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DATA ANALYSIS AND STUDY OF VARIOUS IMAGE STEGNOGRAPHY TECHNIQUES USED FOR DATA HIDING

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ABSTRACT: Steganography will pick up its significance because of the exponential development and mystery correspondence of potential PC clients over the web. It can likewise be characterized as the investigation of undetectable correspondence that ordinarily manages the methods for concealing the presence of the imparted message. For the most part information implanting is accomplished in correspondence, picture, content, voice or interactive media content for copyright, military correspondence, confirmation and numerous different purposes. In picture Steganography, mystery correspondence is accomplished to install a message into cover picture (utilized as the transporter to insert message into) and produce a stego image (produced picture which is conveying a shrouded message). In this paper we have fundamentally investigated different steganographic methods.

I. INTRODUCTION

Advanced information installing in computerized media is a data innovation field of quickly developing business, and in addition national security of intrigue. The transmission of computerized media items by means of web is getting increasingly prominent. Since the computerized medium can be helpfully transmitted and lossless replicated, they additionally prompt an expansion of advanced theft. To tackle this issue diverse information concealing procedures are utilized [1]-[4]. Undercover correspondence or steganography, which actually signifies "secured expressing" in Greek, is the way toward concealing information under a cover medium (additionally alluded to as host, for example, picture, video, or sound, to build up mystery correspondence between trusting gatherings and hide the presence of inserted information. i.e. The fundamental goal of information stowing away is to impart safely such that the genuine message which is installed in any of the advanced media is not obvious to the eyewitness. That is undesirable gatherings ought not have the capacity to recognize in any sense between cover (picture not containing any mystery message) and stego-picture (adjusted cover-picture that contains mystery message). Consequently the stego picture ought not stray much from the first cover picture. Diverse information concealing systems can be assessed on following four fundamental properties of information concealing [10]: (i) payload - information delivery rate; (ii) robustness - hidden data resistance to noise/disturbance; (iii) transparency - low host distortion for concealment purposes; and (iv) security - inability by unauthorized users to detect/access the communication channel.

As of late, creating information concealing innovations, especially as steganography, are believed to represent a risk to individual protection, business and national security interests. The countermeasure innovation to steganography security is habitually alluded to as steganalysis, which can be characterized into two classes: Passive and dynamic. The essential undertaking of inactive steganalysis is to choose the nearness or nonappearance of shrouded information in given media objects (double theory testing issue). Dynamic steganalysis (otherwise called criminology steganalysis) alludes to the exertion by unintended beneficiaries to extricate/evacuate/change the genuine concealed information. In this specific situation, dynamic steganalysis is not at all like assaults to watermarking security.

Steganography is one of the security in which data is secretly embedded in a cover image, where the actual message want to be sent is completely changed to another form, hidden data under a cover image and sent to the destination. Only the person who knows the technique can easily decrypt the message. The performance of Steganography methods can be rated by three Parameters: capacity, security and imperceptibility. So "Steganography means hiding one piece of data within another."

The Steganography algorithms are help to perform secret communication. The most popular data formats used are .bmp, .jpeg, .mp3, .txt, .doc, .gif. Data hiding is the process of hiding a secret message within cover medium such as image, video, text, audio. Hidden image has many applications, especially in today's modern, high-tech world. Privacy and secrecy is a concern for most people on the internet. Hidden image allows for two parties to communicate secretly and covertly. The hidden data must be secure during transformation can be

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obtained by two ways: Encryption and Data Hiding. A combination of the two techniques can be used to increase the data security.

1.1 Techniques of Stegnography.

Contingent upon the sort of the cover question there are numerous appropriate steganographic strategies which are followed with a specific end goal to get security.

1) Image Steganography: Taking the cover protest as picture in steganography is known as picture steganography. For the most part, in this procedure pixel forces are utilized to shroud the data.

2) Network Steganography: When seeking shelter question as system convention, for example, TCP, UDP, ICMP, IP and so on, where convention is utilized as bearer, is known as system convention steganography. In the OSI arrange layer demonstrate there exist undercover channels where steganography can be accomplished in unused header bits of TCP/IP fields.

3) Video Steganography: Video Steganography is a procedure to conceal any sort of documents or data into computerized video design. Video (blend of pictures) is utilized as bearer for shrouded data. For the most part discrete cosine changes (DCT) modify a value (e.g., 8.667 to 9) which is utilized to shroud the data in each of the pictures in the video, which is not perceptible by the human eye. Video steganography uses, for example, H.264, Mp4, and MPEG, AVI or other video groups.

4) Audio Steganography: When taking sound as a transporter for data concealing it is called sound steganography. It has turned out to be extremely huge medium because of voice over IP (VOIP) fame. Sound steganography utilizes advanced sound arrangements, for example, WAVE, MIDI, AVI MPEG or and so on for steganography.

5) Text Steganography: General procedure in content steganography, for example, number of tabs, void areas, capital letters, much the same as Morse code is utilized to accomplish data covering up. Figure 1 demonstrates diverse sorts of Image Stegnography.

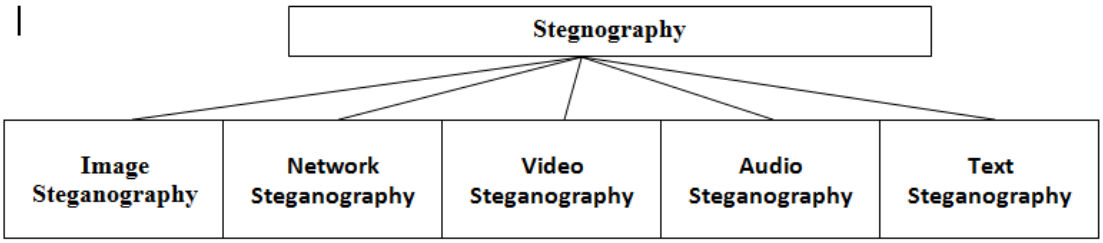

Figure 1: Types of Image Stegnography.

1.2 Model of Image Stegnography

By and large picture steganography is technique for data stowing away into cover-picture and produces a stego-picture. This stego-picture at that point sent to the next gathering by known medium, where the outsider does not realize that this stego-picture has shrouded message. In the wake of getting stego-picture concealed message can just be extricated with or without stego-key (contingent upon implanting calculation) by the less than desirable end [5].

Fundamental chart of picture steganography is appeared in Figure 2 without stego-key, where inserting calculation required a cover picture with message for implanting technique. Yield of installing calculation is a stego-picture which basically sent to extricating calculation, where removed calculation unhides the message from stego-picture.

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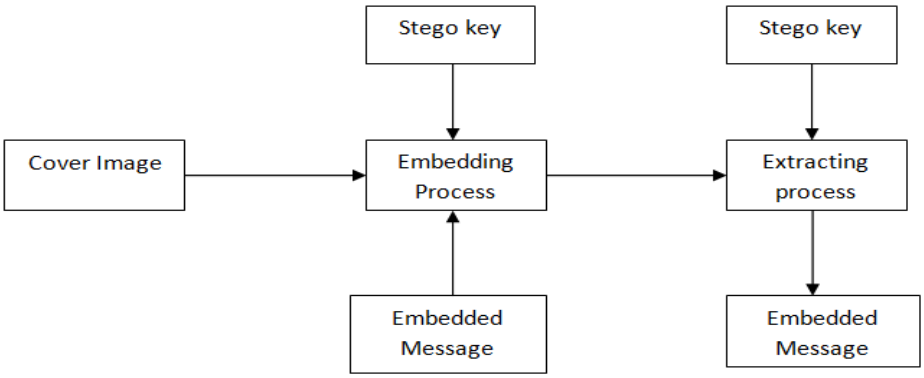

Figure 2: Basic Diagram of Image Stegnography

1.3 Cryptography Vs Steganography

Cryptography and Steganography differ to each other because cryptography is used to keep the contents of the message secret while steganography is used to hide the existence of secret message. Both techniques are used to protect information from the unauthorized use but sometime it is used in illegal means and neither cryptography is alone perfect nor steganography. Both approaches can be used with each other, to provide better security because cryptography makes the message secret and steganography make existence of message invisible. If someone try to find the existence of secret message and finds but that message would not be understood because it would be encrypted due to the use of cryptography. So, by combining these two approaches, information can be made more secure.

1.4 Image Steganography Classifications.

By and large picture steganography is ordered in following perspectives [6]:

High Capacity: the capacity to put away Maximum size of Data into picture.

