IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

SIGNIFICANCE OF LEAST SIGNIFICANT BITS IN DIGITAL IMAGE PROCESSING

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Abstract: Digital image processing is one of the vital areas in today's era. It has numerous applications in various sectors. Bit slicing is important concept in digital image processing. In most of the literature importance has been given to most significant bit (MSB) because it contains more information. This paper presents importance of least significant bit (LSB) in various applications.

Keywords: **- least significant bit, LSB, bit slice**

INTRODUCTION

The field of digital image processing in computer science and applications is one that is currently seeing growth. There are many applications for digital image processing across many fields. One of the key advantages of digital image processing is the ability to enhance image quality. Digital photos can be sharpened, brightened, or colour-corrected using algorithms to produce clearer, more visually appealing images.

Digital image processing is also used in the realm of medicine to improve the accuracy of diagnosis. For example, it is possible to analyse medical images like X-rays and MRIs to emphasize certain areas of interest or to discern between healthy and diseased tissues. Digital image processing tools can process images considerably more quickly than humans can. This might help save time and money in industries like manufacturing where inspection and quality control procedures are crucial.

Other applications for digital image processing systems include security and surveillance. For example, facial recognition algorithms can be used to identify people or detect suspect activity in public places. Last but not least, graphic design, virtual reality, and video editing are examples of creative applications for digital image processing. By editing digital pictures, artists and designers can create novel and distinctive visual experiences.

Bit slicing is an important concept in digital image processing. Most of the literature has emphasized the MSB because it contains more information. This paper presents the importance of the least significant bit LSB in different applications.

REVIEW OF LITERATURE

The lowest significant bit in a pixel's byte value is known as the LSB. The cover image's (CVR) least significant bits are where the LSB dependent picture steganography hides the secret information [1]. An adaptive least significant bit spatial domain entrenching approach is shown in [2]. By dividing the image's pixel ranges (0–255), this method creates a stego-key. This reserved stego-key has five distinct gray level picture ranges, each of which defines a permanent number of bits to enshrine in an image's least significant bits. The integrity of the secret information in the stego-image and the amazing hidden capabilities are what give the suggested technique its potency. The disadvantage is that extra signature components with concealed messages must be hidden.

An adaptive LSB substitution dependent data concealing approach for an image was suggested by Yang et al. in [3]. It takes into account noise-sensitive region for entrenching in order to get higher visual excellence of stego-image. For entrenchment, the projected technique distinguishes between and benefits from natural texture and edge regions. This method calculates the number of k-bit LSB for entrenching secret data by looking at the cover image's edges, brightness, and texture masking. The value of k is high in non-sensitive image regions and remains low over sensitive image regions to stabilize the overall visual superiority of an image. The high order bits of a picture are used to determine the LSB's (k) for entrenching. Additionally, it makes use of the pixel adjustment technique to enhance the excellence of the stego-image.

In [4], the authors proposed an LSB-dependent image hiding technique. Reciprocal pattern bits mean that the brace key is used to hide data. The LSBs of the pixel are shifted based on the pattern bits of the brace key and the secret message bits. The pattern bits are simply a mixture of MxN rows, columns of the block, and a random value of the key. In the softening process, each pattern bit is aligned with the message bit, during softening, the 2nd LSB bit of the cover image is checked, and otherwise it remains unchanged. The purpose of such a method is to secure the hidden message of the brace image with a shared pattern key. This preferred technique has low hiding power because one secret bit requires a block of MxN pixels.

In 2013, Akhtar, N., Johri, P., Khan, S. [5] implemented a variant of the standard LSB algorithm. The quality of the brace image was increased by the bit inversion method. The LSB technique enriched the peak signal-to-noise ratio (PSNR) of the brace image. By keeping the bit patterns where the LSBs are reversed, the image is conveniently found. To strengthen steganography, the RC4 algorithm was implemented to achieve randomization by hiding the message image pieces as cover image pixels, except that they are stored chronologically. Such a technique arbitrarily scatters the message fragments in the cover image and thus makes it difficult for unauthorized parties to mine the original message. This technique also shows a decent

improvement over the LSB method in terms of security and image quality. In [6], the advanced least significant bit technique information is stored within the image, but only in the blue element of each pixel to reduce image distortion, although the information is stored within the image, therefore noise-free. of the amplified LSB is small compared to the simple LSB. Initially, the data is converted into encrypted data using cryptography. In the key of the encryption process, the plain text message is converted into a set of ascii characters. A text message will then be added telling you the length of the key. Next, the encrypted data is hidden within the image using pixel processing. In [7], steganography is a hash-dependent Least Significant Bit (H-LSB) method, where the location of the LSB to hide text messages is defined depending on the hash function. The hash function finds the location of the least significant bit in each RGB pixel. Next, the hash-LSB method uses the values provided by the hash function to hide the data.

Arnold Gabriel Benedict et al. to [8, 9] "An Advanced File Security System Using Multi-Image Steganography" presented a slicing technique where secret information is sliced and stored in multiple cover images. The least significant bit of all the pixel values of the selected cover image is used to hide the information. Such a method is known as the LSB-dependent steganography method. The payload, which is a group of files hidden inside a wrapper file, is compressed using a ZIP compression process. The image hashing algorithm ensures a random distribution of bits of the compressed payload; it has a great delay in analysing the slice pattern, making it more difficult for Stalker to decipher the pattern. The camouflage ability of the cover image or ability to hide secret information is detectable. Decoding is done in the same way as encoding.

Shaikh Akbar et al. to in [10] "Bit-Plane Slicing Algorithm for Crime Data Security using Fusion Technologies" proposed a unified steganography and forensics system that provides a hybrid expertise to protect crime data. This method presupposes the way fingerprints are taken from the criminal. Collected fingerprints are divided into 8 slices using a bit-level slice system; authorized criminal information is stored in any of the 8 slices. The main purpose of the proposed method is to protect the criminals' information within their fingerprints.

Kumar et al. to in [11] "Image encryption using a genetic algorithm and bit-cut rotation", presents a clever image encoding process combined with genetic algorithm, bit rotation, bit cropping of digital image. The image is divided into 8 layers and each layer is well translated to obtain a fully encoded image after applying a genetic algorithm to each image pixel. This makes it less sensitive to matches. For decryption, the process is carried out in reverse order. Structural similarity index (SSIM) is used to calculate the correspondence between two images [12]. The result shows that the proposed system provides strong encryption and enriched security level.

CONCLUSION

Digital image processing is one of the most important fields today. It has many applications in various fields such computer vision, pattern recognition, remote sensing, medical, agriculture etc. Bit slicing is an important concept in digital image processing. Most of the literature has emphasized the most significant bit (MSB) because it contains more information. This paper presented the importance of the least significant bit (LSB) in various applications.

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