

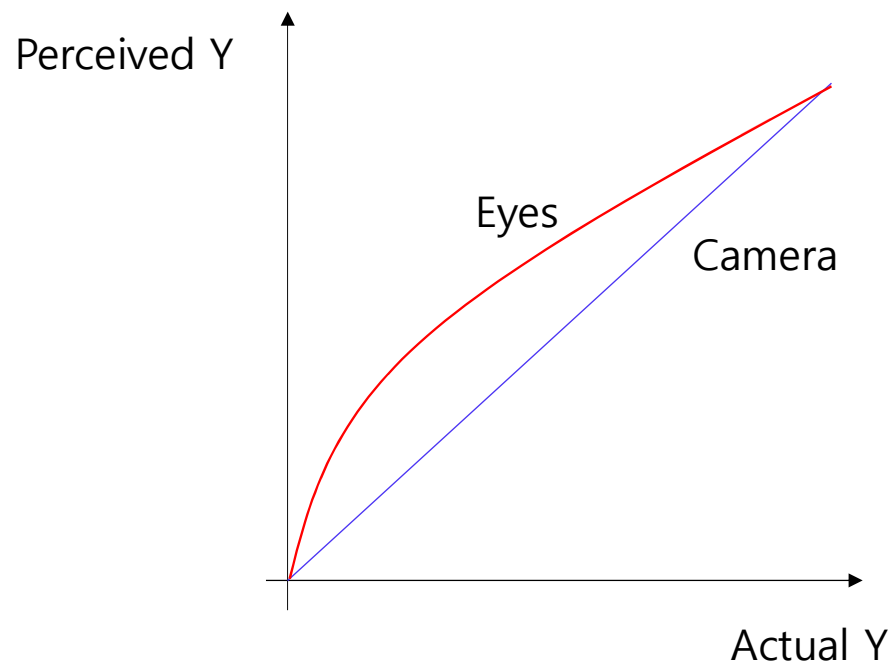
Gamma

이진영



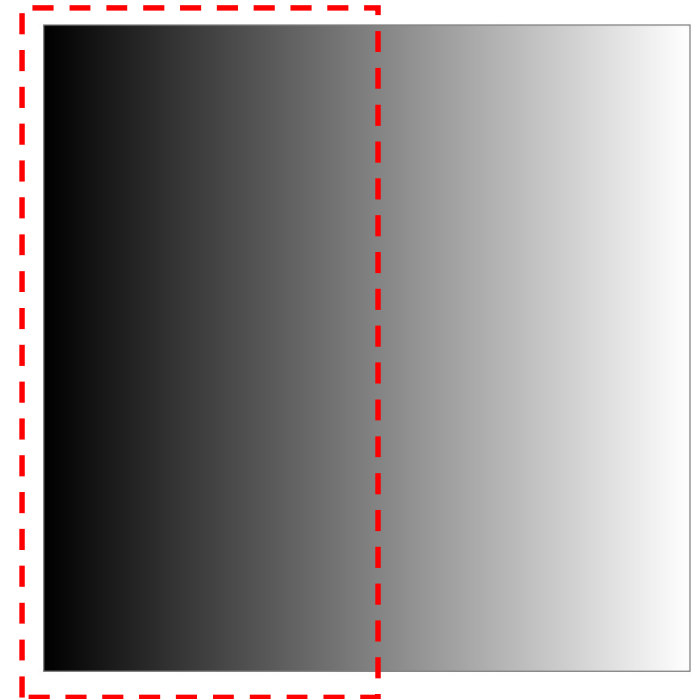
Nonlinearity

- Nonlinear relationship between the actual luminance and its perceived luminance
- Human eye (Nonlinear) \neq Camera



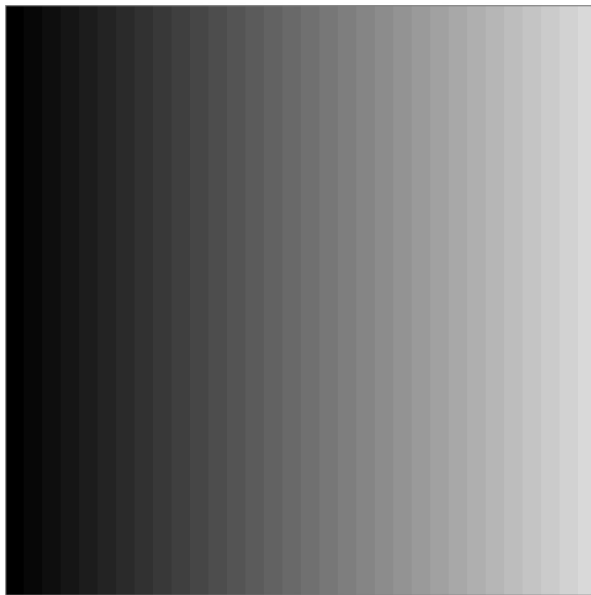
Human Perception

- Differences between darker values (More sensitive) > Differences between lighter values (Less)
 - More sensitive eyes, when it is less bright
 - In general, more important for dark regions
 - Sometimes problem:
 - Many bits in brightness we cannot see
 - Fewer bits in darkness we can see
- Bit optimization for efficient image representation

