Computer Vision HW1 report

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Description of my code

`rbg2gray.py` reads an input image (the image filename should be specified inside the code), feeds it through calculated bilateral and joint bilateral filters, then saves the cost function values in log files. The padding method used was `BORDER_REPLICATE`, as I believe it makes sense when used with range kernels.

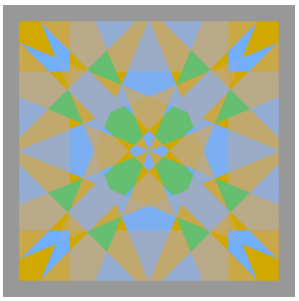
`parse_logs.py` processes these log files, finding the RGB weight configuration local minima and tallying vote counts for them. My method of locating the local minima is to compare each point to its nearest 6 neighboring points (they are all distanced $0.1 * \sqrt{2}$ away). If a point is on the boundary (e.g. point $(1,0,0)$) , then it will have less neighboring points to compare with.

When writing my code, I was careful to avoid as many `for` loops as possible, and instead use broadcasting features of `numpy` which speeds up the calculation process. Also, I purposely incorporated information logging so that if something went wrong, I would not have to restart calculations from scratch.

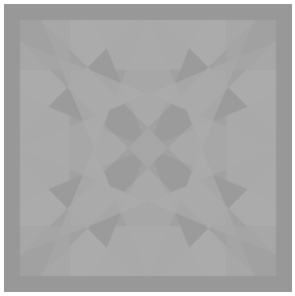
Results

0a best candidates (the outputs are shown below from left to right):

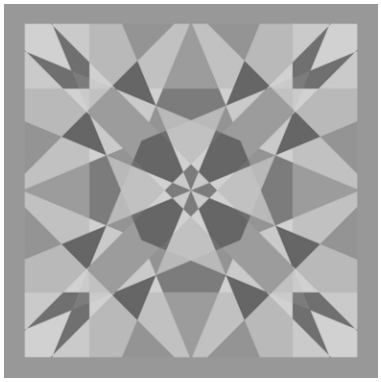
w_b	w_g	w_r	votes
0.0	**0.0**	**1.0**	**9**
1.0	**0.0**	**0.0**	**9**

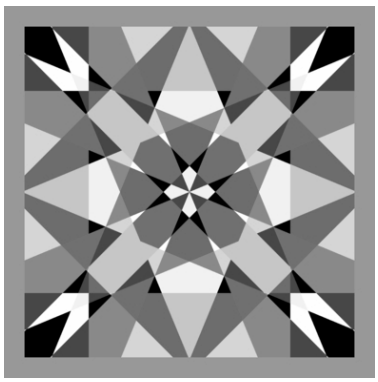


input



conventional rgb2gray





0b best candidates (the outputs are shown below from left to right):

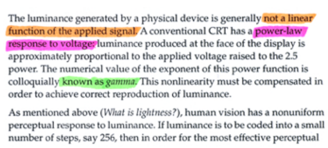
w_b	w_g	w_r	votes
0.0	**0.0**	**1.0**	**3**
0.0	**0.2**	**0.8**	**3**
0.1	**0.2**	**0.7**	**2**

input

conventional rgb2gray

0c best candidates (the outputs are shown below from left to right):

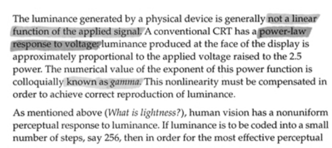
w_b	w_g	w_r	votes
0.3	**0.4**	**0.3**	**3**
0.0	0.0	1.0	2
0.3	**0.5**	**0.2**	**1**



The luminance generated by a physical device is generally not a linear function of the applied signal. A conventional CRT has a power-law response to voltage: luminance produced at the face of the display is approximately proportional to the applied voltage raised to the 2.5 power. The numerical value of the exponent of this power function is colloquially known as *gamma*. This nonlinearity must be compensated in order to achieve correct reproduction of luminance.

As mentioned above (*What is lightness?*), human vision has a nonuniform perceptual response to luminance. If luminance is to be coded into a small number of steps, say 256, then in order for the most effective perceptual

input



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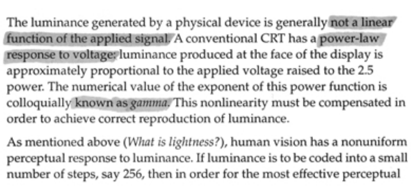

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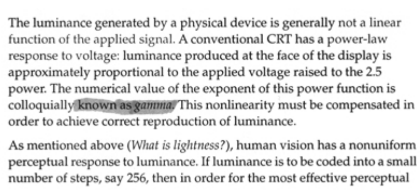

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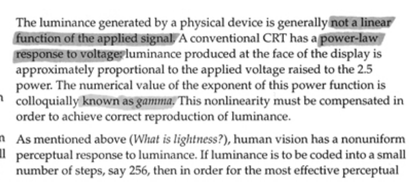

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I was surprised that the second best candidate was unable to clearly show all the highlight colors!