ISSN: 2321-2152

IJMECE

International Journal of modern electronics and communication engineering

E-Mail
editor.ijmece@gmail.com
editor@ijmece.com

www.ijmece.com

ISSN2321-2152
www.ijmece .com
Vol 12 Issue.1Jan 2024

Data Hiding Scheme using Prediction Tunning Model

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ABSTRACT

Data hiding strategies in photographs have become more common as data security and information hiding gain importance. The efficiency of sensitive data protection is reduced by the errors caused by imprecise prediction model findings and the room for improvement in embedding capacity that exists in current reversible data hiding strategies. We suggest a bit shifting algorithm in this project. General optimization techniques are used to fine-tune the settings for the best outcomes, and standard test photos are used to verify our findings. Additionally, by enhancing data concealing in terms of characteristics like embedding capacity (embedding rate), errors from incorrect predictions can be eliminated while maintaining the visual quality of the images.

Keywords: encryption, decryption, data hiding, features extraction.

1. Introduction

These days, cell phones are an essential component of life. A power source is a necessary component of every electronic system. Mobile phones are used for the majority of tasks on a regular basis, so charging them is a necessary necessity. Thus, the primary concept under consideration is the creation of a system that will enable charging upon coin insertion. What matters is that the aforementioned system will always be usable and accessible in public areas. Since electricity is a constant source of power, we shall use it. The user must place a coin in the coin acceptor and connect the appropriate adaptor to the phone. The amount of charging will be pre-defined values as mentioned in the microcontroller. This system is easy to install and useful for the long distance travelling peoples. The mobile phone market is a vast industry, and has spread into rural areas as an essential means of communication. While the urban populations use more sophisticated mobiles with good power batteries lasting for several days, the rural

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populations buy the pre-owned mobile phones that require charging frequently. Many times battery becomes flat in the middle of conversation particularly at inconvenient times when access to a standard charger isn't possible. The coin-based mobile battery chargers are designed to solve this problem. The user has to plug the mobile phone into one of the adapters and insert a coin; the phone will then be given a micro pulse for charging. It does not bring a mobile from 'dead' to fully charged state. The charging capacity of the mobile is designed with the help of pre-defined values. It is of course, possible to continue charging the mobile by inserting more coins. This compact and lightweight product is designed to cater for the growing number of rural mobile users worldwide. A suitable microcontroller is programmed for all the controlling applications. The source for charging is obtained from direct power grid.

2. Literature Survey

There are many conventional information hiding methods, including Least Significant Bit (LSB) insertion, Histogram Shifting (HS) and Difference Expansion (DE), to name a few. These techniques are studied extensively and many of their variants are proposed [1, 2, 3] to achieve a balance trade-off among embedding capacity, image quality, robustness against attacks, etc. However, these techniques are not widely adopted into the usual operations performed by the users, and often they are implemented as an additional step after the image is processed. In most cases, the user has to explicitly install or develop the data embedding algorithm to enable data embedding into the image of interest. Therefore, in this paper, we design an information hiding method as part of the image enhancement process. In other words, data can be inserted into the image while executing the image enhancement steps. As a proof of concept, the proposed method is demonstrated by using the Median Filter.

High capacity RDH scheme uses a prediction method to predict the cover data and embeds the data by modifying the prediction errors[1].The proposed scheme achieves a high embedding capacity while maintain good visual quality of cover data[2].The prediction tuning model can be effective for high capacity reversible data hiding[3].The proposed scheme achieve high embedding capacity while preserving the quality of the host signal , making them suitable for a wide range applications[4].

3. Efficient Reversible Data Hiding Based on Multiple Histograms Modification:

Reversible data hiding (RDH) aims to embed secret message into a cover image by slightly modifying its pixels, and more importantly, the original image as well as the embedded message should be completely restored from the marked image. In the last decade, RDH has received much attention from the information hiding community and this technique has also been applied in some applications, such as image authentication, medical image processing multimedia archive management, image trans-coding, and data coloring in the cloud, etc. In general, RDH is a fragile technique and the marked image cannot undergo any degradation. In this light, a RDH method is usually evaluated by its capacity-distortion performance, i.e., for a given embedding capacity (EC), one expects to minimize the embedding distortion measured by PSNR of the marked image versus the original one. Early RDH methods are mainly based on lossless compression. The idea behind these methods is to losslessly compress a feature set of cover image and utilize the saved space for reversible embedding. In Fridrich et al. proposed to compress a proper bit-plane with the minimum redundancy.

In, Celik et al. proposed a generalized least significant bit (LSB) compression method to improve the compression efficiency by using unaltered bit-planes as side information. However, the lossless compression-based methods cannot yield satisfactory performance, since the correlation within a bit-plane is too weak to provide a high EC. As EC increases, one needs to compress more bit-planes, thus the distortion increases dramatically.

