High Capacity Reversible Data Hiding Technique Framed for Experimentation with PSO

Simran Uppal, Harpreet Kaur, Parul Sharma

***Abstract*: In this paper we have studied the reversible data hiding techniques. We have seen previous techniques and also carefully analyzed the high capacity reversible data hiding method in MSB. We have proposed a model with particle swarm optimization which will work in future with HCRDH to ensure improvement in several parameters like precision and PSNR. We want to contribute towards a proposed method before actual experimentation and results are worked for.**

***Index Terms*: High Capacity Reversible data hiding, Most Significant Bit, Reversible data hiding.**

I. INTRODUCTION

Advanced picture security assumes a critical job in all fields, particularly in exceptionally classified regions like the military and restorative universes. By the advent of computer technology the internet and soft filing of data has increased uncountable times. The security of the data has emerged as one of the most important issues in the line of what we can say a fully secured world. The computer technology can affect the security in a huge manner. The point of encryption strategies is to ensure information protection by completely or somewhat randomizing the substance of unique pictures [1]. Amid the transmission or the filing of scrambled pictures, usually important to investigate or to process them without knowing the first substance, or the mystery key utilized amid the encryption stage [2].

Since quite a while, the security of mixed media information is ending up essential. The insurance of this mixed media information should be possible with encryption or information concealing calculations. To diminish the transmission time, the information pressure is fundamental. Since couple of years, another issue is endeavoring to consolidate in a solitary advance, pressure, encryption and information covering up. Up until this point, couple of arrangements has been proposed to join picture encryption and pressure for instance. These days, another test comprises to insert information in scrambled pictures. Since the entropy of encoded picture is maximal, the installing step, thought about like clamor, is beyond the realm of imagination by utilizing standard information concealing calculations. Another thought is to apply reversible information concealing calculations on encoded pictures by wishing to evacuate the inserted information before the picture unscrambling. [3] ongoing reversible information concealing strategies have been proposed with high limit, however these techniques are not material on encoded pictures. In this paper we propose an examination of the nearby standard deviation of the stamped scrambled pictures so as to evacuate the inserted information amid the unscrambling step. We have connected our strategy on different pictures, and we appear and break down the got outcomes.

As the inadequate coding is an estimation arrangement, the main leftover mistakes are encoded and self-implanted inside the spread picture [4]. Besides, the scholarly lexicon is likewise installed into the encoded picture. Because of the ground-breaking portrayal of meager coding, a substantial cleared room can be accomplished, and subsequently the information hider can insert progressively mystery messages in the scrambled picture. Broad trials exhibit that the proposed technique altogether beats the cutting edge strategies as far as the inserting rate and the picture quality.

Lately, flag preparing in encoded pictures got much consideration from the scholarly world because of the security protecting property. Reversible information stowing away in scrambled pictures is a procedure that inserted extra information into an encoded picture without getting to the substance of the first picture, the implanted information can be removed and the scrambled picture can be recouped to the first one [5]. Two reversible information concealing strategies in scrambled pictures, to be specific a joint strategy and a distinct technique, are presented by receiving expectation blunder. In the joint technique, information extraction and picture recreation are performed in the meantime. The reversibility, number of off base removed bits is essentially improved while keeping up great visual nature of recouped picture, particularly while installing rate is high. In the distinguishable technique, information extraction and picture recuperation are isolated. The divisible technique likewise gives improved reversibility and great visual nature of recouped picture for high payload installing.

II. LITERATURE REVIEW

Customarily [6], information installing strategies go for keeping up high-yield picture quality with the goal that the contrast between the first and the inserted pictures is subtle to the exposed eye. As of late, as another pattern, a few scientists abused reversible information installing strategies to intentionally corrupt picture quality to an attractive dimension of twisting. In this paper, brought together information implanting scrambling method called UES is proposed to accomplish two goals at the same time, to be specific, high payload and versatile adaptable quality debasement. Initial, a pixel force esteem expectation technique called checkerboard-based forecast is proposed to precisely anticipate 75% of the pixels

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in the picture dependent on the data acquired from 25% of the picture. At that point, the areas of the anticipated pixels are emptied to insert data while corrupting the picture quality. Given an attractive quality (evaluated in SSIM) for the yield picture, UES manages the inserting scrambling calculation to deal with the definite number of pixels, i.e., the perceptual nature of the installed mixed picture can be controlled. Moreover, the forecast blunders are put away at a foreordained exactness utilizing the structure side data to flawlessly reproduce or rough the first picture. Specifically, given an attractive SSIM esteem, the accuracy of the put away forecast mistakes can be acclimated to control the perceptual nature of the reproduced picture. Trial results affirmed that UES can splendidly remake or surmised the first picture with SSIM esteem after totally debasing its perceptual quality while inserting at 7.001 bpp by and large.