Perceptual Transparency: After concealing procedure into cover picture, perceptual quality will be corrupted into stego-picture as contrast with cover-picture.

Strength: After installing, information should remain in place if stego-picture goes into some change, for example, editing, scaling, separating and expansion of clamor.

Temper Resistance: It ought to be hard to change the message once it has been installed into stego-picture.

Computation Complexity: How much costly it is computationally to embed and separating a shrouded message?

1.5 Performance Measure

Payload Capacity: It alludes to the measure of information that can be embedded into cover media without disintegrating its uprightness. The payload is the information secretly imparted. The transporter is the flag, stream, or information record that shrouds the payload—which varies from the channel (which commonly implies the kind of info, for example, a JPEG picture). The subsequent flag, stream, or information document with the encoded payload is in some cases called the bundle, stego record, or incognito message. The rate of bytes, tests, or other flag components adjusted to encode the payload is known as the encoding thickness, and is regularly communicated as a number in the vicinity of 0 and 1.

Picture Perceptual quality: It is fundamental that to maintain a strategic distance from doubt the implanting ought to happen without noteworthy debasement or loss of perceptual nature of the cover media.

Image Security: Provide Security to concealed message from unapproved gets to. Given the expansion of advanced pictures, and given the high level of repetition introduce in a computerized portrayal of a picture (in spite of pressure), there has been an expanded enthusiasm for utilizing advanced pictures as cover-objects with the end goal of information stowing away. Since boundless number of duplicates of a unique can be effectively circulated or produced, the assurance and requirement of licensed innovation rights is another imperative issue. An advanced watermark is proposed to supplement cryptographic procedures, and is a vague flag added to computerized content that can be later distinguished or removed with a specific end goal to make some statement about the substance. On the off chance that computerized watermarks are to be utilized as a part of steganography applications, identification of their essence by an unapproved specialist overcomes their exceptionally reason. Indeed, even in applications that don't require shrouded correspondence, yet just strength, it is alluring to first distinguish the conceivable nearness of a watermark before attempting to expel or control it. For instance, supplanting a copyright check with the one asserting legitimate proprietorship.

II. IMAGE STEGNOGRAPHY

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The most prominent records for concealing information are the pictures. Picture Steganography alludes to the way toward passing mystery or classified information in a picture. In this procedure, a picture is taken and mystery message (payload) is set in that picture and is passed to the sender. The sender would then be able to extricate the data from the picture utilizing the key gave by the sender. There are various steganographic Techniques that can be utilized to implant mystery data in a transporter medium. The algorithms can be categorized in following groups: spatial domain, Transform Domain, Speed Spectrum and frequency domain techniques. Masking and filtering is also a common steganography technique. The distinctive methods of Image Stegnography are appeared in figure 3.

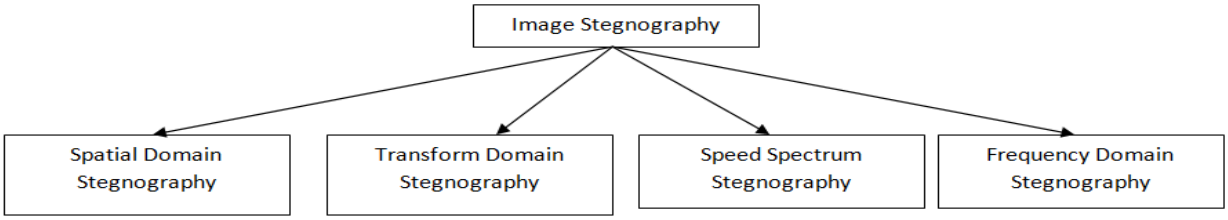

Figure 3: Image Stegnography Techniques.

2.1 Spatial Domain Stegnography

There are many versions of spatial steganography, all directly change some bits in the image pixel values in hiding data. Least significant bit (LSB)-based steganography is one of the simplest techniques that hides a secret message in the LSBs of pixel values without introducing many perceptible distortions. Changes in the value of the LSB are imperceptible for human eyes. The Different types of Spatial Domain Techniques are shown in figure 4.

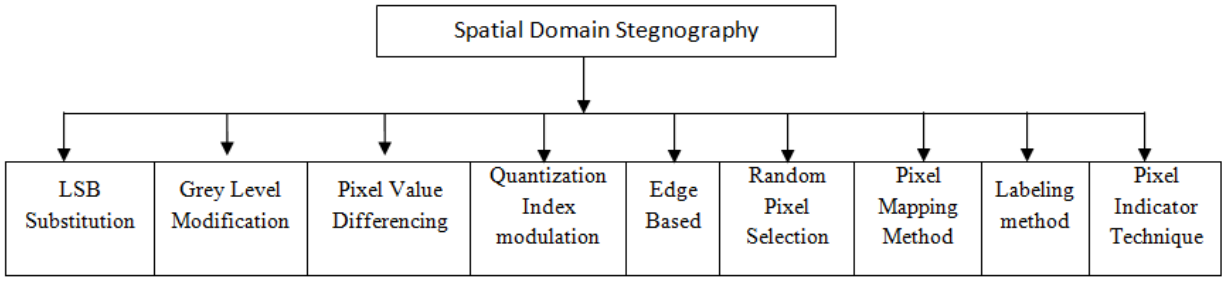

Figure 4: Different Spatial Domain Techniques

2.1.1. Least Significant Bits (LSB Substitution)

In this technique picture will be go about as reference picture to shroud the content. Utilizing this dark scale reference picture any content can be covered up. Single character of a content can be spoken to by 8-bit. On the off chance that the reference picture and the information document are transmitted through system independently. Here the picture is not in any manner contorted on the grounds that said picture is utilized for referencing. Any huge amount of content material can be concealed utilizing a little picture. Unravel the content is impractical catching the picture or information document independently. In this way, it is more secure.

In a dim scale picture every pixel is spoken to in 8 bits. The last piece in a pixel is called as Least Significant piece as its esteem will influence the pixel esteem just by "1". Thus, this property is utilized to conceal the information in the picture. Here we have considered last two bits as LSB bits as they will influence the pixel esteem just by "3". These aides in putting away additional information. The Least Significant Bit (LSB) steganography is one such procedure in which minimum noteworthy piece of the picture is supplanted with information bit. As this technique is helpless against stegano-investigation in order to make it more secure we scramble the crude information before inserting it in the picture. In spite of the fact that the encryption procedure builds the time many-sided quality, however in the meantime gives higher security too. This approach is extremely basic. In this technique the slightest critical bits of a few or the majority of the bytes inside a picture is supplanted with a bit of the mystery message. The LSB implanting approach has turned into the premise of numerous systems that shroud messages inside mixed media bearer information. LSB installing may even be connected specifically information areas - for instance, inserting a concealed message into the shading estimations of RGB bitmap information, or into the recurrence coefficients of a JPEG picture.

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LSB inserting can likewise be connected to an assortment of information configurations and sorts. In this manner, LSB implanting is a standout amongst the most imperative steganography methods being used today. From one of our reference paper we found that in LSB steganography, to hide the message the slightest critical bits of the cover media's computerized information are utilized. The valuable element of the LSB steganography strategies is LSB substitution that makes LSB stegnography as basic. To mirror the message it should be concealed, LSB substitution steganography flips the last piece of each of the information esteems. Consider a 8-bit dark scale bitmap picture where every pixel is put away as a byte.

Furthermore, it additionally speaking to in dark scale esteem. Suppose the first eight pixels of the original image have the following gray scale values: 11010010 01001010 10010111 10001100 00010101 01010111 00100110 01000011 the letter C whose binary value is 1000001. To hide this binary value it can replace the LSBs of these pixels to have the following new gray scale values: 11010011 01001010 10010110 10001100 00010100 01010110 00100111 01000011. On a normal, just a large portion of the LSBs should be changed. The distinction between the cover (i.e. unique) picture and the stego picture is hard to see by human eye. The real restriction of LSB is little size of information which can be implanted in such sort of pictures utilizing just LSB. The LSB is to a great degree powerless against assaults. The LSB strategy which is actualized to 24 bit design is extremely hard to distinguish in opposition to the 8 bit organize. Another case of LSB procedure is: Considering a framework for 3 pixels which is having 24-bit picture and the number 300 is to be implanted utilizing LSB method. The resulting grid is as follows: PIXELS: (01010101 01011100 11011000) (10110110 11111100 00110100) (11011110 10110010 10110101) C: 10000011 (01010101 01011100 11011000) (10110110 11111100 00110100) (1101111110110011 10110101).) In the above example the number C was embedded into the first 8 bytes of the grid and only the 2 bits need to be changed according to the embedded message .On an average, to hide a secret message using the maximum cover size, only half of the bits in an image will need to be modified [7].