Later on, more efficient RDH methods based on histogram modification and expansion technique have been devised. The histogram-modification-based method is firstly proposed by Ni et al. This method focuses on high visual quality with quite limited EC, in which the peak point of image histogram is utilized for data embedding. In this method, each pixel value is modified at most by 1, and thus the marked image quality is well guaranteed. Ni et al.'s method is improved by Lee et al. by using the histogram of difference image. The spatial correlation of natural images is exploited in by considering the difference of adjacent pixels. Thus, a regular-shaped histogram is utilized in Lee et al.'s method. This histogram is centered at origin and has rapid two-sided decay which is more suitable for RDH. The expansion technique is firstly proposed by Tian .

This method is performed on pixel pairs, and one data bit is embedded into each selected pixel pair by expanding its difference. Compared with the lossless-compression based RDH, Tian's difference expansion (DE) based method can provide a higher EC with an improved PSNR. The DE approach has attracted considerable attention and it makes an important progress in RDH. Afterwards, the expansion technique has been widely investigated and developed, mainly in the aspects of integer-to-integer such as image authentication, medical image processing, multimedia archive management, image trans-coding [9], and data coloring in the cloud, etc. In general, RDH is a fragile technique and the marked image cannot undergo any degradation. In this light, a RDH method is usually evaluated by its capacity-distortion performance, i.e., for a given embedding capacity (EC), one expects to minimize the embedding distortion measured by PSNR of the marked image versus the original one.

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Nowadays, the most effective and extensively exploited RDH technique is the PEE technique which is firstly proposed by Thodi and Rodriguez. Instead of the difference value in DE, the prediction-error is utilized in PEE for expansion embedding. Thus, unlike DE where only the correlation of two adjacent pixels is considered, the local correlation of a larger neighborhood is exploited in PEE. As a result, compared with DE, better performance can be derived by PEE.

Following Thodi and Rodriguez's work, many RDH techniques related to PEE have been proposed in recent years, for example, double-layered embedding adaptive embedding, context modification, optimal expansion bins selection and two-dimensional histogram modification etc. On the other hand, some PEE-based method exploit advanced prediction techniques to generate a more sharply distributed prediction-error histogram (PEH), and this is also helpful for enhancing the embedding performance. Notice that, most previous PEE-based methods are based on one- or two-dimensional PEH modification.

4. Methodology

In this project, we propose a Bit shifting Algorithm is a common operation used in high capacity reversible data hiding scheme. In this the cover image is divided into blocks, and the least significant bits (LSBs) of each block are replaced with the secret data .To reduce the distortion caused by the embedding, the LSBs of the cover image are shifted to the right before embedding the secret data, and then shifted back to their original positions after embedding. This is done using bit shifting operations, such as left and right shifts.

The use of bit shifting allows for the insertion of a large amount of secret data into the cover image without significantly affecting its visual quality. Moreover, since the bit shifting operation is reversible, the original cover image can be easily reconstructed after the secret data is extracted .Overall, bit shifting is a useful algorithm in high capacity reversible data hiding schemes as it allows for efficient and effective embedding of secret data into cover images while maintaining their quality and reversibility.

Phase 1:

Select on cover image for data embedding cover
image should be a color image containing red, green and
blue pixels.

Phase 2: In the second phase apply modified least
significant bits

Decompose the cover image into different bands i.e.
LL,LH,HH,HL

Convert into integer value using threshold

ISSN2321-2152
www.ijmece .com
Vol 12 Issue.1Jan 2024

Embed the secret message in the middle using modified

MLSB

Obtain encoded-image.

Phase 3:

In this phase the encoded image is taken to extract original image.

Resize

Apply inverse Bit shifting algorithm

The output obtained is orginal image.

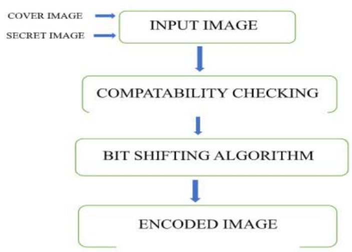

Fig 1: Encoding

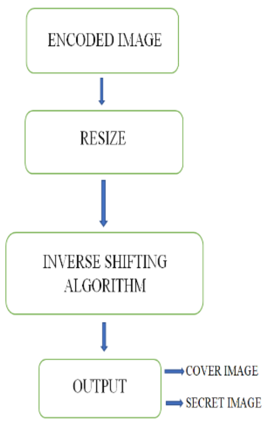

Fig 2: Decoding

5. Simulation Results

This section explains the simulation result .