This paper [7] tells us about the advent of changes due to the digital technologies. In advanced and modern storage systems and utilities the digital data has to be stored in encrypted formatted. The format of data can be anything, even videos, as videos are required to be saved in digital encrypted format. The point made in this work is around the hiding of the data in the encrypted videos which are comparatively more complex structure of the video itself. A novel scheme is given in this work to hide the data in encrypted formats using code words and predictions. By this method the data hiding can be done in the original video without decrypting the original content of the video.

This paper [8] examines the utilization of nearby expectation in distinction extension reversible watermarking. For every pixel, a least square indicator is figured on a square fixated on the pixel and the relating expectation mistake is extended. A similar indicator is recouped at location with no extra data. The proposed nearby expectation is general and it applies paying little respect to the indicator request or the forecast setting. For the specific instances of least square indicators with a similar setting as the middle edge finder, angle balanced indicator or the straightforward rhombus neighborhood, the nearby expectation based reversible watermarking unmistakably beats the best in class plans dependent on the traditional partners. Test results are given.

This paper [9] proposes a novel method of data hiding technique by means of watermarking in the lossless manner without using the map for the location of the image and coder. This uses prediction error to make changes in the image. Sorting technique is use to find more space in the order of the image to hide data. The performance of the method is proved against its competitors. The algorithm is fast and takes up less computational space in the systems when tested on grounds of computation costs.

This correspondence proposes [10] a system of reversible information concealing (RDH) in a scrambled JPEG bit stream. Dissimilar to existing RDH techniques for encoded spatial-area pictures, the proposed strategy goes for scrambling a JPEG bit stream into an appropriately sorted out structure, and implanting a mystery message into the encoded bit stream by marginally altering the JPEG stream. We distinguish usable bits reasonable for information stowing away with the goal that the scrambled piece stream conveying mystery information can be effectively decoded. The mystery message bits are encoded with mistake amendment codes to accomplish an ideal information extraction and picture recuperation. The encryption and inserting are constrained by encryption and implanting keys individually. On the off chance that a beneficiary has both keys, the mystery bits can be separated by examining the blocking ancient rarities of the neighboring squares, and the first bitstream impeccably recouped. In the event that the beneficiary just has the encryption key, he/she can in any case disentangle the bitstream to get the picture with great quality without separating the shrouded information

This paper [11] presents a reversible or lossless watermarking calculation for pictures without utilizing an area map much of the time. This calculation utilizes forecast mistakes to insert information into a picture. An arranging strategy is utilized to record the forecast mistakes dependent on greatness of its nearby difference. Utilizing arranged expectation mistakes and, if necessary, however seldom, a decreased size area map enables us to install more information into the picture with less contortion. The execution of the proposed reversible watermarking plan is assessed utilizing diverse pictures and contrasted and four strategies.

Reversible data inserting (RIE) [12] is a method changing host signals and the message into the stego-signals, and the stego-signs can be lossless turned around to the host signals and the message. We think about the conditions: 1) the host signals are made out of dark scale free and indistinguishably disseminated (i.i.d.) tests; 2) the mean squared blunder is received as the proportion of twisting; and 3) the method is a scalar methodology, i.e., the encoder just peruses a host flag and after that yields the relating stego-motion in every emphasis. In this paper, we propose an iterative calculation to ascertain the flag change probabilities approximating the ideal rate-mutilation bound. At that point we propose an unequivocal execution to install a message in an i.i.d. have succession. The analyses demonstrate that the proposed strategy intently approaches the normal rate-twists in i.i.d. dim scale signals. By the picture expectation demonstrate, the proposed strategy can be connected to dark scale pictures. The technique for PSO [13] was found through reproduction of a rearranged social model; in this manner the social illustration is examined, however the calculation remains without allegorical help. This paper portrays the molecule swarm advancement idea regarding its forerunners, quickly inspecting the phases of its improvement from social recreation to analyzer. Examined next are a couple of ideal models that execute the idea. At long last, the usage of one worldview is talked about in more detail, trailed by results acquired from applications and tests whereupon the worldview has been appeared to perform effectively.

