In [2]:

```
import tensorflow as tf
import numpy as np
import matplotlib.pyplot as plt
from matplotlib.pyplot import savefig
import cv2
```

In [3]:

```
num_images = 3670
dataset = []

for i in range(1, num_images+1):
    img = cv2.imread(r"C:\Users\MY\Desktop\color_images\color_" +str(i) +".jpg" )
    #print(np.array(img).shape)
    dataset.append(np.array(img))

dataset_source = np.asarray(dataset)
print(dataset_source.shape)

dataset_tar = []

for i in range(1, num_images+1):
    img = cv2.imread(r"C:\Users\MY\Desktop\gray_images\gray_" +str(i) +".jpg", 0)
    dataset_tar.append(np.array(img))

dataset_target = np.asarray(dataset_tar)
#To make the dimension of the gray images equal to the color images
dataset_target = dataset_target[:, :, :, np.newaxis]
print(dataset_target.shape)
```

```
(3670, 128, 128, 3)
(3670, 128, 128, 1)
```

In [4]:

```
red = dataset_source[:,:,:,0]
green = dataset_source[:,:,:,1]
blue = dataset_source[:,:,:,2]
gray = dataset_target[:,:,:,0]
print(gray.shape)
```

```
(3670, 128, 128)
```

In [5]:

```
red = np.array(red.flatten())
green = np.array(green.flatten())
blue = np.array(blue.flatten())
gray = np.array(gray.flatten())
print(red.shape)
print(gray)
```

```
(60129280,)
[138 145 148 ...  71  55  58]
```

