Picture Steganography Is the Science of Data Protection

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ABSTRACT

In this survey paper discuss the distinctive information concealing strategies in image encryption and decryption. Many times it is needed not only to convert data into unreadable form but also to hide its existence. For this purpose one use steganography. Steganography is a part of information safety. The main purpose of steganography is, concealing the presence of the real correspondence. In steganography one can shroud the genuine data into other data so that burglar cannot detect it. In steganography data can be covered up in transporters such as image, audio files, text files and video files. In this paper discuss the different image steganography techniques. This paper gives a review of image steganography, its various techniques, its advantages and disadvantages and application.

Keywords: steganography, spatial domain techniques, transform domain technique, cover image and stego image.

I. Introduction

In the field of image processing, image for information security different conventional methodologies like Cryptography, Steganography, and Data Hiding can be utilized. Steganography alludes to the investigation of numerical methodology and related parts of Information Safety like information secrecy, information uprightness, and of information validation. In today's world use of computer and internet and transfer of important information through it increasing day by day, for the transfer of such essential information, security of information is also necessary. one technique of security of such information is encryption. In encryption information is transformed in such a way that it cannot be find by burglar. But during encryption; message is changed so it become distorted and burglar may suspect about the presence of main information. Another way of securing the secret information is steganography. Steganography is a branch of information safety. Steganography application hiding information in other, seemingly innocent media. Steganography comes from greek words sta\eganos(covered) and graptos(writing).Its meaning is "covered or hidden writing".

. Reversible data hiding means a technique where the data is embedded in the host end and at the receiving end the secret data and also the host end will be recovered loss less level.

Reversible data hiding

Reversible information stowing away can be characterized as a methodology where the information is cover up in the host media that might be spread picture. A reversible information disguise is a calculation, which can recuperate the genuine picture misfortune less after the information have been separated.

The transmitter elevation of such structures involves wrap icon, additional records, encryption enter and statistics thrashing answer. The concrete icon will be encrypted, records will be veiled and then icon will be transmitted. The beneficiary thus necessitates decrypting the icon and haul outing the data. The reversibility implies that not just the inserted mystery information and real picture yet in addition the encoded spread picture must be extricated misfortune less at the collector side.

II. Back Ground

Image data hiding processes are essentially part for any secret data communication. When hide the clandestine data in an image quality of image degrade. Hence techniques that ask for to enhance the interpretability or recognition of

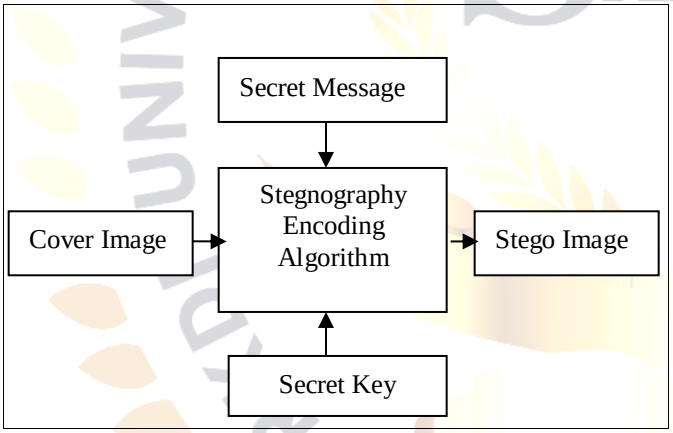
images for the human viewers and providing higher input for the automated image process techniques. In this paper paying attention on different image based data hiding steganography.

Steganography –

Image steganography have some terminologies are as follows:-

Cover-Image: Inventive icon which is use for hide information.
Message: Concrete information which is use to conceal into cover image. Message could be a pure book or some other picture.
Stego-Image: Subsequent to implanting message into spread picture is known as stego-picture.
Stego-Key: A key is use for embedding or extracting the message from cover-images and stego-images.

