Hello everyone, today I will introduce an important concept in computer vision field, contrast in complex images.

Although many physical contrast methods have been defined well and agree with the perceived contrast, like sinusoidal gratings or a patch of light on a uniform background. However, it is useless in complex images, coz the background in the complex image is not uniform. And the simple contrast definition based on uniform background.

Therefore, we need to have a new definition of contrast in images. This is the main goal of the paper.

Now, let’s know some concept about simple contrast at first.

The first method is weber contrast, which is used for small patterns like sharp-edged symbols in a uniform background.

And the second one is Michelson contrast, for simple periodic pattern.

Above are simple contrast method, and now we will introduce the concept of local band-limited contrast, new definition in this paper.

This method consists of two important part, which are band-limited contrast and local contrast respectively. Let’s see band-limited contrast,

Band-limited contrast can simply be explained to something that using filter (low-pass, band-pass and high-pass) to do convolution with the image in frequency domain.

Concretely, low pass filter would remove big portion of high frequency part, and keep most of low frequency part, which is for smoothing image. And high pass filter is inverse, which is for clarify the image.

Ok, let’s go ahead to local contrast, this method is to separate image to several parts, and calculate the contrast for each part respectively. What it brings is that processing for each part of image is independent with each other, so it could avoid that contrast value is not compatible with the perceived contrast.

However, if we use band-limited contrast method, whatever we do, we just can have influence on the frequency domain, from the result in the paper, it’s not very satisfying after image processing. Cause if we just consider the influence of spatial frequency, the luminance in space domain could be ignored. Thus, for combining the two methods and to adopt their own advantage, we use the local band-limited contrast conception.

After we know about the two methods just talk about , it’s easy to understand the local band limited contrast.

At first , we need to obtain a band-limited version of the image in the frequency domain A(u,v), This can be done by using a radically symmetric band-pass filter G(r).

And then, we need to transform this equation to the space domain, by doing this, we need to do inverse Fourier transformation of G(r), and we could get that function.

The contrast definition here, we define like this.