5:5);
labs_col = (1:4);

% b)

% Calculating the averages for each respective mark
exam_avg = csv_get_averages(marks, max_marks, exam_col);

midterm_avg = csv_get_averages(marks, max_marks, midterm_col);

labs_avg = csv_get_averages(marks, max_marks, labs_col);

% c)

cumulitive_avg = 0.4.*(exam_avg) + 0.3.*(midterm_avg) + 0.3.*(labs_avg);

cumulitive_avg_desc = sort(transpose(cumulitive_avg), 'descend');

plot(cumulitive_avg_desc)
title('Ahmed Fuad Ali 400075937 & Daniel Jabbour 400095100');
```

Editor - /Users/fuad/Documents/MATLAB/csv_get_averages.m

lab1.m | csv_get_averages.m | dirac.m

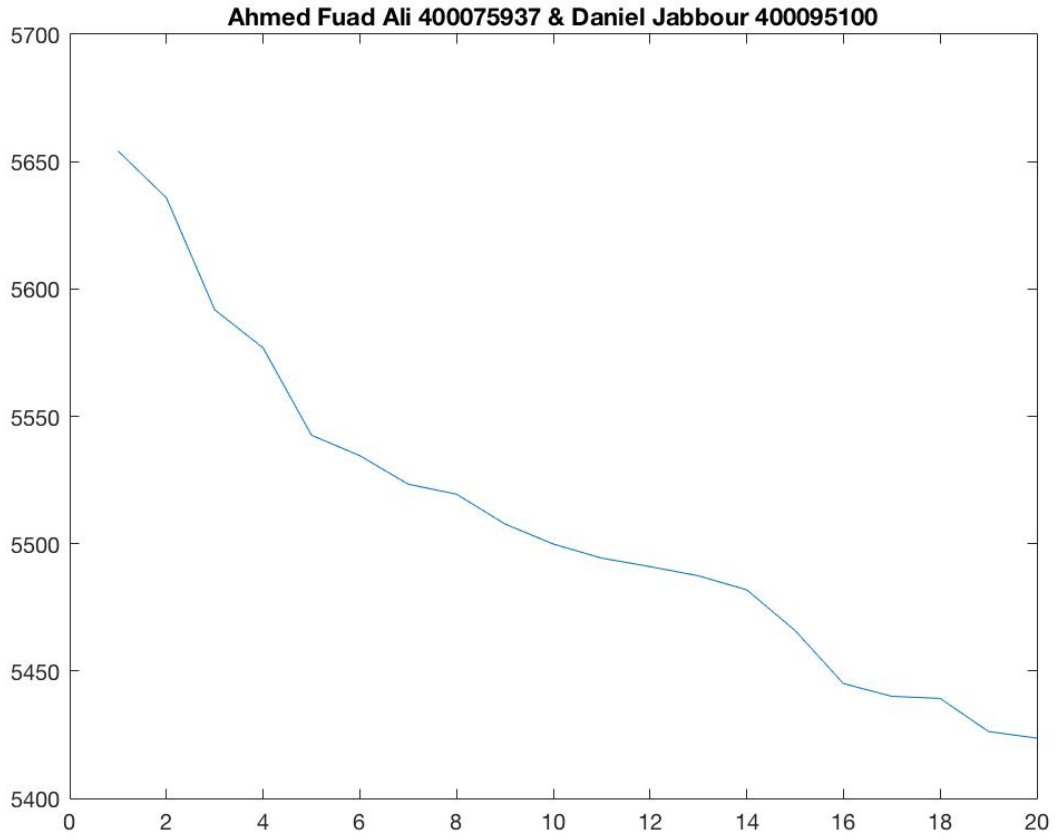
```
function y = csv_get_averages(m, max, columnindexes)
if (nargin ~= 3)
    disp('the function requires 3 arguments')
    return
end