(a)Stego Image Generated at dispatcher Side



(b) Message extraction at receiver side

Fig.1. Concept of Steganography

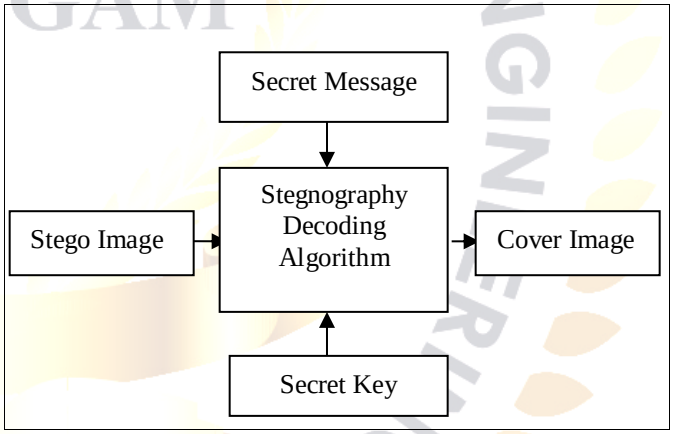
Generally image steganography is method of hiding secret message into cover-image and generate a stego-image. This stego-image send to the second party by any known middling, where the third revelry does not distinguish the hidden message of stego-image.After receiving a stego-image hide message can be easily extract with stego-key or without stego-key (depends on embedded algorithm) by the receiver end. Indispensable map of reflection steganography is shown in Figure 1 with stego-key, where embedding algorithm mandatory a swathe reflection with surreptitious message for embedding course of action. Output of embedded algorithm is a stego-image which minimally sent to extracting algorithm, where extracting algorithm extract the message from stego-image.

III. Prior Approaches

During this in survey discuss couple concepts,algorithms of the data hiding with the help of steganography.

Gandharba Swain (2016)

In this research work author discussed, steganography strategies by consolidating least huge piece (LSB) replacement and pixel esteem differencing (PVD) have been proposed to enhance the concealing limit and peak signal-to-noise ratio (PSNR). This paper proposes a stegano graphic technique by using both LSB substitution and PVD within a block. The picture is divided into 2×2 pixel obstructs in a non-covering design. For each 2×2 pixel obstruct the upper-left pixel is implanted with k-pieces of information utilizing LSB replacement. At that point the new estimation of this pixel is utilized to compute three pixel esteem contrasts



with the upper-right, base left, and base right pixels of the square. At that point information pieces are concealed utilizing these three contrast esteems in three ways. Both even and vertical edges are thought of. A steganographic method dependent on LSB replacement and three directional PVD in 2×2 pixel squares is proposed. There are two variations of this proposed procedure. However if we put side by side the two variants of the wished-for modus operandi, then deviation-1 is preferable for higher PSNR and the variant-2 is preferable for higher hiding capacity. The extraction process is very simple and does not require the original cover image. This technique can be further extended to 3×3 pixel blocks.[2]

Tripti Dhruw,Dr. Namita Tiwari(2016)

In this research work auther discussed various PVD methods (Pixel value differencing), PVD methods are the most popular method which were explored. It basically follows the theory that the edge areas can endure more changes than smooth areas. This paper presents the improvement of various PVD methods from 2003 to till now. PVD with LSB method provide good grades in requisites of capacity and PSNR. However, if PVD method is combined with other methods like MP and MPD then it is expected to provide better hiding capacity and PSNR. Since all methods used gray image as a cover media, use color image as cover media for data embedding process in PVD method. And if able to embed more data at edge area then increase the tolerance of steganalysis attacks. This paper represents the results of various PVD with different parameters. Lena, baboon and peppers each having size 512×512.The comparisons have been drawn by conducting tests on gray scale images. PSNR and embedding capacity have been complied[26].

