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AN IMPROVED LOSSLESS HIDING TECHNIQUE USING INTEGER TRANSFORM FUNCTION

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Abstract. *This paper proposes an efficient reversible information hiding scheme to improve Alattar et al.'s integer transform function hiding scheme, which needs a location map to recover the original image. The proposed scheme uses four pixels in the nearby area to embed three message bits. The differences between neighboring pixels are expended to conceal the secret bits.*

Keywords: Lossless information hiding, Reversible data embedding, Location map, Secret message

1. **Introduction.** As the growth of digital technology and Internet development, the world has entered the digital era. The convenience of Internet promotes the transmission of digital information. That is, all messages can be transmitted to all over the world rapidly through the digital form. However, due to the enhancement of Internet, it also brings a lot of new issues about security. For example, the information theft and tampering, the intellectual property right violation and so on. Therefore, the information security gets people's attention day by day. How to ensure the safety of the transmission for digital information has become a critical topic in the digital era. In the field of information security, except data encryption, information hiding is another safe information transmission technique for protecting the digital information. As information hiding will cause distortion in stego-image, the scholar proposed the lossless information hiding schemes [2, 6, 7, 8, 9, 10, 11, 13] to improve this problem. Thses schemes are also known as reversible data embedding schemes and they are often used in the military and medical imaging fields [5].

Alattar proposed a reversible information hiding scheme in 2004 [1]. However, his scheme needs extra record information to restore the image such that it causes the inconvenience of transmission. To improve Alattar's scheme, this paper shall propose a reversible hiding scheme by using the differential expansion between the pixels. The required extra information is less than what required by Alattar's method.

2. **Related Works.** Tian proposed a reversible hiding scheme in 2003 [12]. This method is to embed one secret message bit in the difference between two neighboring pixels. Assume that two neighboring pixels are A=42 and B=32 and the embedded secret message bit is W=1. First, Tian's scheme computes the difference d between two pixels and the average value by d=A-B=42-32=10 and l=$\lfloor\frac{A+B}{2}\rfloor$=$\lfloor\frac{42+32}{2}\rfloor$=37, respectively. Then, it expands the difference up to two times and further embeds W to get d', where d' = $2\times d+W$=$2\times$10+1=21. At last, the stego pixels are calculated by A'=$l+\lfloor\frac{d'+1}{2}\rfloor$=37+$\lfloor\frac{21+1}{2}\rfloor$ =48 and B'=l-$\lfloor\frac{d'}{2}\rfloor$=37-$\lfloor\frac{21}{2}\rfloor$=27. In the extracting and restoring process, the receiver