In [6]:

```
y = gray
X = np.column_stack((red,green,blue))
print(X.shape)

#initialize weight with random values
w = np.array([0.3,0.8,0.2])
print(w.shape)
Cost = []
Weights = []
alpha = 0.001
for i in range(0,1000):
    pred =  X[:,0]*w[0] + X[:,1]*w[1] + X[:,2]*w[2]
    pred = pred.astype(int)
    err = np.array(y-pred)
    sq_err = np.array(np.square(err))
    if i%10==0:
        print("Cost = ", np.median(sq_err)/256)
        Cost.append(np.median(sq_err)/256)
        print("Weights = ", w)
        Weights.append(w)
        print(i/10)
    w[0] = w[0] - (alpha*(np.median(sq_err)/256)*w[0])/(w[0]+w[1]+w[2])
    w[1] = w[1] - (alpha*(np.median(sq_err)/256)*w[1])/(w[0]+w[1]+w[2])
    w[2] = w[2] - (alpha*(np.median(sq_err)/256)*w[2])/(w[0]+w[1]+w[2])
```

```
(60129280, 3)
(3,)
Cost =  1.72265625
Weights =  [0.3 0.8 0.2]
0
Cost =  1.5625
Weights =  [0.29827734 0.79827734 0.19827734]
1
Cost =  1.5625
Weights =  [0.29671484 0.79671484 0.19671484]
2
Cost =  1.41015625
Weights =  [0.29515234 0.79515234 0.19515234]
3
Cost =  1.41015625
Weights =  [0.29374219 0.79374219 0.19374219]
4
Cost =  1.41015625
Weights =  [0.29233203 0.79233203 0.19233203]
5
Cost =  1.265625
Weights =  [0.29092187 0.79092188 0.19092188]
6
Cost =  1.265625
Weights =  [0.28965625 0.78965625 0.18965625]
7
Cost =  1.265625
Weights =  [0.28839062 0.78839063 0.18839063]
8
Cost =  1.12890625
Weights =  [0.287125 0.787125 0.187125]
9
Cost =  1.12890625
Weights =  [0.28599609 0.78599609 0.18599609]
10
Cost =  1.12890625
Weights =  [0.28486719 0.78486719 0.18486719]
11
Cost =  1.0
Weights =  [0.28373828 0.78373828 0.18373828]
12
Cost =  1.0
Weights =  [0.28273828 0.78273828 0.18273828]
13
Cost =  1.0
Weights =  [0.28173828 0.78173828 0.18173828]
14
Cost =  1.0
Weights =  [0.28073828 0.78073828 0.18073828]
15
Cost =  1.0
Weights =  [0.27973828 0.77973828 0.17973828]
16
Cost =  0.87890625
Weights =  [0.27873828 0.77873828 0.17873828]
17
Cost =  0.87890625
Weights =  [0.27785937 0.77785938 0.17785938]
18
Cost =  0.87890625
Weights =  [0.27698047 0.77698047 0.17698047]
```

```
19
Cost =  0.87890625
Weights =  [0.27610156 0.77610156 0.17610156]
20
Cost =  0.765625
Weights =  [0.27522266 0.77522266 0.17522266]
21
Cost =  0.765625
Weights =  [0.27445703 0.77445703 0.17445703]
22
Cost =  0.765625
Weights =  [0.27369141 0.77369141 0.17369141]
23
Cost =  0.765625
Weights =  [0.27292578 0.77292578 0.17292578]
24
Cost =  0.765625
Weights =  [0.27216016 0.77216016 0.17216016]
25
Cost =  0.765625
Weights =  [0.27139453 0.77139453 0.17139453]
26
Cost =  0.66015625
Weights =  [0.27062891 0.77062891 0.17062891]
27
Cost =  0.66015625
Weights =  [0.26996875 0.76996875 0.16996875]
28
Cost =  0.66015625
Weights =  [0.26930859 0.76930859 0.16930859]
29
Cost =  0.66015625
Weights =  [0.26864844 0.76864844 0.16864844]
30
Cost =  0.66015625
Weights =  [0.26798828 0.76798828 0.16798828]
31
Cost =  0.66015625
Weights =  [0.26732813 0.76732813 0.16732813]
32
Cost =  0.66015625
Weights =  [0.26666797 0.76666797 0.16666797]
33
Cost =  0.66015625
Weights =  [0.26600781 0.76600781 0.16600781]
34
Cost =  0.5625
Weights =  [0.26534766 0.76534766 0.16534766]
35
Cost =  0.5625
Weights =  [0.26478516 0.76478516 0.16478516]
36
Cost =  0.5625
Weights =  [0.26422266 0.76422266 0.16422266]
37
Cost =  0.5625
Weights =  [0.26366016 0.76366016 0.16366016]
38
Cost =  0.5625
Weights =  [0.26309766 0.76309766 0.16309766]
39
```

```
Cost =  0.5625
Weights =  [0.26253516 0.76253516 0.16253516]
40
Cost =  0.5625
Weights =  [0.26197266 0.76197266 0.16197266]
41
Cost =  0.5625
Weights =  [0.26141016 0.76141016 0.16141016]
42
Cost =  0.47265625
Weights =  [0.26084766 0.76084766 0.16084766]
43
Cost =  0.47265625
Weights =  [0.260375 0.760375 0.160375]
44
Cost =  0.47265625
Weights =  [0.25990234 0.75990234 0.15990234]
45
Cost =  0.47265625
Weights =  [0.25942969 0.75942969 0.15942969]
46
Cost =  0.47265625
Weights =  [0.25895703 0.75895703 0.15895703]
47
Cost =  0.47265625
Weights =  [0.25848438 0.75848437 0.15848438]
48
Cost =  0.47265625
Weights =  [0.25801172 0.75801172 0.15801172]
49
Cost =  0.47265625
Weights =  [0.25753906 0.75753906 0.15753906]
50
Cost =  0.47265625
Weights =  [0.25706641 0.75706641 0.15706641]
51
Cost =  0.47265625
Weights =  [0.25659375 0.75659375 0.15659375]
52
Cost =  0.47265625
Weights =  [0.25612109 0.75612109 0.15612109]
53
Cost =  0.390625
Weights =  [0.25564844 0.75564844 0.15564844]
54
Cost =  0.390625
Weights =  [0.25525781 0.75525781 0.15525781]
55
Cost =  0.390625
Weights =  [0.25486719 0.75486719 0.15486719]
56
Cost =  0.390625
Weights =  [0.25447656 0.75447656 0.15447656]
57
Cost =  0.390625
Weights =  [0.25408594 0.75408594 0.15408594]
58
Cost =  0.390625
Weights =  [0.25369531 0.75369531 0.15369531]
59
Cost =  0.390625
```

```
Weights =  [0.25330469 0.75330469 0.15330469]
60
Cost =  0.390625
Weights =  [0.25291406 0.75291406 0.15291406]
61
Cost =  0.390625
Weights =  [0.25252344 0.75252344 0.15252344]
62
Cost =  0.390625
Weights =  [0.25213281 0.75213281 0.15213281]
63
Cost =  0.390625
Weights =  [0.25174219 0.75174219 0.15174219]
64
Cost =  0.390625
Weights =  [0.25135156 0.75135156 0.15135156]
65
Cost =  0.390625
Weights =  [0.25096094 0.75096094 0.15096094]
66
Cost =  0.390625
Weights =  [0.25057031 0.75057031 0.15057031]
67
Cost =  0.390625
Weights =  [0.25017969 0.75017969 0.15017969]
68
Cost =  0.31640625
Weights =  [0.24978906 0.74978906 0.14978906]
69
Cost =  0.31640625
Weights =  [0.24947266 0.74947266 0.14947266]
70
Cost =  0.31640625
Weights =  [0.24915625 0.74915625 0.14915625]
71
Cost =  0.31640625
Weights =  [0.24883984 0.74883984 0.14883984]
72
Cost =  0.31640625
Weights =  [0.24852344 0.74852344 0.14852344]
73
Cost =  0.31640625
Weights =  [0.24820703 0.74820703 0.14820703]
74
Cost =  0.31640625
Weights =  [0.24789063 0.74789062 0.14789062]
75
Cost =  0.31640625
Weights =  [0.24757422 0.74757422 0.14757422]
76
Cost =  0.31640625
Weights =  [0.24725781 0.74725781 0.14725781]
77
Cost =  0.31640625
Weights =  [0.24694141 0.74694141 0.14694141]
78
Cost =  0.31640625
Weights =  [0.246625 0.746625 0.146625]
79
Cost =  0.31640625
Weights =  [0.24630859 0.74630859 0.14630859]
```

```
80
Cost =  0.31640625
Weights =  [0.24599219 0.74599219 0.14599219]
81
Cost =  0.31640625
Weights =  [0.24567578 0.74567578 0.14567578]
82
Cost =  0.31640625
Weights =  [0.24535938 0.74535938 0.14535937]
83
Cost =  0.31640625
Weights =  [0.24504297 0.74504297 0.14504297]
84
Cost =  0.31640625
Weights =  [0.24472656 0.74472656 0.14472656]
85
Cost =  0.31640625
Weights =  [0.24441016 0.74441016 0.14441016]
86
Cost =  0.31640625
Weights =  [0.24409375 0.74409375 0.14409375]
87
Cost =  0.31640625
Weights =  [0.24377734 0.74377734 0.14377734]
88
Cost =  0.31640625
Weights =  [0.24346094 0.74346094 0.14346094]
89
Cost =  0.25
Weights =  [0.24314453 0.74314453 0.14314453]
90
Cost =  0.25
Weights =  [0.24289453 0.74289453 0.14289453]
91
Cost =  0.25
Weights =  [0.24264453 0.74264453 0.14264453]
92
Cost =  0.25
Weights =  [0.24239453 0.74239453 0.14239453]
93
Cost =  0.25
Weights =  [0.24214453 0.74214453 0.14214453]
94
Cost =  0.25
Weights =  [0.24189453 0.74189453 0.14189453]
95
Cost =  0.25
Weights =  [0.24164453 0.74164453 0.14164453]
96
Cost =  0.25
Weights =  [0.24139453 0.74139453 0.14139453]
97
Cost =  0.25
Weights =  [0.24114453 0.74114453 0.14114453]
98
Cost =  0.25
Weights =  [0.24089453 0.74089453 0.14089453]
99
```