Pulkit Khandelwal,Neha Bisht(2015)

In this paper author discussed plethora algorithm,according to author data conceal in interactive media frameworks is a universal work on empowering mystery correspondence of exceptionally secret data among various gatherings. To accomplish such an undertaking, a steganography framework is to be figured it out. Add to the plenty of calculations configuration to cover mystery information in pictures, another information concealing plan dependent on Energy and Cost of the Image has been proposed. Vitality of a picture depicts the connection between contiguous pixels which depends on its latent capacity. Branches of Dynamic Programming are utilized to assess the expense of the picture and further irregular crossing is utilized to choose the pixels in which information is to be implanted. The data as pieces is implanted in every one of the chose pixel in a predefined way. The mean square blunder and pinnacle sign to clamor proportion has additionally been determined alongside basic similitude list to survey the nature of the spread and the acquired stego picture. With lowest amount computational moment in time a robust steganography method is reached. Dynamic Programming helped in the development of an Image Steganography scheme which offers high security against unintended intruders in a digital communication channel, due to the randomness of data hiding in the cover image. Markov Random Field was set a building base for the proposed algorithm. Energy and cost estimation of the grayscale cover image provided an optimal solution for the random traversal through the cover image. Extensive experimental results support the validity of this new technique. Stego image was obtained without any compromise for its quaity with low computational complexity. Higher PSNR values obtained than existing schemes along with the SSIM calculation further backs up the proposed proposal in its aim to provide better imperceptibility. [1]

Praveenkumar, P., G. Ashwin, S.P.K. Agarwal,(2014)

In this research work author describe, RGB based image encryption. In beginning the RGB segments are discrete to each plane strategic planning was utilized. After that stage was accomplished for number of emphasess given by client and afterward the bit planes are consolidated from a solitary picture. Round move activity was performed on either left/right or up/down of the permuted pixels. At last, bitwise tasks are applied dependent on two keys for line and section. Investigating the vigor of the proposed work connection esteems, Unified Average Changing Intensity, Number of Pixels Change Rate and histogram tests were estimate. Chaotic logistic map on individual bit planes of image followed by rubick encryption principal to provide the final encrypted image. Image encryption has become a combat zone of top computer scientists and encrypted image secret is safely hoarded and transmit. The computed horizontal, vertical and sloping link importance's reveal that there exists no correlation between the original image and shuffled image. Chaotic logistic mapping was performed to the RGB planes of the original image to provide shuffling and rubick cube encryption was performed on the shuffled image to get the final encrypted output[14].

Dr. Diwedi Samidha and Dipesh Agrawal (2013)

In this research work author depicts different picture steganography procedures, in light of spatial area and by considering pixel esteems in double configuration. Spatial area depends on pixels physical area in a picture. By and large 8 piece dim level or shading pictures can be utilized as a spread to disguise information. Again paired portrayals of these pixels are considered to cover mystery message. Irregular pieces from these bytes are utilized to supplant the pieces of mystery message. Numerous steganography strategies can be utilize like Least Significant Bit (LSB), design the executives plans, supplanting just l's or just zero's from lower snack from the byte are considered for disguise mystery data in a picture. Along with these

techniques, some more techniques are proposed, based on selection of random pixels from an image and again secret data is concealed in random bits of these randomly selected pixels. For this reason, numerous boundaries of a picture are viewed as like physical area of pixels, power estimation of pixel, and so forth alongside existing strategies of picture steganography, some new techniques for concealing information in pictures are talked about. Information can be covered up in pixels. Physical area of these pixels can be chosen utilizing the methods which are depicted in this paper. After selecting random pixels, the secret data can be hidden in random bits, which are represented in the bytes of binary digits. While selecting these pixels, many parameters from an image are considered for example. Color of pixels, physical location of pixels etc [3].

Xianhua Song, Shen Wang and Xiamu Niu, (2012)

Creator depicts a picture steganography technique dependent on number DCT and relative change. Number DCT is a suitable area for steganography since it is invertible and lossless, yet the difference in the DCT coefficients will harm its Laplacian-shape-like dispersion. To guarantee the security of the technique, utilize relative change to recuperate the Laplacian-shape-like dissemination of the whole number DCT coefficients. Exploratory outcomes show that the proposed strategy can guarantee the stego picture outwardly and factually imperceptible even with enormous payload. A novel image steganography algorithm based on affine transformation and integer DCT is proposed. Before or after LSB replacement in integer DCT coefficients, some affine transformations are executed on the image, which will preserve the Laplacian-shape-like distribution of DCT coefficients histogram. Therefore, the information bits can be extracted both completely and safely because of invertible affine transformation. Experiments in real images show the effectiveness of the algorithm, and the DCT coefficients histogram of the final stego image is similar to the original one. In future, try to prove the recover principle of histogram after affine transformation.[18]