2.1.2 Grey Level Modification

Grey Level Modification is a method to delineate (not install or conceal it) by adjusting the dim level estimations of the picture pixels. GLM Steganography utilizes the idea of odd and even numbers to outline inside a picture. It is a coordinated mapping between the double information and the chose pixels in a picture. From a given picture an arrangement of pixels are chosen in light of a scientific capacity. The dim level estimations of those pixels are inspected and contrasted and the bit stream that will be mapped in the picture. At first, the dark level estimations of the chose pixels (odd pixels) are made even by changing the dim level by one unit.

Once all the selected pixels have an even gray level it is compared with the bit stream, which has to be mapped. The first bit from the bit stream is compared with the first selected pixel. If the first bit is even (i.e. 0), then the first pixel is not modified as all the selected pixels have an even gray level value. But if the bit is odd (i.e. 1), then the gray level value of the pixel is decremented by one unit to make its value odd, which then would represent an odd bit mapping. This is carried out for all bits in the bit stream and each and every bit is mapped by modifying the gray level values accordingly [8].

2.1.3 Pixel Value Differencing

The PVD technique is proposed by Wu and Tsai can effectively give both high implanting limit and exceptional intangibility for the stego-pictures [9].

The PVD technique isolates the cover picture into non covering squares containing two associating pixels and alters the pixel contrast in each piece (match) for information implanting. To appraise what number of mystery bits will be inserted into pixel, the biggest contrast an incentive between the other three as well as four pixels near the objective pixel is figured. PVD is planned such that the pixel change does not damage dark scale go interim. The determination of the range interims depends on the qualities of human vision affectability to dark esteem (0-255) fluctuates from smoothness to differentiate. It gives a simple approach to deliver a more vague outcome than straightforward LSB substitution strategies [10].

The inserted mystery message can be extricated from the subsequent stego-picture without referencing the first cover picture. Also, to accomplish mystery security of concealed information a pseudo-irregular system might be utilized. In the event that mystery information is put away arbitrarily it is hard to comprehend by the gatecrasher. PVD installing is utilized for edged ranges to build picture quality. It is additionally used to shroud message into dark scale and in addition in shading picture.

In PVD technique, dim scale picture is utilized as a cover picture with a long piece stream as the mystery information. At first the cover picture is divided into non-covering pieces of two sequential pixels, pi and pi+1. From each piece the distinction esteem di is computed by subtracting pi from pi+1. The arrangement of all distinction esteems may extend from - 255 to 255. In this way, |di | ranges from 0 to 255. The squares with little distinction esteem situates in smooth region where obstruct with vast contrast esteems are the sharp edged territory. As indicated by the properties of human vision, eyes can endure a greater number of changes in sharp-edge zone than smooth region. Along these lines, more information can be implanted into edge zone than

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smooth regions. Hence, in PVD strategy a range table has been planned with n touching extents Rk (where k=1,2,… ,n) where the range is 0 to 255. The lower and the upper bound are meant as lk and uk separately, at that point Rk ∈ [lk,uk]. The width of Rk is computed as wk=uk-lk+1.wk chooses what number of bits can be covered up in a pixel square. For security reason Rk is kept as a variable, subsequently, unique range table is required to extricate the inserted information [11].

2.1.4 Quantization Index modulation

A common embedding technique used for data hiding is quantization index modulation (QIM) [12, 13].

In QIM, information implanting is performed through a decision of the quantizer and a component is quantized once to insert a specific piece. Here, we take a gander at joining "twofold implanting" in QIM-based steganographic plans, where a similar component is altered twice to install 2 bits. The point is to expand the concealing rate without trading off on the inserting mutilation presented and the power of the steganographic conspire against the same steganalysis strategies. As a safe concealing system in which to analyze the perceptibility of single and twofold implanting, we have utilized our as of late proposed secure steganographic plot, Yet Another Steganographic Scheme (YASS) [3], which achieves security based on hiding in randomized blocks [14].

In YASS, covering up happens in a chose band of quantized discrete cosine change (DCT) components processed per 8×8 piece, picked haphazardly out of a B × (B > 8) major square. To adjust for the mistakes presented by the JPEG pressure venture in YASS, it is combined with a rehash amass (RA) [4] 15 the QIM installing rationale be changing over a component to the closest even/odd different of the quantization interim, Δ, to implant 0/1, individually. For concealing, we utilize quantized discrete cosine change (DCT) coefficients. For perceptual straightforwardness, we don't adjust coefficients that are excessively near zero; subsequently, all coefficients in the range [-0.5,0.5] are mapped to zero and are viewed as eradications.

2.1.5 Edge Based

Edge Detection algorithm hides information into the pixels that make up the removed edges of the transporter picture. The mystery information can be of any sort, not really content, and they are really hidden into the three LSBs (Least Significant Bits) of the pixels of the transporter picture, however not in each pixel, just in the ones that are a piece of the edges distinguished by the edge recognition calculation.

It is an expansion of edge implanting in shading picture. To get genuine edges, Canny edge recognition strategy has been utilized. The determination of edges for inserting is reliant on the length of payload and the picture. As the payload estimate expands, a powerless edge for the determination of edges is utilized with the goal that more edges can be chosen to oblige the expanded measure of information. For a given payload, the keenest conceivable edges are chosen to insert the message. Edge choice is to discover Canny high limit, so adequate number of edges are chosen to implant the given payload in a cover picture, while installing is finished by processing edge-outline on edge. Payload is inserted in a cover picture in an irregular request in view of the stego key and the edge delineate.

2.1.6 Random Pixel Selection

In this algorithm data is hidden randomly i.e., data is hidden in some randomly selected pixel. Random pixel is generated by using Fibonacci algorithm.

Using this technique, any bit or any intermediate bit from a given byte (of a pixel value) can be replaced by the bit of a data to be hidden. For ex. Original data is: . Cover Data 10101110 00011101 11001101 11110001 01010100 11101111 10110001 10101010 Message to hide is – 11001101 Bits are replaced according to any random sequence from LSB to MSB position. In following table underlined bits shows the bits of secret message are replaced with the bits of original data at that position. Cover Data + Secret Data = Stego 10101110 00011101 11001101 11110001 5th Bit 2nd Bit 6th Bit 4th Bit 01010100 11101111 10110001 10101010 4th Bit 3rd Bit 5th Bit 2nd Bit [16].

2.1.7 Pixel Mapping Method (MPP)

The technique for data stowing away inside the spatial space of a picture. Inserting pixels are chosen in light of some scientific capacity which relies upon the pixel force estimation of the seed pixel and its 8 neighbors are chosen counter clockwise way. Before implanting a checking has been done to see if they chose inserting pixels or its neighbors lies at the limit of the picture or not. Information implanting is finished by mapping every two or four bits of the mystery message in each of the neighbor pixel in light of a few components of that pixel.

Pixel mapping strategy utilizes the possibility of pixel force and number of one‟s in pixel to delineate. This approach produces enhanced inserting capacity and PSNR Value over PVD and GLM techniques. On the off chance that we utilize this PMM technique with BPCS, this approach creates better picture quality over the utilization of PMM strategy alone. In the event that the 2 LSBs of reflecting outlet is 00 then this pixel does not contain any furtive data and go to venture of testing.

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It can likewise utilize a discretionary capacity 2r+ 5 % width to pick pixels in irregular way where r speaks to line of picture. By utilizing discretionary areas the security of furtive correspondence. Yet, at times, it might debase the inserting limit.

Inspecting is unpredictably associated with blasting steganography and plays a fundamental obligation in this methodology. The specimens are chosen in view of the info cover question, mystery rub and the stego key. Further, a striking normal for the testing errand is that the specimen consider diminishes exponentially we move inwards from the fringe to the Center of the photo. This depends on the arrangement that the inside of the photo is normally more painstakingly saw and concentrated on by the human eye, and fringe parts by and large draw in slighter itemized and devoted notice. The testing is fortified remembering the unmistakable changes in the histogram, accordingly shocking steganalysis cunningly. Further, the undertaking guarantees that generally rise to number of pixel tests have been chosen from every one of the four quadrants, to abstain from grouping of tests from a solitary one. To dispense with the limitation of a foreordained size mystery message, we goal to advance a programmed alteration calculation.

