INTRODUCTION TO DIGITAL IMAGE PROCESSING HOMEWORK-2

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Development Tool: MATLAB

Task-1

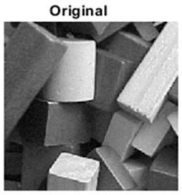
Picture A0

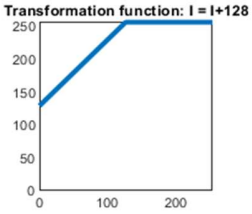
I = I+128

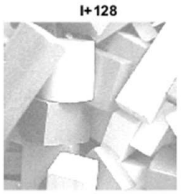
In this photo we increased the intensity level by 128, the image brightness is increased.

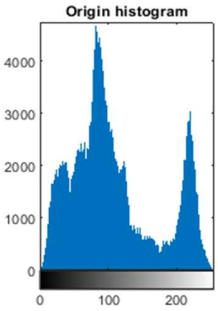
However, this caused detail loss in our transformed photo.

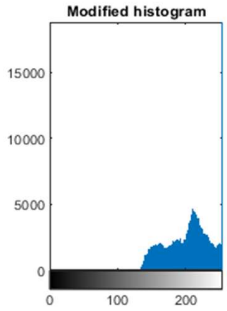
```
Original Max: 254
Original min: 0
Original mean: 1.087636e+02

Modified Max: 255
Modified min: 128
Modified mean: 2.168558e+02
```









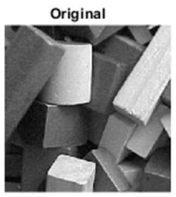


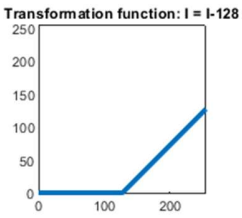
I = I-128

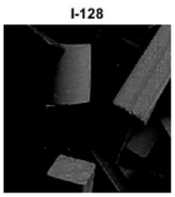
In this photo we reduced the intensity level by 128, the image brightness is reduced.

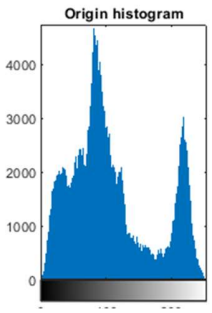
Since the original mean of the photo is lower than 128 the detail loss in this transformed photo is more obvious than I=I+128 function.

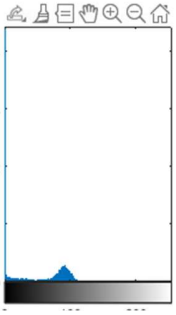
```
Original Max: 254
Original min: 0
Original mean: 1.087636e+02

Modified Max: 126
Modified min: 0
Modified mean: 1.961671e+01
```







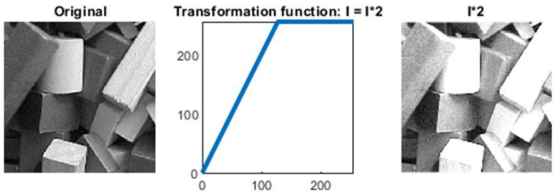


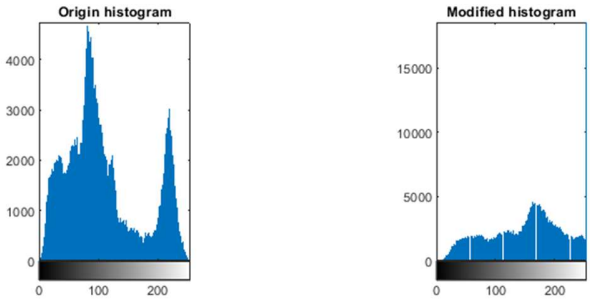


I = I*2

In this photo we multiplied the intensity level by 2. The overall brightness of the photo is increased.

```
Original Max: 254
Original min: 0
Original mean: 1.087636e+02

Modified Max: 255
Modified min: 0
Modified mean: 1.780027e+02
```

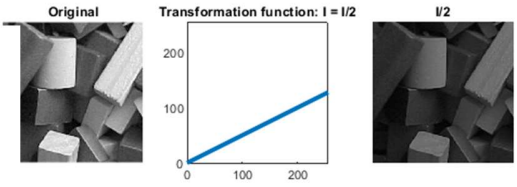


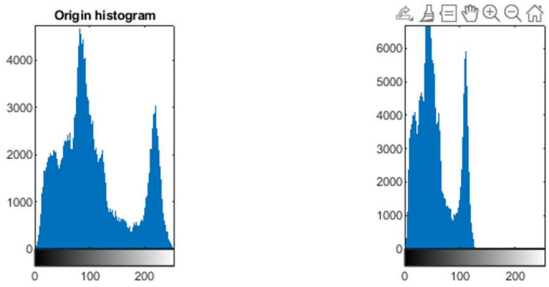


I = I/2

In this photo we divided the intensity level by 2. The overall brightness of the photo is reduced.

```
Original Max: 254
Original min: 0
Original mean: 1.087636e+02

Modified Max: 127
Modified min: 0
Modified mean: 5.463108e+01
```