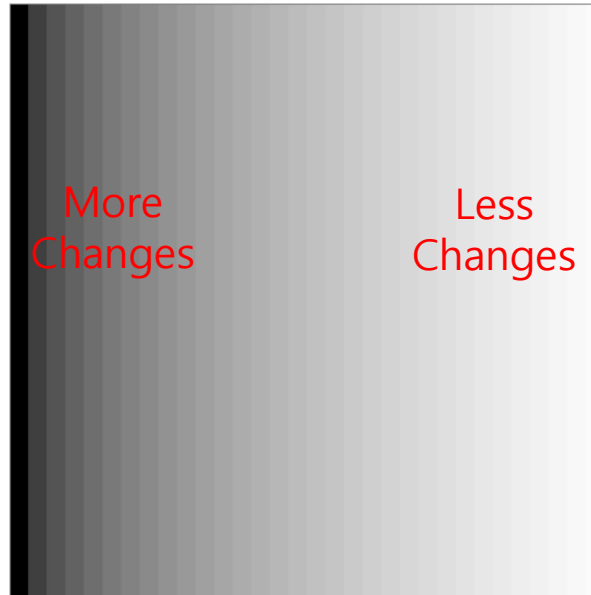


Gamma Encoding

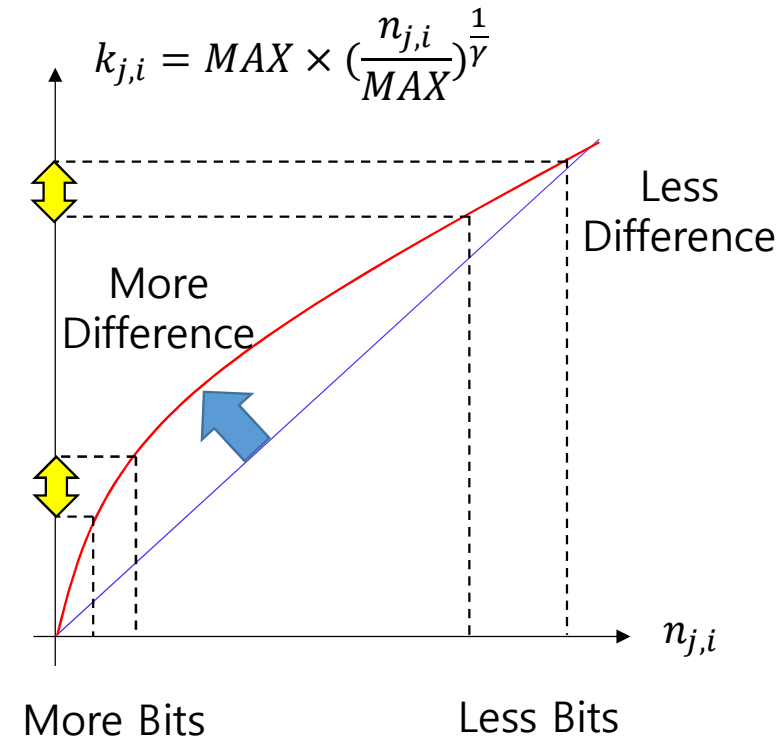
- Maximization of visual quality, by optimizing the usage of bits in the encoding
- Correction of gamma characteristics of early display devices



