Using Cucumber Plants Leaves A Cover To Hiding Encryption Text

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Abstract. The article presented a way to increase the efficiency of hiding information by relying on the leaves of the cucumber plant and using it as a cover to hide the information after applying a set of digital image processing techniques to this image. As for the text to be hidden, the text is initially encrypted based on an innovative cryptographic algorithm, three criteria were used to measure The efficiency of the algorithm is psnr, mse, rmse.

Keywords. information hiding, image processing, steganography.

1. Introduction
Hiding information is an artistic method, science, or practice in which you try to hide important and confidential information, pictures, or files within pictures or other files [1-2]. Recent experiments have shown that data can be hidden using various methods within different types of digital files. The main task or goal of hiding information is that the payload data does not reach the investigators who get the computer data checked. Only the person who sends the hidden data and the target authorized to receive the data; But for anyone else, for the data to be safe, the object that contains the hidden data should just appear as a regular daily object. It is the reference referred to in information hiding techniques [3].

One of the areas of research in information security that has been around for several years is data encryption and caching. However, although both technologies aim to protect confidential data, they possess different concepts. The encryption includes the mechanism of protecting the communication by encrypting the data before sending it or sharing it without hiding the existence of the connection, that is, the third party (the hackers or the unauthorized party) can see the encrypted data during its transfer to the destination, which may lead to suspicion and interception and as a result try to decipher the access to the data. In contrast to the encryption process above, information hiding is the process of hiding information in the codes that make up digital files (the unauthorized party cannot be in any condition) such as voice, text, image, or video while preventing unwanted sources from detecting the existence of the connection. That is, the data transmission remains confidential between the parties connected to it. This ensures that data protection is well preserved and is essential in any type of communication.

The information hiding system consists of three main parts: the sender, the communication channel, and the recipient. The transmitter is the first part that transmits confidential data and the recipient is the third part to which the data is intended while the channel helps in transmitting data. In hiding information
from digital images, confidential data can be hidden in the appropriate cover image. Which can be transferred directly over an insecure public network, we see the output is the Stego image (Image containing hidden data) as shown in Figure (1).

In security systems, information hiding is a broad system that includes a wide range of many areas of research. The word "hiding" refers to the protection of confidential information through an unknown communication [4].

In addition, due to the large percentage of repetition encountered in the digital image in the event of the digital image receding and insufficient pixels in the image to cover the data to be hidden, many ways to hide information that actually hide the data in digital images have been presented in [5]. A method has been suggested in which pixels are randomly chosen to hide confidential data randomly [6], as well as to process an image that contains stego information. Using Mysterious Hybrid Neural Networks [7] implemented an adaptive method.

An adaptive method was implemented that includes data in the cover image's interest areas. introduced a recent model intended to work mixing information hiding in cybersecurity [8]. The visual quality of stego image has also been improved in the layout that uses a new technology that works on 2-bit mirroring and optimized pixel tuning [9]. To hide the secret data in the image, the cover image has been divided into parts and the data that will be hidden has been divided into slides. Multiple Their technology has greatly improved cognition as data has been hidden in blocks with less impact on the visual quality of the stego image [9].

In further research, we must determine the inclusion positions based on the smooth areas and the edge before hiding the data [10]. To maintain data security, confidential sharing and information hiding
were applied to apply the approach used to include data in images [9]. Done A method of constructing a blind information hiding in the image through the use of discrete wavelet transformation (DCT) proposed by [12]. Being blind means that the original cover image is not required to extract the hidden data which makes the data transfer undetectable by any unauthorized parties.

2. Related Work

The researcher suggested (1) a modern way in which the process of including the texts that will be hidden depending on the HUE layer that is created by converting the color system of the digital image (RGB) to the HSV system is selected, then specific areas are identified in this layer that are used to hide these texts. After converting these texts to a binary system, the researcher finally returns the image to the original color scheme (RGB).

As for the researcher (2) he proposed a method in which he relied on using the least important bit which is the most common in the process of concealing information in addition to increasing the complexity procedures by choosing pixels in which the confidentiality is included in the data depending on an important feature in the digital image which is the degree of contrast Colors for the digital image. This is where one of the three RGB layers of the digital photo is chosen.