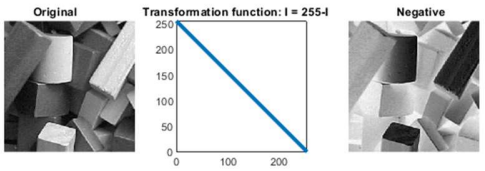


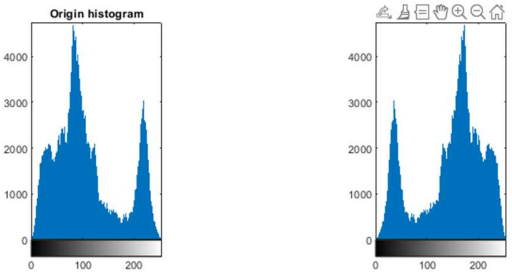
I = 255-I

In this photo we inversed the intensity levels by subtracting it from 255.

Bright places become darker, dark places become brighter.

```
Original Max: 254
Original min: 0
Original mean: 1.087636e+02

Modified Max: 255
Modified min: 1
Modified mean: 1.462364e+02
```

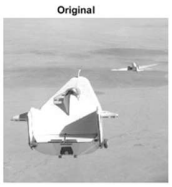


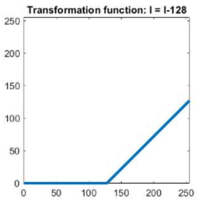


Picture A1

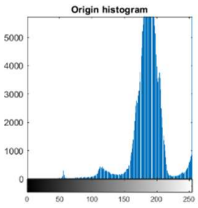
I = I – 128

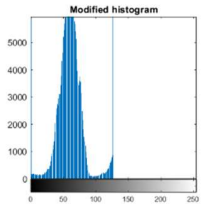
```
Original Max: 255
Original min: 50
Original mean: 1.892563e+02

Modified Max: 127
Modified min: 0
Modified mean: 6.217257e+01
```





In this photo we reduced the intensity level by 128, the image brightness is reduced.



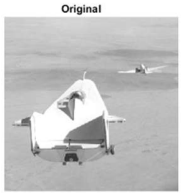


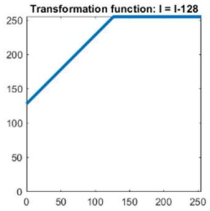
Since the original image has very high intensity level, applying this transformation function doesn't make picture darker as in the A0 photo (less details lost compared to A0 by applying this function)

I=I+128

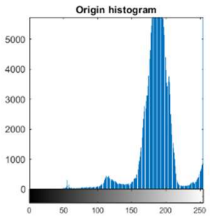
```
Original Max: 255
Original min: 50
Original mean: 1.892563e+02

Modified Max: 255
Modified min: 178
Modified mean: 2.541224e+02
```

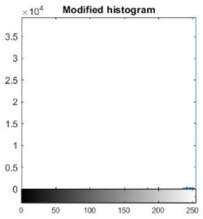
In this photo we increased the intensity level by 128, the image brightness is increased.





Since the original image has very high intensity level, applying this transformation function made most of the image details lost compared to A0.



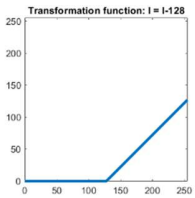


Picture A2

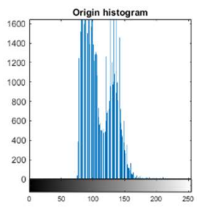
I=I-128

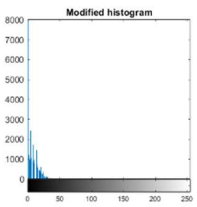
```
Original Max: 224
Original min: 74
Original mean: 1.103037e+02

Modified Max: 96
Modified min: 0
Modified mean: 3.395862e+00
```

In this photo we reduced the intensity level by 128, the image brightness is reduced.



Since original max intensity level is the lower than A0 and A1. Furthermore, the original mean of the picture is lower than 128, applying this transformation function made this photo darker, resulting most details disappear.

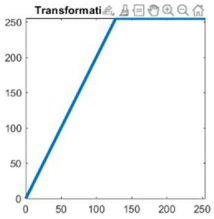


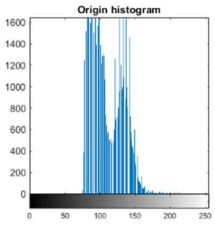


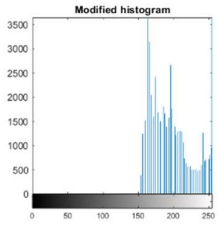
I = I*2

In this photo we multiplied the intensity level by 2. The overall brightness of the photo is increased.

```
Original Max: 224
Original min: 74
Original mean: 1.103037e+02

Modified Max: 255
Modified min: 148
Modified mean: 2.135081e+02
```





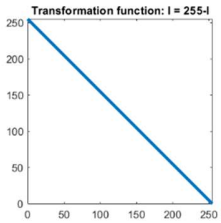


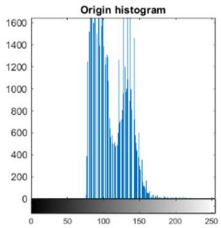
Since the original photo intensity level is close to the gray levels, multiplying the intensity level by 2, made the whole image brighter, so we can't see any darker details.