Linearly Encoding



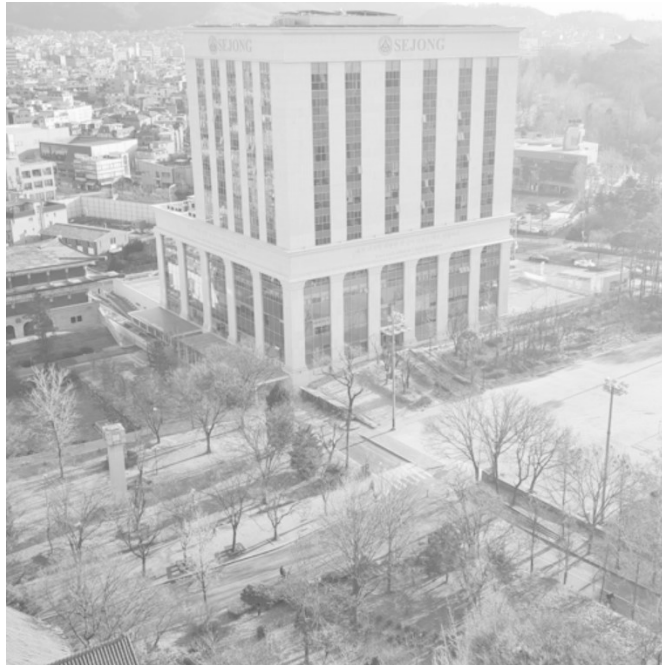
Gamma Encoding



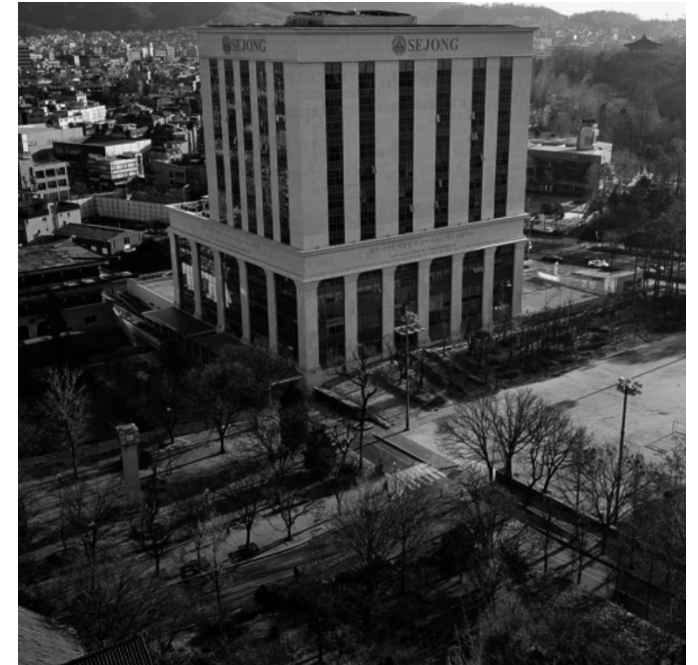
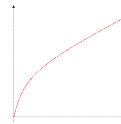
Comparison