% want to take each element and divide by max score
% so each element in the row should be inverted and then
% you can multiply the two vectors so you get a percentage in each one, but
% bc matrix multiplication the inner number of elemnts must be matched,
% transpose the grade matrix, so then you have total weights and divide
% by the length of the column indexes to get the grades
invertmax = 1./max(columnindexes);
transposem = transpose(m(:,columnindexes));
totalmark = invertmax*transposem;
percentages = totalmark./length(columnindexes);

y = percentages;
```

Graphs

Plot of grades:



Question 3

Code

Editor - /Users/fuad/OneDrive/Documents/year3/signalprocessingmatlab/lab1/lab1.m

lab1.m | csv_get_averages.m | dirac.m

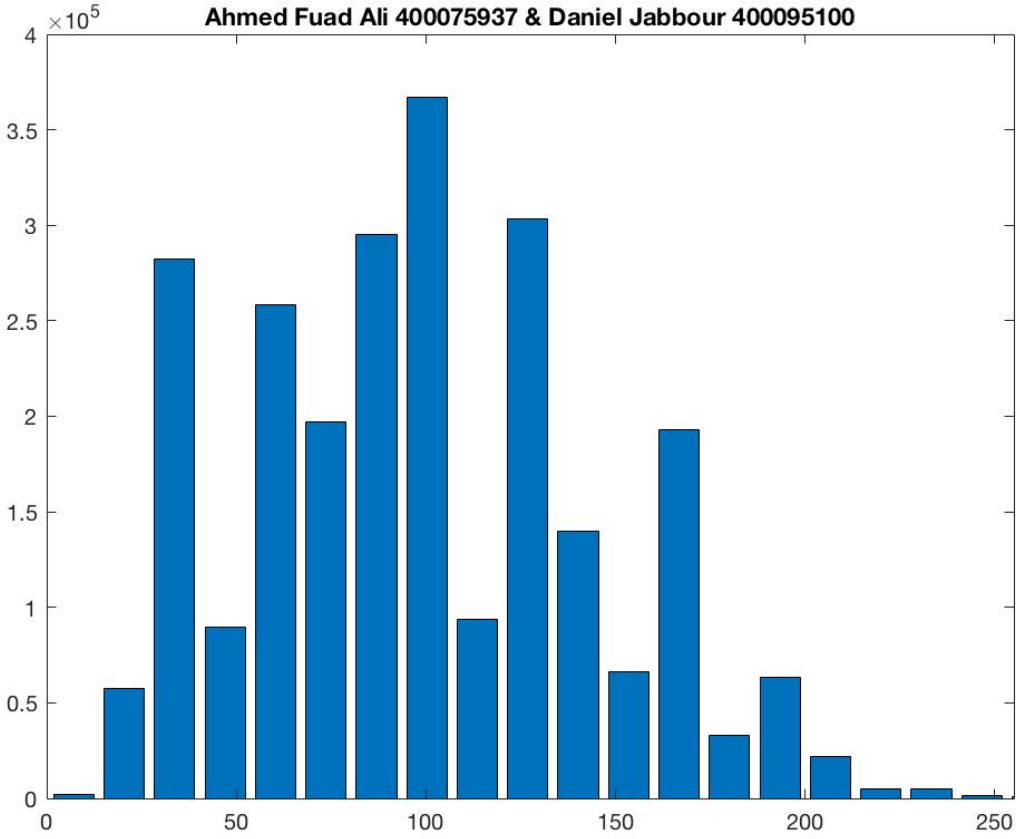
```
64
65      % Question 3
66
67 -    image = imread('ee3tp3picture2018.png');
68 -    image_of_doubles = double(image);
69
70      % a)
71
72 -    [n_elements, centers] = hist(image_of_doubles(:), 20);
73 -    bar(centers, n_elements)
74 -    xlim([0 255])
75
76      % b)
77
78      % c - v'(x,y) = a * v(x, y) + b
79 -    image_of_doubles = image_of_doubles.*9.5 - 1510;
80
81      % d)
82 -    [n_elements, centers] = hist(image_of_doubles(:), 20);
83 -    bar(centers, n_elements)
84 -    xlim([0 255])
85 -    title('Ahmed Fuad Ali 400075937 & Daniel Jabbour 400095100')
86
87      % e)
88 -    imshow(uint8(image_of_doubles));
89 -    image_to_save = uint8(image_of_doubles);
90 -    imwrite(image_to_save, 'saved_image.png');
91
```

Picture

Before

After

Histogram


Ahmed Fuad Ali 400075937 & Daniel Jabbour 400095100
×10^5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
50
100
150
200
250