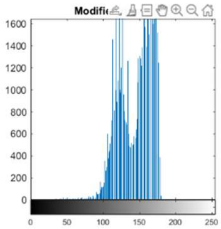
I = 255-I

In this photo we inversed the intensity levels by subtracting it from 255.

```
Original Max: 224
Original min: 74
Original mean: 1.103037e+02

Modified Max: 181
Modified min: 31
Modified mean: 1.446963e+02
```





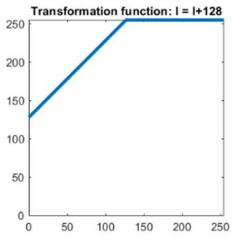


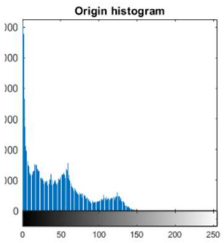
Since the whole image is close to the gray levels taking inverse is not making much difference as in the A0 and A1 images.

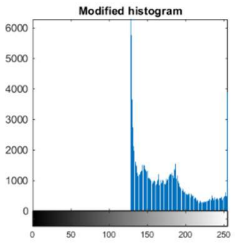
Picture A3

I = I + 128

```
Original Max: 161
Original min: 0
Original mean: 3.509021e+01

Modified Max: 255
Modified min: 128
Modified mean: 1.629235e+02
```



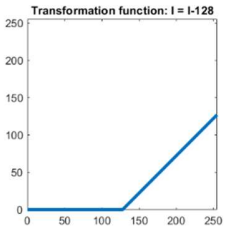


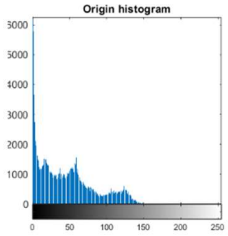


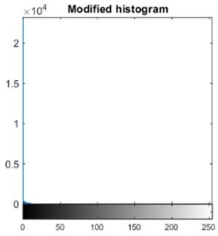
Since the original image is dark, when we add 128 to this image's intensity level, we can see more detail on transformed image. The image becomes brighter.

I = I-128

```
Original Max: 161
Original min: 0
Original mean: 3.509021e+01

Modified Max: 33
Modified min: 0
Modified mean: 1.440790e-01
```



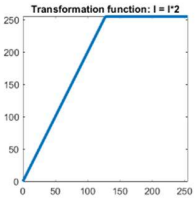


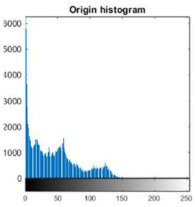


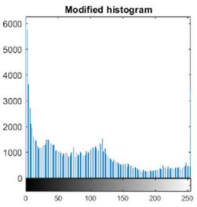
Since the original image is dark, when we subtract 128 to this image's intensity level the whole image considerably become darker compared to other images.

I=I*2

```
Original Max: 161
Original min: 0
Original mean: 3.509021e+01

Modified Max: 255
Modified min: 0
Modified mean: 6.986963e+01
```





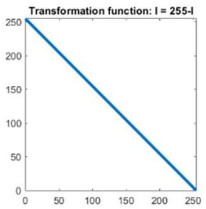


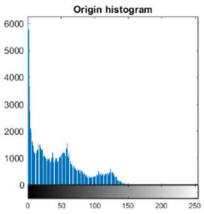
Since the original image is dark when we multiply the image intensity level by 2 the image become brighter. However, compared to the original image this modified image looks more pleasurable.

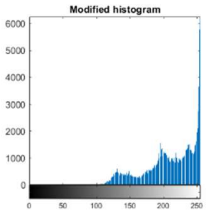
I = 255-I

Since the over original image is dark, taking reverse function of it caused all places over the image brighter compared to other images(A0,A1,A2).

```
Original Max: 161
Original min: 0
Original mean: 3.509021e+01

Modified Max: 255
Modified min: 94
Modified mean: 2.199098e+02
```







Task-2:

The number we used: 57

The hidden message is: No programming language is perfect. There is not even a single best language; there are only languages well suited or perhaps poorly suited for particular purposes. Understanding the problem and associated programming requirements is necessary for choosing the language best suited for the solution.#

Conclusion:

We improved our knowledge about matlab syntax, such as using nested for loops, if else statements and learned how to convert decimal number to ASCII by casting the decimal number as char type. Learned functions about digital image processing in matlab.

The most time taking part was making inferences from histograms.

We had very similar conclusions when we compare some images by each other. So, we didn't indicate those images in report.