The dynamic proportion esteem is characterized relying upon the elements of the picture and the convergence of the shading segment esteems over the cross segments of the picture. In view of the above idea, our calculation cautions against doubt. This recommends the utilization of an additional cover picture or the duplicate of a similar cover picture, which can be created more than once. On contract we isolate the mystery data in the best-extent and afterward re-test it. This technique for part and resampling is a recursive system and ends once an ideally permitted proportion is come to. We store the essential esteems compulsory for interpreting in the four corners of a picture [17].

2.1.8 . Labeling method

Pixel Connectivity A morphological handling begins at the crests in the marker picture and spreads all through whatever remains of the picture in light of the network of the pixels. Network characterizes which pixels are associated with different pixels. A gathering of pixels that associated in view of Connectivity sorts called an Object. The standard two dimensional networks are appeared in Table 1. Choosing Connectivity The sort of neighborhood that may pick influences the quantity of items found in a picture.

Two Dimensional Connectivity	
4 Connected	Pixels are connected if there edges touch. This means that a pair of adjoining pixels is part of same object if they are both on & are connected along the horizontal or Vertical direction.
8 Connected	Pixels are connected if there edges or corner touch. This means that if two adjoining pixels are on, they are part of same object. whether they are connected along the horizontal or Vertical direction or diagonal direction

Table 1: Two Dimensional Connectivity.

The gray thresh function uses Otsu's method, which picks the edge to limit the intra class change of the high contrast pixels.

1) At first limit of picture has been figured keeping in mind the end goal to utilize thresholding to change over this grayscale picture to parallel. A yield as a double picture is required that has estimations of 1 (white) for all pixels in the information picture with luminance more prominent than change and 0 (dark) for every other pixel [18].

2) Now everything is prepared to mark the twofold Image that is consequence of past level. Kind of Connectivity has been said before can be utilized as a part of this phase to name our Image, that here 8-Connectivety has been utilized [19].

2.1.9 Pixel Indicator Technique (PIT)

Pixel marker method is additionally an adjusted form of DLSB and it works fundamentally on security level than on limit level. For the most part, we apply Pixel marker system on RGB pictures. We realize that PIT is an upgraded variant of DLSB and a change over OPAP however it is additionally taking many points of interest from past Steganographic calculations. In the working of PIT, it takes two bits as minimum huge and these bits can be from Red, Green or Blue. By the choice of two bits from any shading channel, it demonstrates the presence of concealed information in the rest of the channels. Bits are looked over R to B constantly like RGB, RBG, GBR, GRB, BRG, and BGR. During the time spent Pixel Indicator Technique there are two sub forms, one is development and other is recuperation [20][21]. There are two measures of Pixel Indicator procedure, one is security and other is limit like different calculations. It works for the advancement of security however its security level is as same as OPAP i.e. medium. For limit estimation we need to figure number of bits per pixel which we can insert with least twisting or no contortion. In PIT number of installed bits must not surpass 3. The working of Different Reversible Data Hiding Scheme is appeared in Table 2.

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Table 2: Different Reversible Data Hiding Scheme		
Author	Method Used	Remark
Tian et al [22]	Tian suggested a data hiding scheme based upon DE difference expansion (DE). In his method difference between two adjacent pixels are computed and this difference is doubled, so that the secret bit can be embedded in to the even value.	Visual quality of Tian scheme is high but capacity is less.
Alattar et al [23]	He proposed a scheme which is based on integer transform	Capacity is higher than Tian method.
Liu et al [24]	He proposed a RDH technique based on bilinear interpolation and difference expansion	In a single cover pixel, two secret bits can be embedded Capacity of embedding is good.
Ni et al [25]	He proposed a data hiding method based on histogram modification. In their scheme maximum change made to a pixel is 1.	Quality of the stego image as it guaranteed a lower bound on the peak signal-to-noise ratio (PSNR) of 48.1 dB. The embedding capacity is dependent on the count of the pixels in the peak bin, which is relatively low in natural images.
Hong et al [26]	A reversible data hiding based on interpolation and histogram modification. In their scheme, cover image is divided into complex block and smooth block.	Smooth block is only used for data embedding so that it produces a high quality stego image. It shows impressive increase in the embedding capacity.
Sabeen et al [27]	Data is embedded in a pixel if the prediction error is less than a predetermined threshold. He uses directional interpolation for a more accurate prediction reducing the prediction error and thereby finding more embeddable number of pixels.	Embedding capacity is high.
Chang et al [28]	A dual-image RDH algorithm that uses the exploiting modification direction (EMD) and the modulo function to build a modulo matrix with values in the range 0–255. The data bits are first converted to quinary data and every two pixels in the two images for meda set for embedding	By Using This method the he achieved embedding capacity of1bpp with PSNR value around 45dB.
C.C.Chang et al [29]	He used decimal representation.	This increased the embedding capacity to 1.55 bpp; however, the image quality to decreased to around 39 dB.

C.qin et.al used Reversible data hiding scheme based on exploiting modification direction. In this method he used two stegnographic Images. By using This Method the embedding capacity that slightly above 1 bpp. However, the quality of the two stego images was asymmetric [30].

Lu et.al used Dual imaging-based reversible data hiding technique using LSB matching. The achieving a maximum embedding capacity around 1 bpp with relatively acceptable symmetric image quality around 49 dB [31].

Lee et.al proposed Reversible data hiding scheme based on dual stegano- images using orientation combination. An average embedding capacity of 1.07 bpp was achieved with stego image quality around 49.6 dB [32].

2.2 Transform Domain Stegnography

Transform Domain techniques are produced for covering up bigger information than picture space with better security, better intangibility and for lossy pressure. Dissimilar to spatial area in transform domain algorithms, we play out some scientific changes before inserting. The working guideline of change space depends on Discrete Cosine Transform (DCT), Discrete Fourier Transform (DFT), Discrete Wavelet Transform (DWT) and Singular Value Decomposition (SVD). These are likewise called renditions of change Domain Steganography. In change area, change coefficients are chosen in a way with the end goal that concealed data is intangible to our visual framework. It is likewise called JPEG Steganography in light of the fact that in this Steganography we

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utilize JPEG picture organize as it gives lossy pressure. JPEG pictures may make change area more secure in light of the fact that ii makes it hard to perceive the nearness or genuine nature of picture.

2.2.1 Discrete Cosine Transform Based Stegnography.

DCT coefficients are used for JPEG compression. It isolates the picture into parts of contrasting significance. It changes a flag or picture from the spatial area to the recurrence space. It can isolate the picture into high, center and low recurrence components. In low recurrence sub-band, a great part of the flag vitality lies at low recurrence which contains most essential visual parts of the picture while in high recurrence sub-band, high recurrence segments of the picture are normally expelled through pressure and commotion assaults. So the mystery message is inserted by altering the coefficients of the center recurrence sub-band, with the goal that the perceivability of the picture won't be influenced. DCT is utilized as a part of steganography as Image is broken into 8×8 pieces of pixels. DCT is characterized as

$$C(u) = a(u) \sum_{i=0}^{N-1} x_i \cos\left(\frac{(2i+1)u\pi}{2N}\right)$$

Where u, v = 0, 1, 2….N-1 Here, the input image is of size N X M. c (i, j) is the intensity of the pixel in row i and column j; C (u,v) is the DCT coefficient in row u and column v of the DCT matrix.

Jsteg

JSteg is developed by D. Upham and is a Xerox of Hide & Seek algorithm. It performs embedding in a sequential form.

It is endorsed as first Steganographic instrument which can be utilized industrially. The calculation picks Discrete Cosine change for implanting picture squares. The qualities of JSteg calculation are implanting in consecutive shape and no mystery key. The procedure of JSteg calculation is as per the following-

a) First we take message which is to be covered up and cover picture.

b) Divide cover picture into picture squares and create DCT coefficients for picture obstructs by performing Discrete Cosine Transformation.

c) Start from first DCT coefficient, if DCT ≠ 0 and DCT ≠ 1 at that point go to LSB of message and supplant DCT LSB with message LSB.

d) When required substitution is accomplished then stego picture is delivered. Effortlessly by Chi-square assault [33].

Basically the JSteg algorithm is based on the LSB (Least Significant Bits) replacement scheme in the DCT domain. This method also used for the LSB for hiding image or data [34].