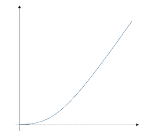
AlCenterY.bmp



Gamma = 2.5



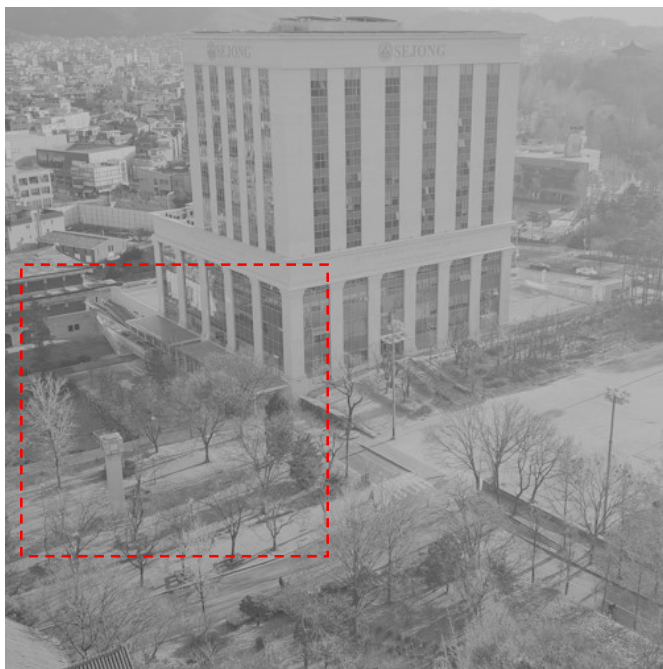
Gamma = 0.4



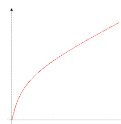
Good Example



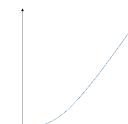
AlCenterY_Dark.bmp



Gamma = 2.5

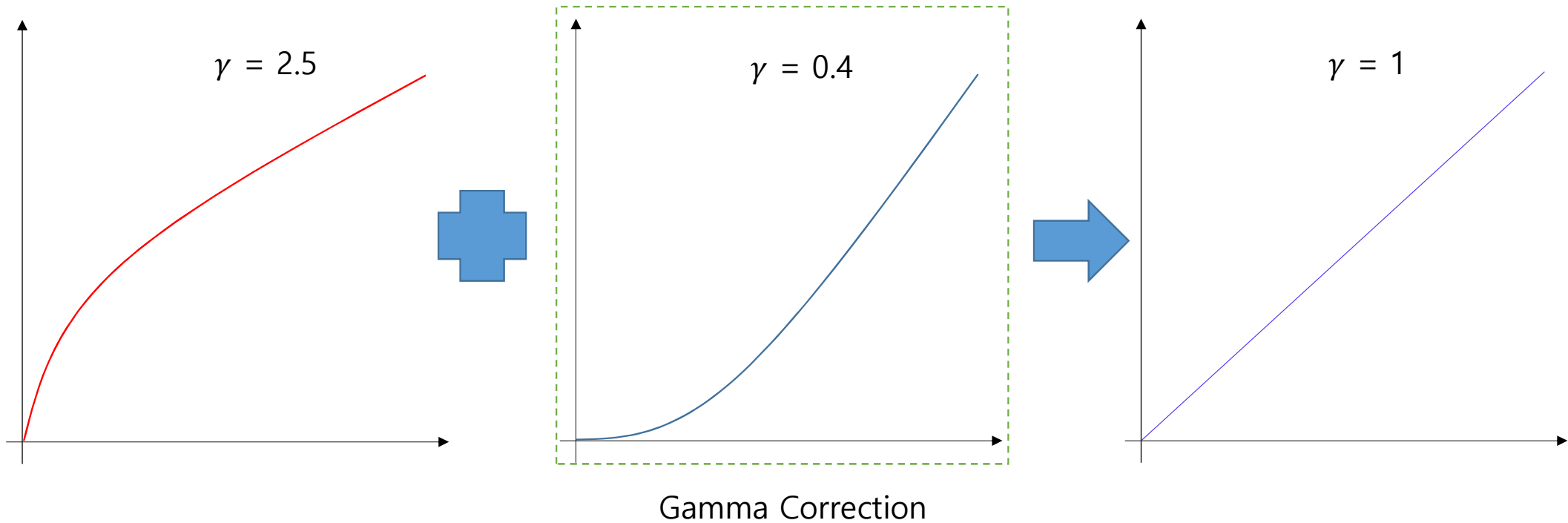


Gamma = 0.4



Gamma Correction

- Inverse conversion from a gamma encoded image to an original image



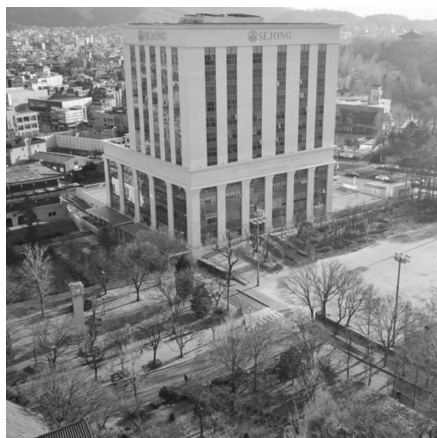
Display Gamma

- Nonlinear input and output characteristics of display devices
- Gamma of cathode ray tube (CRT) displays = $1/2.5$ (Almost inverse of our eyes)
- Sometimes, display gamma = gamma correction
- For example, monitor setting

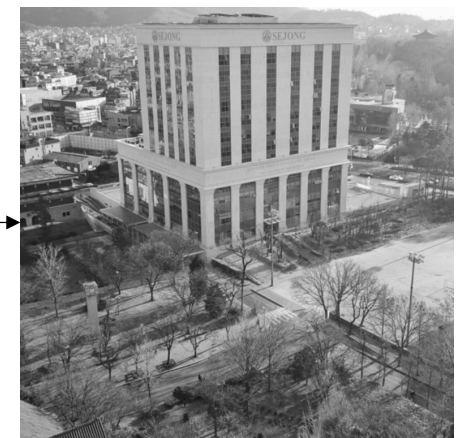
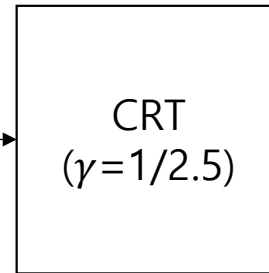
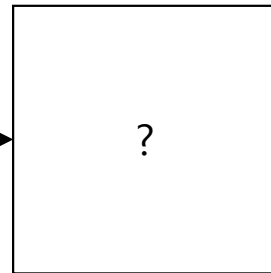


Experiment

- Considering the characteristic of CRT, please perform gamma encoding



Original



Output

```
#include <math.h>
Y2[j * width + i] = (unsigned char)(255 * pow(Y1[j * width + i] / 255.0, 1/gamma));
```