Researcher (3) The researchers presented a comparative study of the effect of the color system of the digital image on the data embedding process, by embedding the data using two methods that result in concealing the data in the digital image.

The first method is to include the data based on the eighth bit, while the second is to include the data using the seventh bit. Then, the researcher conducted a comparative study on eight color systems.

As for the researcher (4), he presented a method to include the data based on the digital image after converting it to the frequency domain using contour transformations, after which the researcher works to include the data in the digital image. Other researchers in this field have introduced advanced technologies that rely on some techniques of artificial intelligence systems to increase the efficiency of the inclusion process (15-18).

3. Measurement Criteria

There are several criteria that can be adopted in the process of including data, which generally measure the impact of the inclusion process on the cover used from these standards that have been used [19].

\[
\text{PSNR} = 10 \times \log_{10} \left( \frac{255^2}{\text{MSE}} \right)
\]

\[
\text{MSE} = \frac{1}{R \times C} \sum_{a=1}^{R} \sum_{b=1}^{C} (O_{image}(a,b) - S_{image}(a,b))^2
\]

\[
\text{RMSE} = \sqrt{\frac{1}{R \times C} \sum_{a=1}^{R} \sum_{b=1}^{C} (O_{image}(a,b) - S_{image}(a,b))^2}
\]

4. Suggest Algorithm

The dependence on the image of the leaves of the sick cucumber plant is because the image is of high contrast in it because it has a difference in color. Also, messaging with this image does not bring doubt, because the most common belief is to use it for diagnosis the figure(2) below show suggest algorithm.
In this article using suggest method to encryption text the following show the equation:

\[ C(T) = P(T) + \text{mean (y layer)} \mod 26 \]

- \( C(T) \): encryption text
- \( P(T) \): plain Text

The extraction of text from stego – image using the following steps figure (3).

5. Result
The algorithm was applied to a set of images and used text with different lengths and the results were as shown in Figures (4-7)
Figure 4. applied algorithm on different image
Figure 5. PSNR Measurement

Figure 6. MSE Measurement

Figure 7. RMSE Measurement
6. Conclusions
One of the most important multimedia that can be used as a cover in the process of including data is the
digital image, which contains a large color contrast in the image pixels and for this, we have adopted in
our article selection the digital images for a diseased plant leaves that achieve high color contrast in
pixels for this type of digital image for different areas in the image. This enables us to include or hide
data with high accuracy and efficiency in this type of image. And it achieves the goal, which is difficult
to identify or access to data if there is any manipulation of the image that contains the important data.
The diagrams above show that there is a direct relationship between the size of the text that needs to be
hidden with the effect on the cover image, where the more data volume required Hiding them had a
greater impact on the cover, and through the results, it also turns out that reliance on these images gave
good results in the process use of including data.

