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HIDING INFORMATION IN BINARY IMAGES WITH COMPLETE REVERSIBILITY AND HIGH EMBEDDING CAPACITY

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Abstract. *A new binary image data-hiding scheme featuring reversible operations, low distortion rate and high data-hiding capacity is proposed. The proposed scheme works on an enlarged cover image obtained by interpolation. A fine-grained pixel block of size 2×2 was chosen as the basic data-embedding unit to enhance its information capacity. Data-hiding starts with the conversion of secret information into a string of septenary values, each of which maps to a symbol corresponding to a specific bit pattern. A variable-length coding technique is applied to minimize the string length. The basic data mechanism is to replace the bit pattern of a pixel block with that of a symbol. Instead of a one-to-one mapping, two complementary patterns are associated with a symbol, and whichever pattern induces fewer pixel changes is used. To minimize visual distortion, a symbol-remapping procedure called maximum pair matching (MPM) and an iterative pixel-block selection procedure were also developed. Both reversible and non-reversible data-hiding schemes were included in the experimental comparisons. Simulation results show that the proposed scheme outperforms other schemes significantly in terms of distortion rate and information-hiding capacity.*

Keywords: Reversible data-hiding, Steganography, Binary images, Authentication

1. **Introduction.** With the fast growth in the quantity of information available, information-processing techniques that secure the information along the communication network [1-5] and support a flexible information system [6,7] are essential. In networking security, which is a critical issue in information security, cryptography and steganography are the two most important networking security technologies for data transmission over the Internet. Cryptography transforms meaningful content into seemingly random data by using symmetric (such as RSA [11,12]) or asymmetric (such as DES [13]) encryption systems, while steganography conceals secret content into multimedia such as text, image, voice and video files [8]. Steganogrophy can be combined with cryptography to achieve an even higher level of security. For example, as illustrated in Figure 1, many steganographic schemes adopt a random number generator initialized with a seed value to determine the