In this algorithm the image or data bits are hidden in the LSB of the DCT coefficients instead of the real values of the pixels.

OUTGESS

It is a change over JSteg calculation and it is proposed by N. Demonstrates. There are two forms of Outguess: Outguess 0.1 and Outguess 0.2.The working of Outguess depends on Pseudo Random Number Generator (PRNG) which is utilized to discover the circumstance of installing bits and their frequencies. The inserting procedure of Outguess 0.1 includes the standards of Hide and Seek calculation (Randomized) and JSteg calculation. The calculation acts as takes after-

a) First we take a cover picture, partition it into pieces and afterward change over the squares into DCT coefficients.

b) Then by utilizing Pseudo Random number Generator we rearranged the coefficients arbitrarily.

c) Then we implant given data as same as in JSteg.

d) Then play out the opposite capacity on the rearranged coefficients.

e) Finally, picture is changed over into spatial area and stego picture is delivered.

After Outguess 0.1, N.Proves built up another variant of Outguess, which is called Outguess 0.2.it is more secure and much subjective approach of Outguess. Not influenced by visual assault, histogram assault and Chi-square assault yet steganalys by Blockiness.

F3 Algorithm

After Outguess 0.2, a more secure calculation is created by A. Westfeld, which is called F3. The idea driving it is that its implanting procedure is not as same as Outguess 0.1 and JSteg. It doesn't abstain from implanting bits in DCT coefficients, which are equivalent to 1 yet it dodges DC coefficients and DCT coefficients equivalent to zero. It doesn't bolster covering of bits. In the event that LSBs of DCT coefficients does not coordinate, at that point it decrements their qualities. In the wake of inserting, LSBs of non-zero coefficients coordinate with the LSBs of given message. In the event that in one time the installing procedure shouldn't be immaculate then we perform re-inserting, this procedure is characterized as shrinkage. F3 is more secure yet it likewise has a few shortcomings, which might be evacuated in next version. we can without much of a stretch break F4 by changing over stego picture into quantized DCT coefficients.

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F4 Algorithm

Re-Embedding is a weakness of F3 algorithm because more zeros are embedded than ones in a result of re-embedding and coefficients of JPEG images have odder values than even. These two points reduces the capability of F3 algorithm. For eliminating these, F4 is proposed, which is an enhanced version of F-Series.it provide a better working than F3 by also taking in account the negative coefficients. Like positive coefficients, are also of two types: negative and positive. The values are as follows: even-negative and odd-positive coefficients have values equal to 1; odd-positive and even-negative coefficients have values equal to 0.But this algorithm was not as much better as researchers were thinking.we can easily break F4 by converting stego image into quantized DCT coefficients.(little bit same as F3).

F5 Algorithm

It is created by A.Westfeld in 2001. In past calculations, limit and security both are inverse of each other. On the off chance that any calculation is giving attractive security then it doesn't give alluring inserting limit other and if any calculation is giving required limit then it doesn't give better security. Yet, character of F5 is inverse than all already specified calculations. It gives alluring limit and attractive security in parallel. Like different calculations of F-arrangement, it doesn't bolster covering of squares; it just addition or decrement the estimations of DCT coefficients as required. It presents two new instruments: Matrix Encoding and Permutation Straddling. The working of F5 is as per the following-

a) It seeks shelter picture, quality factor, shrouded message contained in a record, client secret key, PRNG for client watchword.

b) Find the RGB portrayal of cover picture

c) Evaluate quantization table as indicated by quality factor.

d) Perform pressure and store DCT coefficients after quantization.

e) Calculate approx installing limit which is equivalent to hDCT-(hDCT/64) –h(0)- h(1)+0.49h(1)

Where,

hDCT = Number of all DCT coefficients

h(0) = number of AC coefficients esteem equivalent to zero.

h(1) = number of AC coefficients esteem equivalent to 1

(hDCT/64) = number of DC coefficients

- h (1)+0.49h(1) = misfortune because of re-implanting

At that point utilizes PRNG for produce arbitrary request. In this progression we disregard DC coefficients and coefficients equivalent to zero.

f) The mystery message is parceled into fragment of n bits, and bits are implanted in a square of 2n-1 bits.

g) If message estimate is ideal for ascertained implanting limit, at that point installing strategy is proceed generally blunder happens. We evacuate that and keep installing. it is shielded from Blockiness, Chi-square assault, Histogram assault. Yet, we can steganalys it by figuring unique histogram of cover picture from stego picture. Table 4 demonstrates examination of different DCT Based Scheme utilized as a part of Image Stegnography.

Table 4: Study of Different DCT Based Scheme

Method Used	Remark	Author
This method hides secret information in JPEG compressed images according to the Quantized DCT coefficients using Shield Algorithm.	The two different tools are used to perform the analysis of images using the classification accuracy and PSNR. The Shield algorithm is giving better PSNR results from F5 and PQ, and better classification accuracy is obtained than F5 steganography tool.	Deepika Bansal et.al [35]
Discrete Cosine Transformation for gray scale images. Discrete Cosine Transformation is applied on it to generate four frequency components. A consecutive bitwise XOR is applied on it in three steps which generates a triangular form.	It obtains high image fidelity, PSNR. High Embedding capacity in stego images.	Amrita Khamruia et.al [36]
A cover image is first transformed into YCbCr color space in order to separate the lightness and chromaticity information of the image. A data payload, unrelated to the image, is embedded into DCT coefficients of the Y component (lightness) of an image. The	It is very robust to image compression, scaling and blurring. Image is imperceptible even though the number of embedded bits is high. The steganalysis of the method shows that the detection of the modification of the	Ante Poljicak et.al [37]

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security of the hidden information is ensured by the random distribution of bits which is modulated with a secret key.	image is unreliable for a lower relative payload size embedded. large capacity and offers strong robustness for moderate attacks	
DCT is used to transform original image (cover image) blocks from spatial domain to frequency domain. Discrete Cosine Transform(2-d DCT) is performed on each of the P = MN / 64 blocks. Then Huffman encoding is also performed on the secret messages/images before embedding and each bit of Huffman code of secret message/image is embedded in the frequency domain.	It provides additional three layers of security by means of transformation (DCT and Inverse DCT) of cover image and Huffman encoding of secret image. These operations and Huffman encoding of secret image keep the images away from stealing, destroying from unintended users and hence the proposed method may be more robust against brute force attack.	A.Nag et.al [38]
Mod4 steganographic method in discrete cosine transform (DCT) domain. Mod4 is a blind steganographic method. Mod4 is capable in embedding information into both uncompressed and JPEG- compressed image.	To compare Mod4 with other existing methods, carrier capacity, stego image quality, and results of blind steganalysis for 500 various images are done and observed that it provides good embedding capacity.	KokSheikWong et.al [39]
The secret data is sent by using the eigen values and eigen vectors of a transformation matrix. The eigenvalues and eigenvectors of the transformation matrix are extracted and sent as a secret key.	This method has high security because the cover image was not changed through the hiding process and the secret key and cover image send separately. It has higher data capacity than previous works because information is not embedded in cover image. In other words, information is inserted on the secret key. The main drawback of this method is change of extracted image in comparison with secret image. It should be mentioned that it is negligible against capacity and robustness	S. abbas et.al [40]
Image steganography method based on integer DCT and affine transformation. Integer DCT is an appropriate domain for steganography. the change of the DCT coefficients will damage its Laplacian-shape-like distribution.	The information bits can be extracted both completely and safely because of invertible affine transformation. The PSNR value between cover image and stego image is 31.87dB with 1.0bpp.	Xianhua Song et.al [41]
Layer-1 data embedding strategy. Tian's pixel expansion method to design our layer-1 data embedding strategy.	The hiding capacity is good while maintaining acceptable image quality of stego images. A hybrid data embedding scheme offering both reversibility and high hiding capacity properties while maintaining acceptable image quality of stego-image about 30 dB	Chia-Chen Lin et.al [42]
Mid Band DCT Coefficients	It achieves higher image clarity. It maintains the confidentiality into the cover-image pixels instead of sequentially.	SHINU et.al. [43]
He used image information hiding algorithm which bases on the HVS and MBNS. This algorithm uses the characteristics of Human Visual System (HVS) to embedded more large amounts of data	It increase the embedding capacity and decrease the distortion rate. The embedding capacity largely by dividing the cover image into their types area and embedding the secret data.	Ren Chen et.al. [44]
Genetic Algorithm based image authentication technique in frequency domain using Haar Wavelet transform has been used.	It obtains better image fidelity and high PSNR. The payload may be increased based on the requirement.	Amrita Khamrui et.al.[45]

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Histogram shift, in which two empty bins are produced in the image histogram that are then filled up using their neighboring bins through the embedding process.	This method solves the distortion problem with the HKC algorithm and hence thwarts the Kuo attack. It is resistant against the RS and histogram based steganalysis tools.	Yalda Mohsenzadeh et.al [46]

2.2.2 Discrete Wavelet Transform (DWT)

The Discrete Wavelet Transform can distinguish parts of cover picture where mystery information could be viably covered up. DWT parts data into its high and low recurrence segments. The high recurrence part of the flag contain insights about the edge segments, while the low recurrence part contains the greater part of the flag data of the picture which is again part into higher and bring down recurrence parts. For each level of disintegration in two dimensional applications, first DWT is performed in the vertical bearing took after by flat heading.

