MATH 155 HWK1

Shiqi Liang, 305117507

January 13, 2021

1 1a

```
%% hwk1q1
img128 = reducegray(128);
imwrite(img128,'img128.jpg');
img64 = reducegray(64);
imwrite(img64,'img64.jpg')
img32 = reducegray(32);
imwrite(img32,'img32.jpg')
img16 = reducegray(16);
imwrite(img16,'img16.jpg')
img8 = reducegray(8);
imwrite(img8,'img8.jpg')
img4 = reducegray(4);
imwrite(img4,'img4.jpg')
img2 = reducegray(2);
imwrite(img2,'img2.jpg')

function out = reducegray(level)
image = imread('Fig2.21(a).jpg');
 imageSize = size(image);
 num = 256 / level;
 step = 255/(level-1);
 %make an empty array first
 out = uint8(zeros(imageSize(1), imageSize(2)));

for x = 1:1:imageSize(1)
 for y = 1:1:imageSize(2)
  out(x, y) = fix(double(image(x, y)) / num) * step;
 end
end
end
```

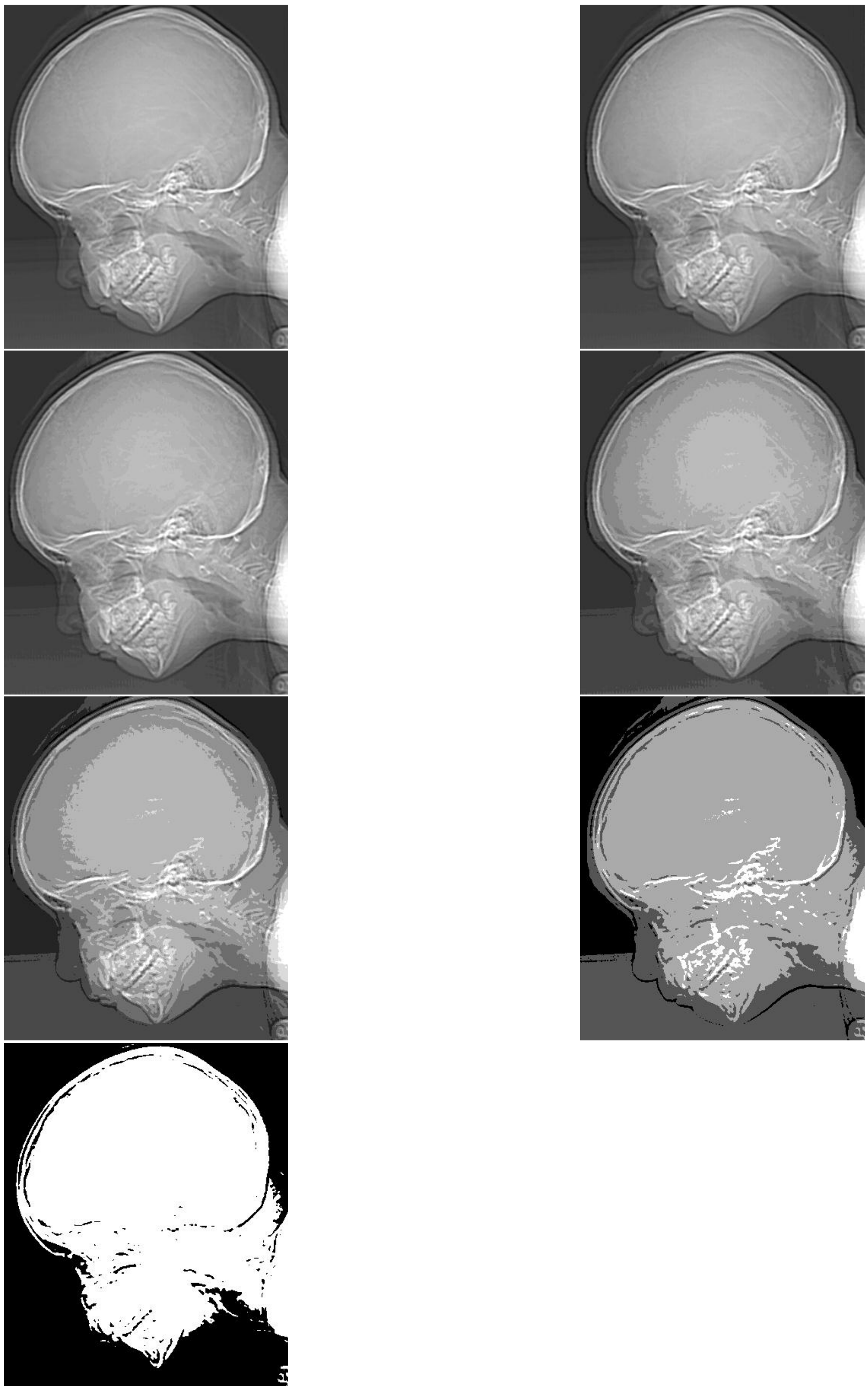


Figure 1: from top down, left to right: 128,64,32,16,8,4,2

2 1b

3 2a

From the plot of the contrast stretching function, we can see that there are 3 properties of T(r) with respect to r:

1. If $r < k$, then the slope is positive.
2. If $r = k$, then the slope is positive infinite and $s = \frac{1}{2}$
3. If $r > k$, then the slope is negative.

Thus, based on these properties, the equation for the stretching function should be

$$s = \frac{1}{1 + (\frac{k}{r})^E} \tag{1}$$

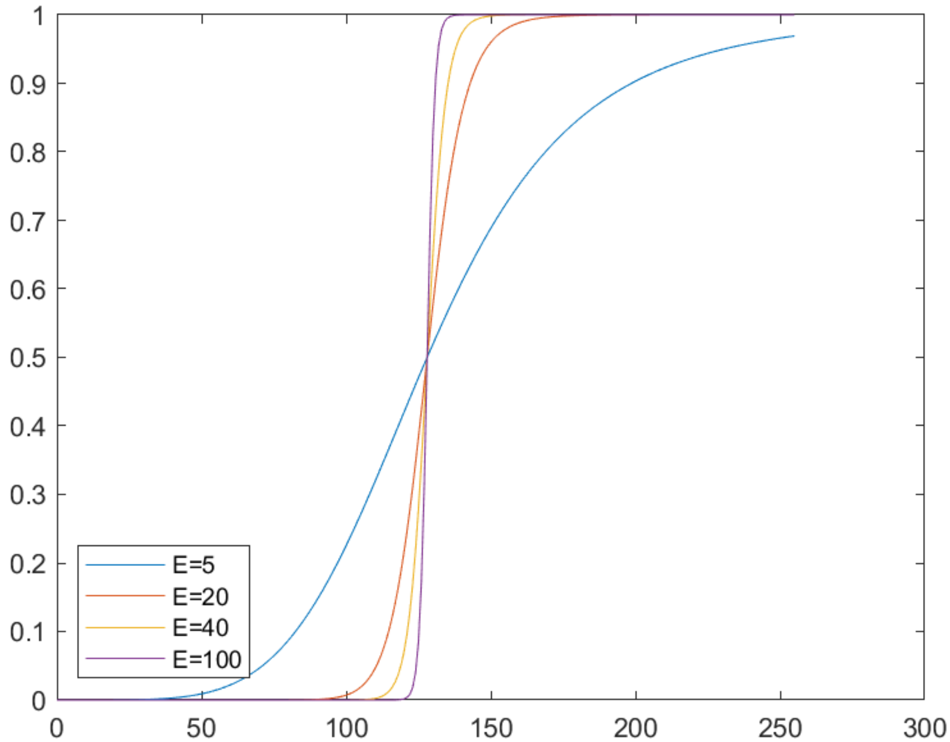
4 2b

```
%% hwk1 q2
r=0:255;
%since I set grey level to 256, here k=L/2 is 128
y5=stretching(128,5);
y20=stretching(128,20);
y40=stretching(128,40);
y100=stretching(128,100);
plot(r,y5)
hold on
plot(r,y20)
plot(r,y40)
plot(r,y100)
legend({'E=5','E=20','E=40','E=100'},'Location','southwest')
function y = stretching(k,E)
y = zeros(256,1)
for r = 1:256
  y(r,1)=1/(1+((k/(r-1))^E));
end
end
```

See the end for graph

5 3

$$T = \frac{L-1}{f_{max} - f_{min}}[f - f_{min}] \tag{2}$$



1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
50
100
150
200
250
300
E=5
E=20
E=40
E=100