Xin Liao, Qiao-yan Wen, Jie Zhang (2011)

In this research work author, Improve the implanting limit and give an indistinct visual quality,by a novel steganographic strategy dependent on four-pixel differencing and adjusted least critical piece (LSB) replacement is introduced. The normal contrast estimation of a four-pixel square is misused to group the square as a smooth territory or an edge zone. Mystery information are covered up into every pixel by the k-bit change LSB replacement procedure, where k is chosen by the level which the normal distinction esteem falls. Rearrangement will be executed to ensure a similar level that the normal contrast esteem has a place with when implanting, and to limit the perceptual contortion. By demonstrating that the rearranging system works, a hypothetical verification is given to legitimize the technique succeses in implanting and extricating. The test results have demonstrated that the proposed technique has a worthy picture quality as well as gives an enormous inserting limit [23].

Bin Li, Junhui He(2011)

This paper gives a review on steganography and steganalysis for advanced pictures, primarily covering the principal ideas, the advancement of steganographic strategies for pictures in spatial portrayal and in JPEG design, and the improvement of the relating steganalytic plans. Some regularly utilized systems for improving steganographic security and upgrading steganalytic capacity are summed up and conceivable examination patterns are talked about . In this paper, review the fundamental concepts and notions as some typical techniques in steganography and steganalysis for digital im- ages. Adaptively selecting the embedding locations. author have witnessed plenty of stegano-graphic methods using adaptive embedding policy to embed statistics into the composite vicinity of an icon, for the sake of steer clear of causing perceptual manufactured articles. Be- sides, the rims and asymmetrical texture vicinity may be stiff to assemble a arithmetical model so that steganalytic scheme could be lying on your front to make false conclusion. Along these lines, choosing areas adaptively for inserting is as yet a promising arrangement in steganography. Note that the adaptive strategy should also be protected, such as using a key to ensure the randomness of the strategy. Or else the Wendy may use the same adaptive strategy to observe embedding artifacts.Reducing embedding distortion and increasing embedding eficiency. It seems to be hard to preserve all statistics of the image after data embedding. Therefore, an intuitive idea is to minimize the embedding impact to the cover image, thus reducing the deviation of statistics. Through reducing the embedding changes and embedding energy, the stego image may be more similar to the cover image, both visually and statistically. Thus the

statistics of the cover image may be preserved better. Embedding data in the image creation process. If the data are embedded in an already generated image, it may be hard to preserve the image statistics. This may be a good solution for steganography. Sacri_cing the imperceptivity while preserving the statistics. Modern steganalytic techniques have greatly progressed. However, there are still some unsolved challenges..Identifying the type of steganography, the used parameters, the embedding rate, and even the embedding locations. In beginning the RGB segments are discrete to each plane strategic planning was utilized. After that stage was accomplished for number of emphasess given by client and afterward the bit planes are consolidated from a solitary picture. Round move activity was performed on either left/right or up/down of the permuted pixels. At last, bitwise tasks are applied dependent on two keys for line and section. Investigating the vigor of the proposed work connection esteems, Unified Average Changing Intensity. [6].

