

# Band-Rejection-Filter Effect Using Removed Spectral Boundary

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**Abstract.** In this paper, band-rejection-filter (BRF) is studied which diminishes intensity in certain stopped region, and delivers both of high and low frequency band. The effect of removed spectral boundary is evaluated in the sense of subjective performance. The experimental results informs that the effect of removed frequency band.

**Keywords:** band-rejection-filter, image processing, frequency domain, spectral boundary.

## 1 Introduction

In image processing, a band-rejection-filter (BRF, or band-stop-filter) is a filter that transparent most frequencies area without any changes, and reduces power in a specific range to quite low levels [1-3]. This is an opposite concept of band-pass-filter which transparent only certain frequency area. A notch filter is a good example of BRF which a narrow rejection band.

In this research, we study the affect between removed spectra range and the image performance [4-28]. The article is organized as follows. In Section 2, Fourier transform is explained. The experimental results are explained Section 3. We present our conclusions in Section 4.

## 2 Fourier Transform

Let us assume an image with size  $M \times M$ , then 2D DFT is described by:

$$F(u, v) = \sum_{x=0}^{M-1} \sum_{y=0}^{M-1} f(x, y) e^{-j2\pi \left( \frac{ux}{M} + \frac{vy}{M} \right)}, \quad (1)$$

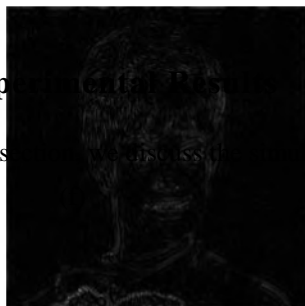
where  $f(x,y)$  is an image in the spatial domain. The inverse Fourier transform is described as Eq. (2).

$$\sum_x \sum_y$$

$$1 \sum_{x=0}^{M-1} \sum_{y=0}^{M-1} F(u, v) e^{i2\pi \left( \frac{ux}{M} + \frac{vy}{M} \right)} \quad (2)$$

### 3 Experiment

In this section, we present the experimental results.



(a)



(b)



(c)



(d)



(e)



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**Fig. 1.** (a) Band-pass-filtered image of Zelda image with excluded spectra range=0, (b) excluded spectra range=25, (c) excluded spectra range=50, (d) excluded spectra range=75, (e) excluded spectra range=100, (f) excluded spectra range=125, (g) excluded spectra range=150, (h) excluded spectra range=175, (i) excluded spectra range=200, (j) excluded spectra range=225, and (k) excluded spectra range=250.

## 4 Conclusions

In this study, we researched the influence of band-rejection-filter. The band-rejection-filter weakens frequency areas, and only certain frequency ranges can pass. Experimental results section informs that the band-rejection-filter can reject or pass certain frequency reasons.

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