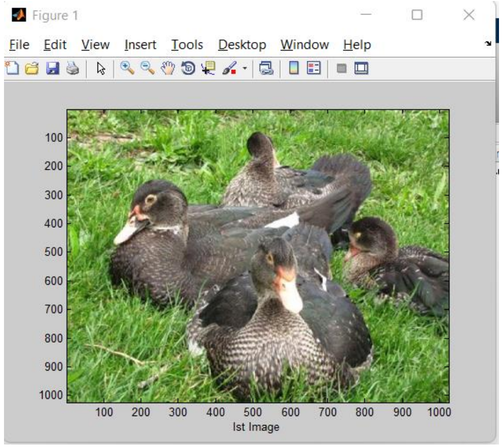

Fig 3: Cover image

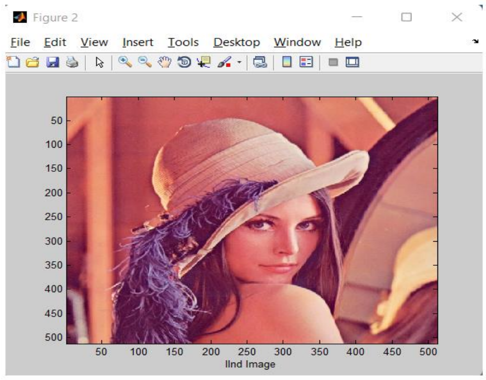

Fig 4: Secret image

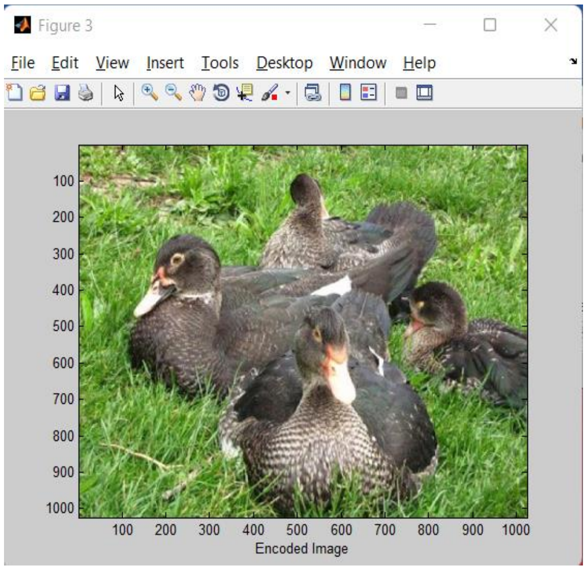

Fig 5: Encoded image

IJMECE International Journal of modern electronics and communication engineering
ISSN2321-2152
www.ijmece .com
Vol 12 Issue.1Jan 2024

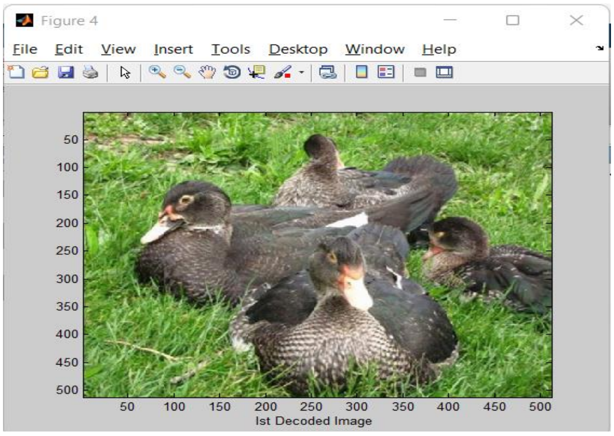

Fig 6: Decoded Cover image

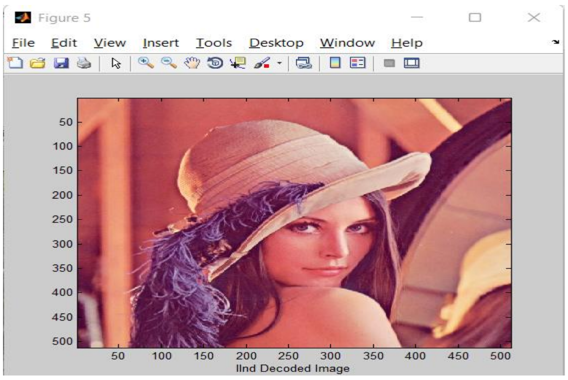

Fig 7: Final secret image

6. Conclusion

Through this study, we introduced an efficient lossless data hiding scheme which makes use of error map and tuned linear regression models to achieve reversibility and data hiding in images. We also addressed the problems with the existing techniques and provided the analysis and comparison of the proposed method with the previous methods in terms of embedding rate in table V. The accuracy of the model for each of the bit planes for different images as well as the dataset has been depicted in table I-IV which shows the prediction errors and size of the error map has significantly reduced through our technique. It is observed that auxiliary information often decreases the embedding capacity in data hiding schemes. Therefore, we have used Huffman Coding, which is a lossless compression technique for compressing the size of error map so that the capacity increases for hiding secret data. For best results through our model, we have tuned the parameter β and regularity threshold using Particle Swarm Optimization (PSO) technique. Hence, we can conclude that this paper significantly increases the embedding capacity and provides more accurate results when compared to existing techniques maintaining the visual quality through keeping the low distortion of the images. In future, we will aim to work on better complexity of the algorithm and computational time of the process.

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