

# A Frequency Domain Scrambling Using Different Sized Empty Block

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**Abstract.** The pay-per-view (PPV) service is a promising industry. In this paper, we study how to protect contents from pirates. The presented method is based on the spectrum domain. The experimental results show that the presented algorithm is effective for scrambling contents in spectrum domain.

**Keywords:** scrambling, block size, spectrum domain, ppv.

## 1 Introduction

The data security is important for commerce on the in TV or internet [1-5]. In this article, we study a novel spectrum domain scrambling algorithm, where image data are effectively scrambled in the spectrum domain by arbitrarily selected empty blocks [627]. The performance is examined by varying the block size. Section 2 discusses Fourier transform preliminaries. Section 3 discusses different simulation results. Finally, we give our conclusion remarks in Section 4

## 2 Transform Preliminaries

The Fourier transform is defined as Eq. (1),

$$F(b) = \int_{-\infty}^{\infty} f(a) e^{-jba} da \quad (1)$$

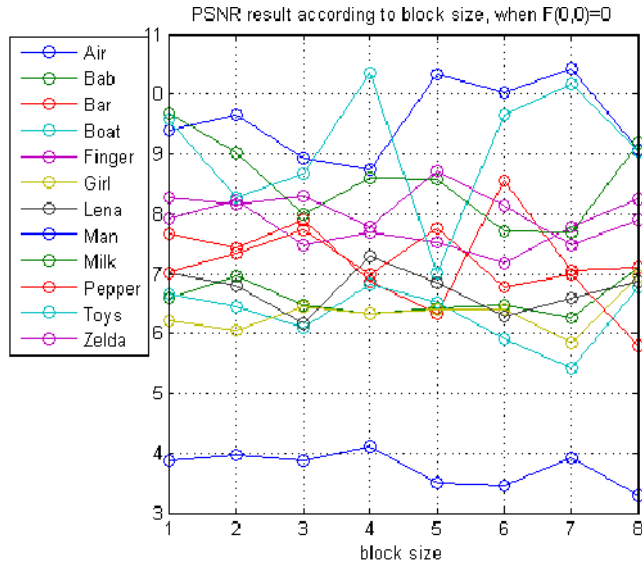
This is generally known as the forward Fourier transform. On the other hand, Eq. (2) is inverse Fourier transform.

$$f(a) = \int_{-\infty}^{\infty} F(b) e^{jba} db \quad (2)$$

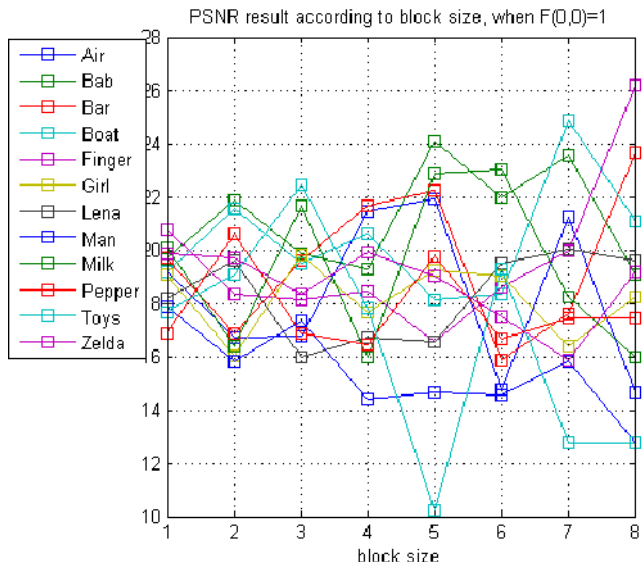
This definition can be stated in another way using Euler's formula which is Eq. (3). 219

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$$e_{j0} = \begin{matrix} 0 \\ \cos \end{matrix} \quad \begin{matrix} j + 0 \\ \sin \end{matrix} . \quad (3)$$



(a)



(a)

**Fig. 1.** PSNR results comparison according to block size,  $1 \leq \log_2(BS) \leq 8$ . (a)  $F(0,0)=0$  and (b)  $F(0,0)=1$ .

### 3 Block Size and Its Performance for Scrambling

We consider the block size (BS) is  $BS=\{2,4,8,16,32,64,128, 258\}$ . The intensity values of each block are either 0 or 1 depends on Eq. (6). The Matlab command ‘*rand()*’ returned any values between 0 and 1, thus after applying ‘*round()*’ command we obtain 0 or 1 values.

$$\text{round}[\text{rand}()] \tag{4}$$

The scrambled spectral domain is calculated as Eq. (5).

$$[ \quad ] \tag{5}$$

### 4 Performance Studies of Scrambled Results

Figure 1 shows the PSNR results comparison according to block size,  $1 \leq \log_2(BS) \leq 8$ .

### 5 Conclusions

Data security is a crucial issue for protecting knowledge from hackers. In this paper, frequency domain based scrambling method was presented. The experimental results inform that the proposed method is efficient for scrambling contents.

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