A wavelet is a small wave which oscillates and decays in the time domain. The Discrete Wavelet Transform (DWT) is a relatively recent and computationally efficient technique in computer science. Wavelet analysis is advantageous as it performs local analysis and multi-resolution analysis. To analyze a signal at different frequencies with different resolutions is called multi-resolution analysis (MRA). Wavelet analysis can be of two types: continuous and discrete. In this paper, discrete wavelet transform technique has been used for image steganography. This method transforms the object in wavelet domain, processes the coefficients and then performs inverse wavelet transform to represent the original format of the stego object [47].

Embedding Procedure

1. The cover picture is crumbled into three shading planes. They are R (Red) plane, G (Green) plane and B (Blue) plane keeping in mind the end goal to implant mystery pictures into each shading plane.
2. Each shading plane of the cover picture is then disintegrated utilizing DWT into 4 non-covering sub-groups. These are LL (estimation coefficients), LH (vertical points of interest), HL (flat subtle elements) and HH (corner to corner details).The LL sub-band is handled to acquire the following estimation of wavelet coefficients until some last esteem "N" is come to. At this stage, we have 3N+1 sub-groups. These comprises of (LLX), (LHX), (HLX) and (HHX) where estimation of "X" ranges from 1 to "N".
3. The division of the planes is finished by utilizing Haar channels 5. On the off chance that a DWT coefficient is changed, it will adjust the district comparing to that coefficient. Here we can see the misuse of the covering impact of HVS (Human Visual System).
4. Mystery pictures are likewise broken down into four sub-groups (LL, LH, HL, HH). The LL sub-band is additionally handled to get the following estimation of wavelet coefficients. Data contained in the LL sub-band of mystery pictures is independently inserted into various groups of cover pictures.
5. In the wake of inserting the mystery picture bits into three shading planes of cover picture, reverse change (IDWT) is performed to recover them. These three planes are then joined to produce the last shading stego picture.

Mystery Image Extraction

1. Stego picture is decayed into three shading planes (R, G and B).
2. Each shading plane of the stego picture is separated into non-covering sub-groups. The sub-groups are LL, LH, HL and HH. The LL sub-band is prepared further to acquire the following size of wavelet coefficients utilizing Haar DWT.
3. Mystery pictures are removed from the comparing inserted recurrence groups of shading planes.

The working of Embedding and Extraction is appeared in figure 5 and figure 6 [48].

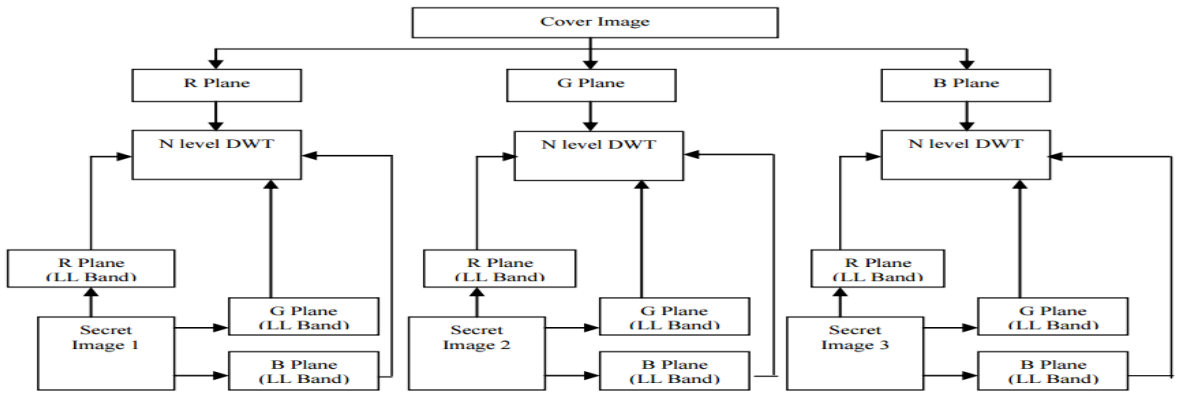

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Figure 5: Embedding Procedure

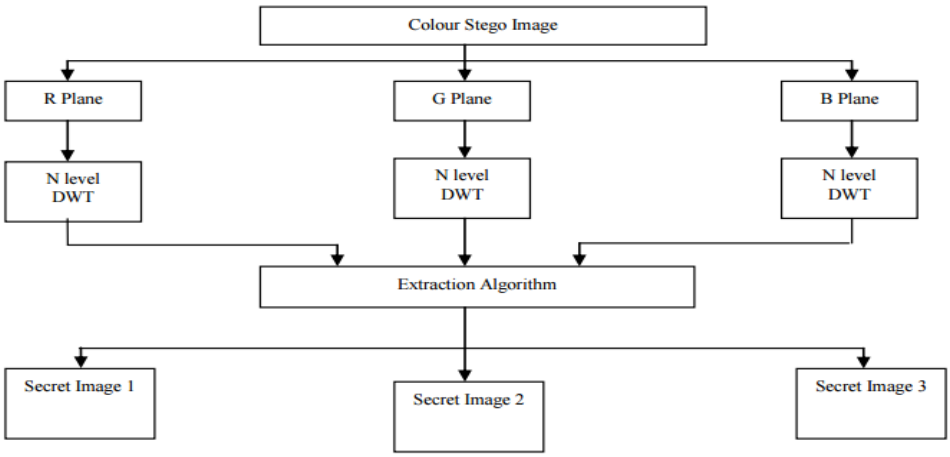

Figure 6: Extraction Procedure

JPEG Based Stegnography

JPEG files use data–loss compression. Redundant graphical information is discarded by this method without a significant impact on the picture. It is possible to achieve much better compression ratio that way than with the lossless compression. JPEG is a standard [6] that prescribes a sequence of operations that are performed with visual data. These operations are:

(1) The color sub sampling,
(2) The discrete cosine transforms,
(3) The quantization of DCT coefficients,
(4) The final variable length code word (VLC) encoding. JPEG defines four modes that can be supported by encoders and decoders: sequential DCT-based, progressive DCT-based, hierarchical, and lossless mode. It uses 8- bit color samples, the calculation of discrete cosine transform, quantization, and the result of this process is encoded with a VLC. Any encoder and decoder have to support this mode of processing image data. Other modes are only optional. The number of applications and libraries working with the JPG format uses this fact and does not support them. Figure 7 and Figure 8 shows detail working of JPEG Encoder and JPEG Decoder. The Analysis of various Transform Domain Techniques is shown in Table 5.

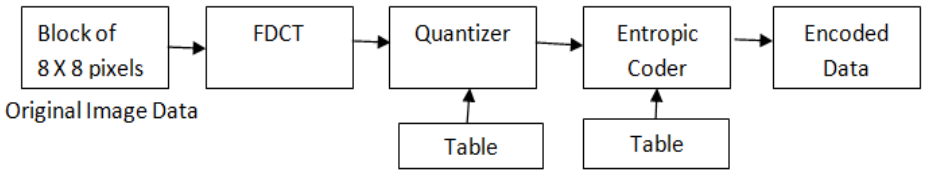

Figure 7: JPEG Encoder.

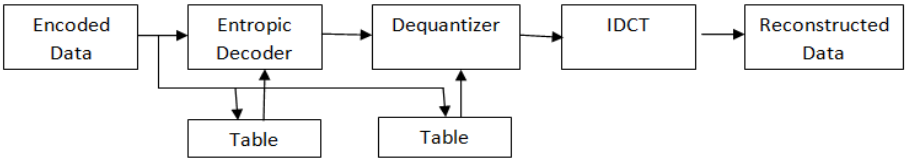

Figure 8: JPEG Decoder.