Thanikaiselvan V,Santosh Kumar(2011)

In this examination work creator portrays, a novel steganographic technique has been proposed to improve the security of inserted information with high limit and intangible visual quality, the proposed strategy depends on four-pixel square differencing, changed LSB replacement and Knights visit. Secret data is embedded randomly using knights tour in each 8×8 pixels block of cover image and n-bit modified LSB substitution has been used to improve the quality of stego image, where n is decided by the point to which the typical disparity rate cascade into, then it employs readjustment procedure to cut the perceptual buckle. The proposed technique adaptively implants the mystery information into spread picture by separating the edge and smooth territories, so more number of mystery pieces can be installed without making any perceptual twisting Results show that our proposed system has given more noteworthy security high inserting limit and a superior picture quality.
It is understood that the major requirements of data hiding are imperceptibility, robustness and high data capacity, and thus this methodology has been developed keeping in mind these prerequisites. Here we have employed four pixel block differencing method, along with n-bit Modified Least Significant Bit (MLSB) substitution method, Knight's tour and Re-adjustment procedure. By using n-bit Modified Least Significant Bit (MLSB) substitution method, security is enhanced, while with Knight's tour, the data embedding path is unique and very difficult to crack by eavesdroppers while the readjustment procedure gives levels of imperceptibility a high boost. Also, the picture's quality is not disrupted significantly to the human eye, by embedding adaptively into the edge pixels higher than that of the smooth pixels. Thus perceptual distortion is significantly reduced. Furthermore, this procedure also has the capacity to embed considerable payloads. Thus, in taken as a whole this modus operandi is one that meets all requests diligently and serves the rationale for which it is created.[19]

Chung-Ming Wang, Nan-I Wu, Chwei-Shyong Tsai, Min-Shiang Hwang (2008)

In this research work author describe, a new image steganography technology is proposed which creating a mystery inserted picture that is totaly indistinguishable from the first picture by the natural eye. Moreover, new technique keeps away from the tumbling off-limit issue by utilizing pixel-esteem differencing and the modulus work. Initially, get a distinction esteem from two continuous pixels by use the pixel-esteem differencing procedure (PVD). The disguising furthest reaches of the two nonstop pixels depends upon the differentiation regard. As it were, the smooth territory is less mystery information can be covered up, the more edges zone has the more mystery information can be inserted. Along these lines, the stego-picture quality debasement is more intangible to the natural eye. Other, rest of the two sequential pixels can be compute by utilizing the modulus procedure, and afterward mystery information can be implanted into the two pixels by adjust their leftover portion. In this plan, there is an ideal way to deal with change the rest of as to significantly decrease the picture twisting brought about by the stowing away of the mystery information. The estimations of the two back to back pixels are hardly change after the inserted of the mystery message by the propose ideal adjustment calculation. Test results have likewise exhibited that the proposed conspire is secure against the RS identification assault. We propose a novel plan to significantly diminish the perceivability of the concealing impact present in the PVD method[9].

H.-C. Wu, N.-I. Wu, C.-S. Tsai and M.-S. Hwang(2005)

So as to improve the limit of the shrouded mystery information and to give a vague stego-picture quality, a novel steganographic technique dependent on least-huge piece (LSB) substitution and pixel-esteem differencing (PVD) strategy is introduced. Initial, an alternate an incentive from two back to back pixels by using the PVD strategy is gotten. A little distinction worth can be situated on a smooth territory and the huge one is situated on an

edged zone. In the smooth regions, the mystery in sequence is covered up into the spread picture by LSB strategy while utilizing the PVD modus operandi in the periphery regions. in view of the fact that the collection width is variable, and the territory where the mystery information is disguised by LSB or PVD technique are difficult to figure, the security level is equivalent to that of a solitary utilizing the PVD strategy for the proposed strategy. From the trial results, contrasted and the PVD strategy being utilized alone, the proposed technique can shroud an a lot bigger data and keeps up a decent visual nature of stego-picture.. In this paper, we have proposed a steganographic method to embed secret data into still images by using pixel-value differencing and least-significant-bit replacement methods. It embeds supplementary surreptitious data into periphery areas than silky areas in the swathe icon and has a better image quality by using PVD method alone. For the sake of increasing the capacity, we hid the surreptitious records in the silky vicinity by using an LSB method with the edged areas still using the PVD method. The untried fallout demonstrate that the proposed routine not solitary has an acceptable image quality but also can provide a large embedded secret data capacity[22].