In [7]:

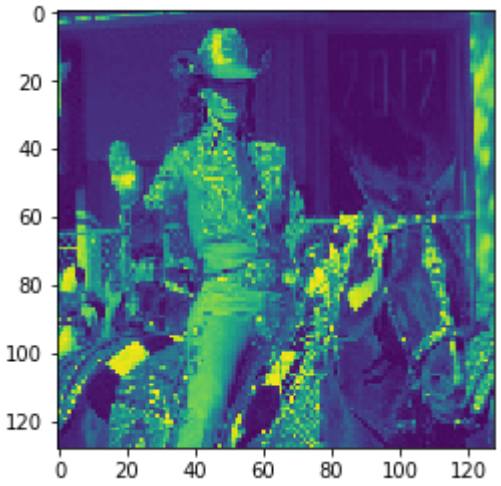
```
#predict
img = cv2.imread(r"C:\Users\MY\Desktop\color_images\color_1900.jpg")
print(np.array(img).shape)
cv2.imshow('Original image',img)
```

```
(128, 128, 3)
```

In [8]:

```
img_nn = img[:,:,0]*w[0]+img[:,:,1]*w[1]+img[:,:,2]*w[2]
img_nn = img_nn.astype(int)
print(img_nn.shape)
plt.imshow(img_nn)
plt.show()
```

```
(128, 128)
```



In [9]:

```
plt.imshow(cv2.cvtColor(img, cv2.COLOR_BGR2GRAY))
plt.show()
```