Table 5 : Analysis of Transform Domain Techniques		
Method Used	**Remark**	**Author**
Binary images, color images, and large text files can be all concealed within a single cover image at the same time using Haar Wavelet transform.	A high capacity of about 99% has been achieved using the Haar Wavelet transform, with low mean square error (MSE) and high power signal-tonoise ratio (PSNR). Size of the concealed secret text file equals to about 752640 bits which is equivalent to 107520	Hamad A et al [49]

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	letters.	
Frequency domain is used to embed secret bits in the higher frequency components of the cover image by applying 2D-Haar DWT on cover image .To enforce the security three ways technique has been used. At first, a decimal array from the secret bits is formed. Secondly, a dynamic block containing values from three different higher frequency components is constructed and lastly bits are embedded in some selected portions of the block.	It exhibits high fidelity data hiding in the frequency domain by embedding data in selected image blocks from DWT sub-bands. The method exhibits increase in the quality of stego image because secret messages are embedded in high frequency sub-bands which is imperceptible to the Human Visual System. It shows better PSNR value than of LSBR. It performs better than JSTEG	Sabyasachi Kamila et.al [50]
Two different techniques are used one using three level wavelet decomposition taking a single plane of the cover image for embedding and processing the image as 4 x 4 blocks with swapping and another using single level wavelet decomposition.	The stego-image is looking perfectly intact and has high peak signal to noise ratio value. An unintended observer will not be aware of the very existence of the secret-image. The extracted secret image is perceptually similar to the original secret image.	T. Narasimmalou et.al [51]
Data hiding of important information is done using DWT (Discrete wavelet transforms) and back propagated neural network considering LSB. This method works by a combinational wavelet transformation and Neural Network classification. The image is first segmented using wavelet transformation and then furthermore the segmented bits are send for the classification using Neural Network .It signifies those bits where the data can be embedded and leaves those bits which has a greater threshold than that of the Neural threshold.	The PSNR value and the valuable decrease in the Mean Square Error value with DWT and Neural Network. It shows 90.12 PSNR and .00156 MSE as compare to vector Quantization	Anupriya Sohal et.al [52]
Lempel–Ziv–Welch (LZW) compression and set partitioning in hierarchical trees (SPIHT) codec are used to obtain a low bit rate and high econstructed quality image compression. In the embedding process, an adaptive phase modulation (APM) mechanism and discrete Fourier transform (DFT) were adopted for secret data embedding.	In these first 256 codes were used, each byte in the original file would be converted into 12 bits in the LZW encoded file, resulting in a 50% larger file size. During uncompressing, each 12 bit code would be translated via the code table back into the single bytes. The adaptive phase modulation technique that has the nearest phase selection strategy is used to improve the imperceptibility of the cover image.	Asghar shahrzad khashandarag et.al [53]
Region of interest coding using partial SPIHT (P-SPIHT) used. P-SPIHT evaluates the probability of the significant coefficients (P1) in each bit plane. Then it codes each bit plane independently and according to its P1. The algorithm uses integer-to-integer shape adaptive discrete wavelet transform (ISA-DWT)	The ROI region has a circular shape and its center is located in the middle of the image, and it occupies about 12% of the total image area. The ROI region is coded using the 5/3 filter and the background is coded lossy using the 9/7 filter. the ROI region losslessly using the proposed ROI-based P-SPIHT coder provides higher compression than ROI-based. SPIHT by 10.7% on the average. The bits rates of P-SPIHT are lower that SPIHT	Ahmed Abu-Hajara et.al [54]

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which has the flexibility of transforming any number of isolated arbitrary shape ROI regions.	due to the efficiency of sorting the data, but they have the same image quality because P-SPIHT selects Mode_1 at low bit rate.	
The embedded zerotree wavelet algorithm (EZW). The EZW algorithm is based on four key concepts: 1) a discrete wavelet transform or hierarchical sub band decomposition, 2) prediction of the absence of significant information across scales by exploiting the self-similarity inherent in images, 3) entropy-coded successive-approximation quantization, and 4) universal lossless data compression which is achieved via adaptive arithmetic coding.	PSNR performance at rates between 0.25 and 1 bit/pixel. Image is encoded first using JPEG to a file size of 12 866 bytes, or a bit rate of 0.39 bpp. The PSNR in this case is 26.99 dB. The precise rate control that is achieved with this method is a distinct advantage. The user can choose a bit rate and encode the image to exactly the desired bit rate.	J.M. Shapior et al [55]
Digital image watermarking is resistant to geometric transformations. A private key, which allows a very large number of watermarks, determines the watermark, which is embedded on a ring in the DFT domain. The watermark possesses circular symmetry. Correlation is used for watermark detection. The original image is not required in detection.	This method is robust to several image processing attacks such as filtering, noise addition, scaling, rotation, cropping, JPEG compression. Due to rotation property and the division of the watermark domain in sectors, the watermark is detectable after a small rotation (up to 3^0). Correlation with rotated watermarks for several angles can detect a watermark for any rotation angle of the watermarked image.	V. Solachidis et al [56]
Any lossy image compressor may be applied first to a cover image to produce a lossily-processed result as the basis for embedding data in the cover image. The stego-image is produced by embedding data in each pixel of a cover image by changing its gray value without excessing the range of the gray value difference of the corresponding pixels of the cover image and its lossily-processed one. The quantity of distortion that is caused by embedding data is never in excess of that is caused by the lossy compressor. A multipie-based number system is used to convert the information in the secret bit stream into values to be embedded in the choosing pixels of the cover image.	It is seen from the observed that the RMSE values become smaller and the PSNR values become larger, which means that the distortion caused by embedding data in the stego-images are not more than those of the JPEG-processed results, so the resulting stego-images are lossily-processed one. more imperceptible than the lossily-processed one.	D.C. Wu et al [57]
First, they use a wavelet transform in order to obtain a set of biorthogonal subclasses of images; the original image is decomposed at different scales using pyramidal algorithm architecture. The decomposition is along the vertical and horizontal directions and maintains constant the number of pixels required to describe the	This method enables high compression bit rates while maintaining good visual quality through the use of bit allocation in the subimages. The blocking effects seen when spatial VQ is performed are avoided. This method is well adapted to progressive transmission as well as very low bit rate compression.	M. Antonini et al [58]

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image. Second, according to Shannon's rate distortion theory, the wavelet coefficients are vector quantized using a multiresolution codebook.		
Transformation of a spatial domain cover image into a frequency domain image using the Haar digital wavelet transform (HDWT) method, compresses the coefficients of the high frequency band by the Huffman (or arithmetic) coding method, and then embeds the compression data and the secret data in the high frequency band. Since the high frequency band incorporates less energy than other bands of an image, it can be exploited to carry secret data.	It is very simple reversible data hiding method and it can also give a high hiding capacity. Maintains good stego-image quality. It can provide a better performance than most other proposed hiding methods	Y. K. Chan et al [59]
This method modifies the quantization table first. Next, the secret message is hidden in the cover-image with its middle-frequency of the quantized DCT coefficients modified. Finally, a JPEG stego-image is generated. JPEG is a standard image and popularly used in Internet. The stego-image will not be suspected if we could apply a JPEG image to data hiding.	It increases the message load in every block of the stego-image while keeping the stego-image quality acceptable. The requirement of steganography with a larger message capacity than that of Jpeg–Jsteg.	C. C. Chang et al [60]
The image copyright protection against illegal use by attackers for security hiding image in a plain image. The attacker is unable to retrieve secret messages from the plain image in which they were hidden. So he does not know the contents of secret image unless he has the ability to decipher the plain image.	The attacker is unable to remove or severely destroy the hidden watermarks even he knows what the contents of watermarks.	C.T. Hsu et al [61]

2.3 Speed Spectrum Image Stegnography.

Spread spectrum communication portrays the way toward spreading the transmission capacity of a narrowband motion over a wide band of frequencies. This can be refined by adjusting the narrowband waveform with a wideband waveform, for example, background noise. In the wake of spreading, the vitality of the narrowband motion in any one recurrence band is low and in this manner hard to identify. SSIS works by putting away a message as Gaussian commotion in a picture. At low clamor control levels, the picture debasement is imperceptible by the human eye, while at more elevated amounts the commotion shows up as dots or "snow." The procedure comprises of the accompanying significant strides, as delineated in figure 9.