Zhou Wang, Alan Conrad Bovik,(2004)

In this exploration work ,Objective strategies for surveying perceptual picture quality generally endeavored to measure the perceivability of mistakes (contrasts) between a twisted picture and a reference picture utilizing an assortment of branded properties of the human illustration framework. Develop a structural similar index and denote its promise by a set of instinctive sample, as well as comparisson to in cooperation prejudiced ratings and state-of-the-art intention technique on a catalog of icon packed together with JPEG and JPEG2000[24].

Chi-Kwong Chan, L.M. Cheng (2003),

In this research work, a facts thrashing format proposed by simple LSB substitution technique. Try an optimal pixel fine-tuning modus operandi on the stego-icon generated by the LSB substitution technique, the icon eminence of the stego-image can make well again with little extra computational intricacy. Extensive try outs give you an idea about the electiveness of the wished-for method. With respect to icon eminence and computational efficiency[25].

Table 1 – Shows the comparison of different previous methods

Year	Method	Advantage	Draw backs
2016	A steganographic method combining LSB substitution and PVD in a block.	Improved Data Hiding Capacity and PSNR. Using both LSB substitution and PVD within a block	Implement only at 2X2 block size
2015	Randomly Hiding Secret Data using Dynamic Programming for Image Steganography	Higher PSNR vales and lower MSE error. Energy Matrix based pixel detection.	Random data hiding
2014	Rubik's cube blend with logistic map on RGB	Tests Unified Average Changing Intensity, Number of Pixels Change Rate and histogram	Rubik's cube blend has high complexity
2013	Random Image Steganography in Spatial Domain	LSB layout schemes replacing only l's or only zero's from lower nibble from the byte.	Visual quality is not well. Quality of Stego image low
2012	An Integer DCT and Affine Transfor mation Based Image Steganography	system is invertible and lossless, but the alter of the DCT coefficients will harm its Laplacian contour in the vein of distribution.	Degrade quality of Stego image, not well PSNR and MSE
2011	A steganographic method for digital images with four-pixel differencing and modified LSB substitution.	The method acceptable image quality, also provides a large embedding capacity	Higher Level of complexity
2008	A top notch steganographic strategy with pixel-esteem differencing and modulus work	Difference value from two consecutive pixels by utilizing the PVD technique. Secure against the RS detection attack	PVD is secure but SSIM is low of Color image.
2005	Image steganographic scheme based on pixel-value differencing and LSB replacement methods	Smooth areas in the cover image and has a better image quality by using PVD method	SSIM is very low of Color image.
2004	Image Quality Assessment: From Error Visibility to Structural Similarity	Develop a Structural Similarity Index and demonstrate its promise through a set of intuitive also images compressed with JPEG and JPEG2000.	JPEG image compressed contain low pass filter that is destroy the image data.
2003	Hiding data in images by simple LSB substitution	Simple LSB substitution is proposed. By applying an most advantageous pixel tuning process to the stego-image obtained by the simple LSB changeover method,	LSB has un-sufficient data hiding capacity

IV. Conclusion

In this survey paper discus the different data hiding process of images. Discuss about data hiding and also reversible data hiding schemes. There are different image steganography techniques are analyzed and summarized. A short discuss on steganography. Also discuss the literature survey on different image steganography techniques in Table 1 shows the comparison of different methods.There are various applications of image stegnogrphy like Confidential contact and secret figures storing, Protection of data alteration, Access be in charge of system for digital content giving out, Media Database systems, prospective competence to hide from view the existence of not to be mentioned data, solidity of detecting the out of sight (i.e.,

embedded) data, Enhancing the mystery of the encrypted data.In the future work proposed a new method the data hiding in online social era. Day to day number of data hacking and attacks increased so required a highly secured data hiding technique. Image steganography is one of the true solution of this problem. In future proposed a new method that is based modification of Algorithm Spatially Desynchronized Steganographic Algorithm (SDSA). This method is based on JPEG based data hiding, due to the generation of large data like big data, requirement of big data hiding. In proposed future method SDSA is based JPEG based, JPEG based data capacity is very high, but in same losses are also occurred in future proposed method SDSA based apply enchantment for minimizing the losses and improving data hiding capacity.

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