

# CS 519 Vector and Tensor Field Visualization

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## Project 1

Yu Zhang  
932-296-820

Zhangy6@onid.oregonstate.edu  
Master Student in Computer Engineering  
School of Electrical Engineering and Computer Science  
Oregon State University

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## 1. Image decolorization

Original graph



There are two formulas for calculating the intensity of each pixel:

a)  $L = ((R^2 + G^2 + B^2)/3)^{0.5}$

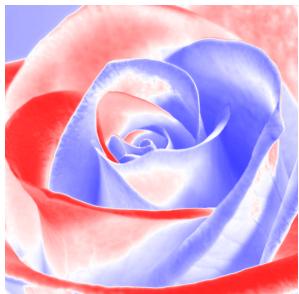


b)  $L = 0.30 * R + 0.59 * G + 0.11 * B$



After computing 5 pictures(the other pictures are stored in the folder), I find that the second formula is better than first one. The first formula is just simply calculation, but the second one is more precise to transfer colorful image to the grayscale image.

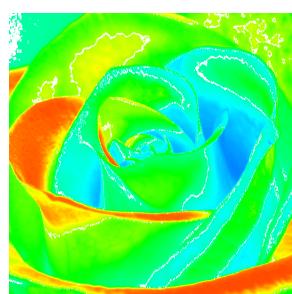
## 2. Color maps



Blue to Red



2 color



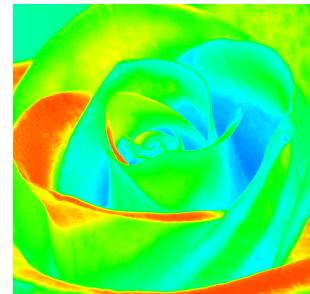
Rainbow and contour



Heat



Color map by intensity



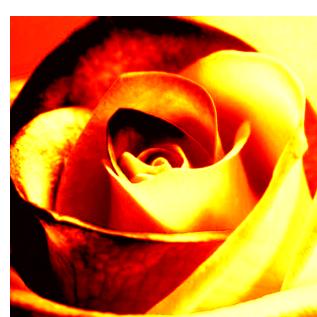
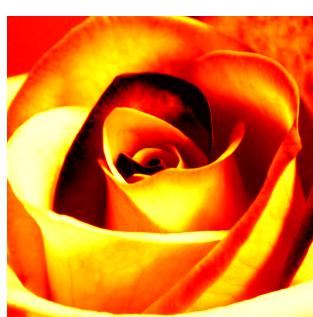
Rainbow



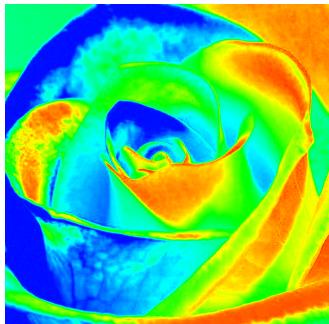
Color map by saturation

I think rainbow and heat schemes are the most efficient to understand the images, because you can see more details about the images.

For the red, green, blue channels, I did as following:



According the heat color mapping, I find the blue channel is better to understand the image, and I also checked the blue channel with rainbow color mapping, I think my conclusion is right:

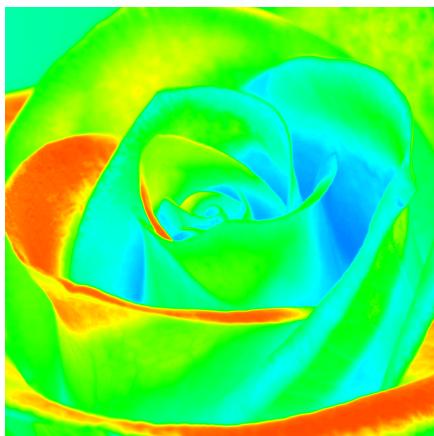


### 3. Image smoothing

I used IrfanView to fuzz up my images, such as:



And then I applied color mapping, the result shown as following:

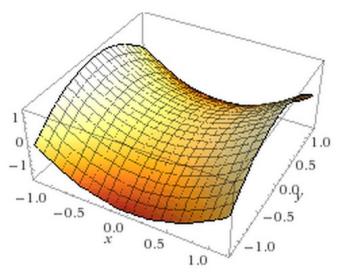


I found that when the image is blurred, the contours become less and less blur, the change of color becomes less outstanding.

### 6. Decide whether it is Morse and provide your justification

- a) since  $f(x,y,z) = 1$ , the unit sphere is constant, so it is not Morse.
- b) this is Morse, because the unit sphere can changed by changing of  $x$ .
- c) Morse

d) this is Morse, since the 3d image of  $x^2 - y^2$  is such as:



e) Morse

f) Morse