1. Make encoded message by including excess through mistake redressing code.
2. Add cushioning to make the encoded message an indistinguishable size from the picture.
3. Interleave the encoded message.
4. Create a pseudorandom clamor grouping, n.
5. Utilize encoded message, m utilizing propelled encryption standard (AES) to balance the succession, creating clamor.
6. Consolidate the clamor with the first picture, f. Recuperate the shrouded message. A channel is utilized to remove the commotion from the stegoimage, bringing about a guess of the first picture. The better this channel works the less blunders in the separated message.

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The reverse process, of extracting and restoring the original message, is of course very similar and as illustrated in figure 10:

1. Filter the stegoimage, g, to get an approximation of the original image, f.
2. Subtract the approximation of the original image from the stegoimage to get an estimate of the noise, s, added by the embedder.
3. Generate the same pseudorandom noise sequence, n.
4. Demodulate by comparing the extracted noise with the regenerated noise.
5. Deinterleave the estimate of the encoded message, m, using advanced decryption standard (ADS) and remove the padding.
6. Use error-correcting decoder to repair the message as needed.

III. IMAGE QUALITY MEASURE.

A decent target quality measure should well mirror the bending on the picture due to, for instance, obscuring, commotion, pressure, sensor

.

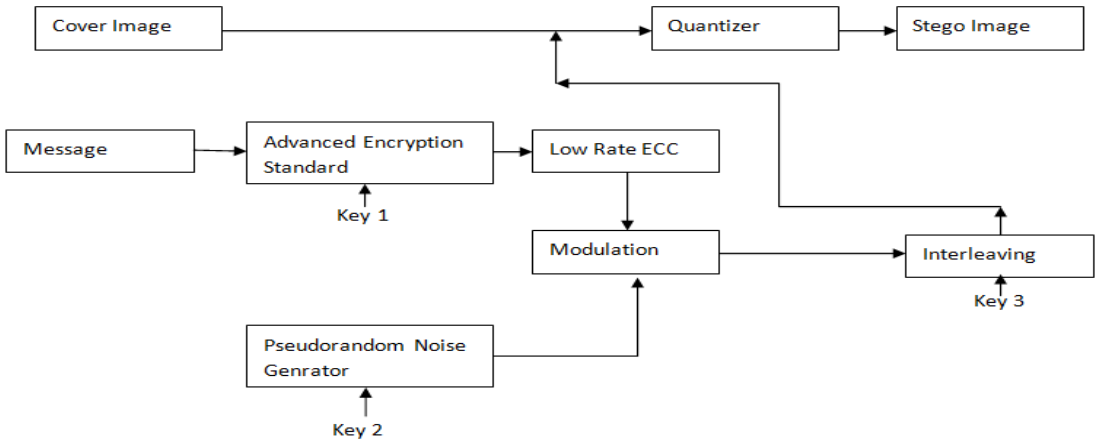

Figure 9: SSISAE Encoder

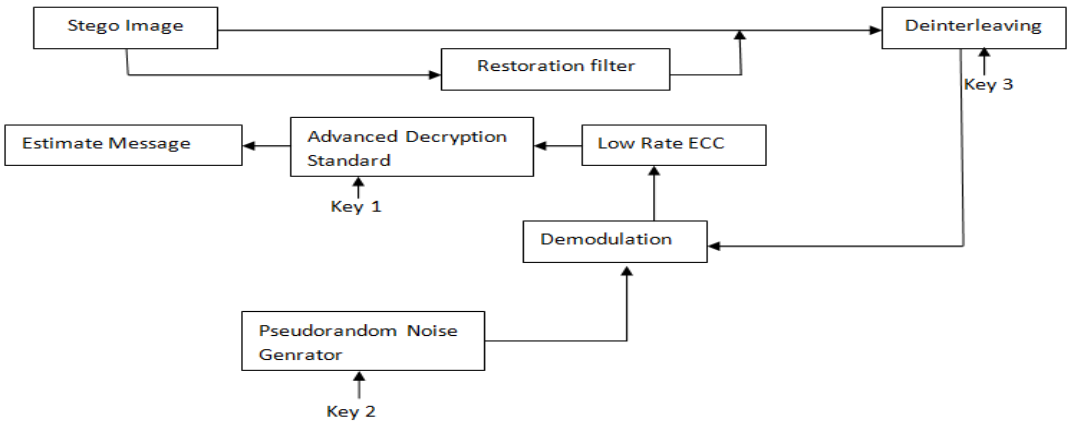

Figure 10: SSISAE Decoder.

insufficiency. One expects that such measures could be instrumental in foreseeing the execution of vision-based calculations, for example, highlight extraction, picture based estimations, location, following, division and so forth errands. In the subjective evaluation of measures attributes of the human observation winds up noticeably central, and picture quality is corresponded with the inclination of a spectator or the execution of an administrator on some particular errand.

In the image coding and computer vision literature, the raw error measures based on deviations between the original and the coded images are overwhelmingly used [62,63,64],Mean Square Error (MSE) or alternatively Signal to Noise Ratio (SNR) varieties being the most common measures. The reason for their widespread choice

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is their mathematical tractability and it is often straightforward to design systems that minimize the MSE. Raw error measures such as MSE may quantify the error in mathematical terms, and they are at their best with additive noise contamination, but they do not necessarily correspond to all aspects of the observer's visual perception of the errors [65,66], nor do they correctly reflect structural coding artifacts.

Target picture quality measures depend on picture highlights, a useful of which, connects well with subjective judgment, that is, the level of (dis)satisfaction of a spectator [67]. The enthusiasm for creating target measures for surveying mixed media information lies in the way that subjective estimations are exorbitant, tedious and not effortlessly reproducible. Target measures are likewise used in execution expectation of vision calculations against quality misfortune because of sensor deficiency or pressure antiques [68].

A decent picture quality measure ought to be precise, steady and monotonic in foreseeing quality. With regards to steganalysis, expectation exactness can be deciphered as the capacity of the measure to identify the nearness of information with least mistake by and large. Also, expectation monotonicity implies that picture quality measure scores ought to in a perfect world be monotonic in their relationship to the quality of the watermark flag. At last, expectation consistency identifies with the quality measure's capacity to give reliably precise forecasts to a substantial arrangement of picture sorts. The steganalysis procedure depends on relapse investigation of various "unmistakable" picture quality measures. Henceforth, quality measures those are touchy particularly to watermarking and obscuring impacts. As it were, those measures for which the inconstancy in score information can be clarified preferred due to treatment fairly over as irregular varieties because of the picture set. The picture quality measure is appeared in table 6.

Table 6 : Image Quality Measure

Criteria	Metric Evaluation
Pixel difference-based measures such as mean square distortion;	Mean Square Error, Mean Absolute Error, Modified Infinity Norm, L*a*b* Perceptual Error, Neighborhood Error, Multiresolution Error, Signal to Noise Ratio (SNR), Peak SNR (PSNR), Video Quality Expert Group (VQEG),
Correlation-based measures, that is, correlation of pixels, or of the vector angular directions	Normalized Cross-Correlation, Image Fidelity, Czenakowski Correlation, Mean Angle Similarity, Mean Angle-Magnitude Similarity
Edge-based measures, that is, displacement of edge positions or their consistency across resolution levels	Pratt Edge Measure , Edge Stability Measure
Spectral distance-based measures, that is Fourier magnitude and/or phase spectral discrepancy on a block basis	Spectral Phase Error , Spectral Phase-Magnitude Error, Block Spectral Magnitude Error, Block Spectral Phase Error, Block Spectral Phase-Magnitude Error
Context-based measures, that is penalties based on various functionals of the multidimensional context probability;	Rate Distortion Measure, Hellinger distance, Generalized Matusita distance, Spearman Rank Correlation.
Human Visual System-based measures, measures either based on the HVS weighted spectral distortion measures or (dis)similarity criteria used in image database browsing functions	HVS Absolute Norm, HVS L2 Norm, Browsing Similarity, DC Tune

IV. CONCLUSION:

In this paper, we surveyed a portion of the crucial concepts, performance measures and other critical parameters that effect Image steganography. Distinctive approaches to implant mystery bits with different sorts, their benefits and negative marks are examined. There are three distinctive ways to deal with configuration secure, high limit picture steganography framework: (a) Choose reasonable cover picture shape the database. (b) Select fitting inserting areas (c) Use scrambled variant of mystery information for implanting. Every one of these potential outcomes is examined in detail.

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