HW2, Computer problem, Part (a)
EECS 203A, Digital Image Processing. UCI. Fall 2004
Nasser Abbasi

Define the transformation and generate 2 lookup tables and plot the curves. I also list the first and last 5 rows in each table for each curve to better see the values. The first column in the table is the r values and the second column is the s values.

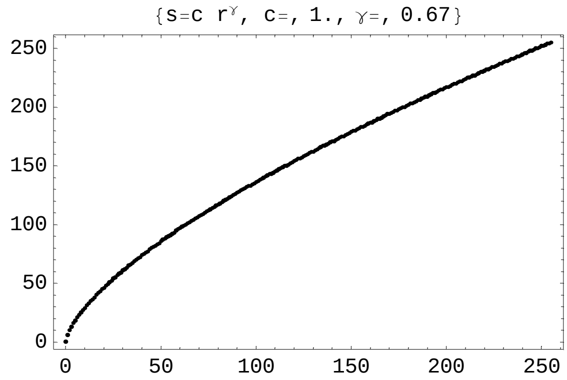
In[27]:=

```
Clear["Global`*"];

applyGLT[data_, tbl_] := Module[{i, out},
   out = Table[i, {i, Length[data]}];

   For[i = 1, i ≤ Length[data], i = i + 1,
       out[[i]] = tbl[[data[[i]] + 1, 2]]
   ];

   out = Partition[out, cols];
   rows = 480;
   cols := 640;
   ListDensityPlot[Reverse[out], Mesh → False, Frame → False,
    ImageSize → {rows, cols}, PlotRange → All, AspectRatio → Automatic];

   Print[Dimensions[out]];
   Return[out];
  ];

s[c_, γ_, r_] := c r^γ;

process[c_, γ_] := Module[{L, tbl, r},
  L = 256 - 1;
  tbl = Round[Table[{r L, s[c, γ, r] L}, {r, 0, 1, N[1/L]}]];
  Print[TableForm[Take[tbl, {1, 5}]]];
  Print["...\n", TableForm[Take[tbl, -5]]];

  ListPlot[tbl, PlotLabel → {"s=c r^γ, c=", c, "γ=", γ},
   Frame → True, Ticks → {{0, L/4, L/2, 3 L/4, L - 1}}];
  Return[tbl];
 ]

tbl1 = process[1.0, 0.67];
Print["lookup table has size=", Dimensions[tbl1]];
tbl2 = process[1.0, 1.5];
```

0	0
1	6
2	10
3	13
4	16

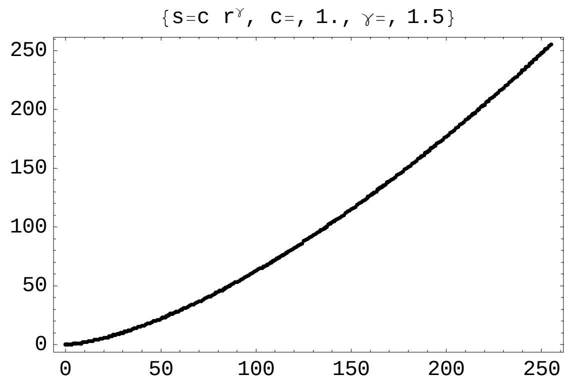
...

251	252
252	253
253	254
254	254
255	255



lookup table has size={256, 2}

```
0      0
1      0
2      0
3      0
4      1

...
251      249
252      251
253      252
254      254
255      255
```



Now set current directory to where the image is (same folder as this note book) and read the image file

```
In[34]:= SetDirectory[
           ToFileName[Extract["FileName" /. NotebookInformation[EvaluationNotebook[]],
             {1}, FrontEnd`FileName]]];

         fileName = "cat.raw";
         rows = 480;
         cols = 640;
         data = FastBinaryFiles`ReadListBinary[fileName, Byte];
```

Now that the image is read into data, we display it before appying GLT on it.

In[39]:=
```
ListDensityPlot[Reverse[Partition[data, cols]], Mesh → False, Frame → False,
  ImageSize → {rows, cols}, PlotRange → All, AspectRatio → Automatic];
```

Now apply first GLT to this image.c=1.0,γ=0.67 and display the result

In[40]:=

```
out = applyGLT[Flatten[data], tbl1];
fileName = "cat_low_gamma.raw";
strm = FastBinaryFiles`OpenWriteBinary[fileName];
FastBinaryFiles`WriteBinary[strm, Flatten[out], Byte];
Close[strm];
```

Now apply second GLT to this image.c=1.0,γ=1.5 and display the result

In[45]:=
```
out = applyGLT[Flatten[data], tbl2];
fileName = "cat_high_gamma.raw";
strm = FastBinaryFiles`OpenWriteBinary[fileName];
FastBinaryFiles`WriteBinary[strm, Flatten[out], Byte];
Close[strm];
```

Conclusion

With γ=1.5,the new image is darker than the original image.With γ=0.67,the new image is lighter than the original image.-Looking at the curves we see that with smaller γ darker areas are spread more over to the lighter gray level,and the reverse happens with higher γ