References
[1] Ahmed S. Abdullah. "Text Hiding Based On Hue Content In Hsv Color Space ", International
Journal Of Emerging Trends & Technology In Computer Science (Ijettcs), Volume 4, Issue 2,
March-April 2015.
[2] Ahmed Saadi Abdullah. "Improving Message Embedding by using some Attributes of Color
Image", Raf. J. of Comp. & Math's., Vol. 13, No.2, 2019
[3] C. Thien and J.-C. Lin, “A Simplicity Method for Hiding Digit-by-Digit Data in Images Based
on Modulus Function,” Pattern Recognition, Vol. 36, No. 12, 2003, pp. 2875-2881.
doi:10.1016/S0031-3203(03)00221-8
[4] P. Khandelwal, N. Bisht, V. Thanikaiselvan "Randomly hiding secret data using dynamic
programming for image steganography" EEE International Conference on Computing and
Network Communications (CoCoNet’15) (2015), pp. 777-783 CrossRefView Record in
ScopusGoogle Scholar
[5] M.S. Subhedar, V.H. Mankar,"Current status and key issues in image steganography: a survey"
,Comput. Sci. Rev., 13–14 (2) (2014), pp. 95-113 ArticleDownload PDFView Record in
ScopusGoogle Scholar
[6] A. Saleena, T. Amarunnishad ,"A new steganography algorithm using hybrid fuzzy neural
networks ",International Conference on Emerging Trends in Engineering, Science and
Technology (ICETEST-2015) (2016), pp. 1566-1574
[7] ArticleDownload PDFView Record in ScopusGoogle Scholar A. Cheddad, J. Condell, K. Curran,
P.M. Kevitt "Enhancing steganography in digital images" Canadian Conference on Computer
and Robot Vision (2008), pp. 326-332 CrossRefView Record in ScopusGoogle Scholar
Cheddad et al., 2010
[8] D. Han, J. Yang, W. Summers "Inject stenography into cybersecurity education"2017 31st
International Conference on Advanced Information Networking and Applications Workshops
Inject (2017), pp. 50-55 CrossRefView Record in ScopusGoogle Scholar
[9] S. Kaur, N. Goel ,"Segmentation and block based image steganography using optimal pixel
adjustment process and identical approach",Proc. 2015 RAECIS VIET Panjib Univ.
Chandigarh 21-22nd December 2015 Segmentation (December 2015), pp. 1-5 View Record
in ScopusGoogle Scholar
[10] Q. Li, X. Liao, G. Chen, L. Ding,"A novel game-theoretic model for content-adaptive image
steganography"2017 IEEE 37th Int. Conf. Distrib. Comput. Syst. Work. A (2017), pp. 232-237
View Record in ScopusGoogle Scholar
[11] M. Rajput, M. Deshmukh, N. Nain,"A novel approach for concealing image by utilizing the
concept of secret sharing scheme and steganography",2016 International Conference on
Information Technology A (2016), pp. 51-56 CrossRefView Record in ScopusGoogle Scholar
[12] Bugár, G., Bánoci, V., Broda, M., Levický, D., Dupák, D., 2014. “Data hiding in still images
based on blind algorithm of steganography 2”, pp. 8–11 Google ScholarCalifornia UUo, 2017
[13] Qasim Mohammed Hussein, Ahmed Saadi Abdullah, Nada Qasim Mohammed," The Efficiency
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of Color Models Layers At Color Images As Cover In Text Hiding", Tikrit Journal Of Pure Science, Vol. 21, No. 1, Pp. 130–139, 2016.

[14] Khalil Ibrahim Alsaif , Meaad M. Salih , " Contourlet Transformation For Text Hiding In Hsv Color Image " , International Journal Of Computer Networks And Communications Security , Vol. 1, No. 4 , September 2013.

[15] Hazim Noman Abed, Noor Hasan Hassoon, Ahmed Luay Ahmed, Ismael Salih Albayaty “Hiding Information in an Image Based on Bats Algorithm”, Iraqi Journal of Information Technology, volume 8 , issue 2 , 2018.

[16] Zainb Bakar Dahoos,” Hide Encoded Text Within the Image by Using the Third Least Significant Bit”, Journal of University of Thi-Qar Vol.9 No.4 Dec. 2014.

[17] Kartik Sharma, Ashutosh Aggarwal, Tanay Singhania, Deepak Gupta, Ashish Khanna,” Hiding Data in Images Using Cryptography and Deep Neural Network”, Journal of Artificial Intelligence and Systems, 2019

[18] Omar Younis Abdulhameed. “Hiding A Secret Watermark In Image Using Intelligent Water Drops Algorithm,” Diyala Journal For Pure Science, volume 13, issue 2, 2017.

[19] Khalil Ibraheem Al-Saif and ahmed s. Abdullah,” Color Image Enhancement Based on Contourlet Transform Coefficients “Australian Journal of Basic and Applied Sciences, 2013.

[20] Saadaldeen Rashid Ahmed1, Ahmed S. Abdullah2, Nayif Mohammed Hammash3,” Universal Filtered Multicarrier (UFMC) vs. Orthogonal Frequency Division Multiplexing (OFDM)”, Journal of Physics: Conference Series,2020.