III. HIGH CAPACITY RDH

HighCapacity RDH is the recently proposed strategy. On the off chance that a picture is encoded, it is hard to distinguish on the off chance that it contains a shrouded message or not [14]. Truth be told, the pixel estimations of an encoded picture are pseudo arbitrarily produced. In this way, there is no connection between's a pixel and its nearby neighbors. Therefore, they propose to utilize the MSB esteems rather than the LSB esteems to implant the shrouded message. With this methodology, in the scrambled area, secrecy is as yet the equivalent and amid the unscrambling, the forecast of the MSB esteems is simpler to get than those of the LSB. They initially present the worldwide plan of our proposed strategy for

distinguishable reversible information covering up in the encoded area. They recommend implanting the mystery message by MSB substitution. As the estimations of the supplanted MSB are lost amid the information concealing stage, it is important to have the capacity to foresee them without mistakes amid the translating stage. In the second piece of this segment, we present two conceivable methodologies in detail considering the most critical requirement which can be the completely reversibility (PSNR $\rightarrow +\infty$) or the greatest limit. The principal approach, which isn't completely reversible, yet where we can insert one piece for each pixel, is called high-limit reversible information concealing methodology with adjustment of expectation blunders (CPE-HCRDH). The second methodology, where the first picture is superbly recreated, however where we need to adjust the to-be embedded message, is called high-limit reversible information concealing methodology with inserted forecast blunders (EPE-HCRDH).

TABLE I: Comparison of literature reviewed

S no.	Ref no.	Title	Application	Technique
1	[6]	A unified data embedding and scrambling method.	Hiding in distorted images	UES: Unified embedding scrambling
2	[7]	Data hiding in encrypted H. 264/AVC video streams by codeword substitution.	Security and Protection	Encryption, embedding and extraction
3	[8]	Local-prediction-based difference expansion reversible watermarking.	Use of local Predictor	Reversible watermarking
4	[9]	An improved reversible data hiding in encrypted images using side match.	Data hiding in Encrypted images	Side match scheme
5	[10]	Reversible data hiding in encrypted JPEG bitstream.	RDH encryption	Encryption and embedding keys
6	[11]	Reversible watermarking algorithm using sorting and prediction.	Lossless watermarking	Prediction errors
7	[12]	The scalar scheme for reversible information-embedding in gray-scale signals: Capacity evaluation and code constructions.	Reversible information embedding	Iterative algorithm for signal transition
8	[13]	Particle swarm optimization.	Optimization	Algorithm inspired by particle swarm natural methods.

Fig 1: Original Image

Fig 2: Error location

Fig 3: Pre processed image

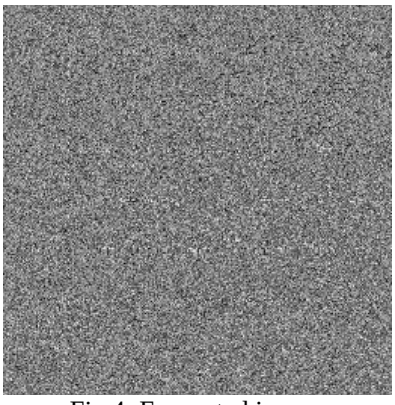

Fig 4: Encrypted image

Fig 5: Reconstructed image.

IV. HIGH CAPACITY RDH WITH PARTICLE SWARM OPTIMIZATION

Molecule swarm streamlining will be utilized to limit the MSB mistake in high limit RDH. Molecule Swarm Optimization (PSO) is an advancement technique that is populace based and was first created in 1995 by Dr. James Kennedy and Dr. Russell Eberhart [13]. This strategy looks for the ideal arrangement utilizing a populace of particles. The inquiry begins by thinking about every molecule as the hopeful arrangement. The PSO calculation is enlivened by the conduct of people, fish, bugs, or herd of flying creatures, where the people search for the best arrangement in an issue dimensional space. Take a swarm of honey bees for example looking for sustenance. These honey bees move in an efficient way where they won't crash into one another. Contrasting the swarm of honey bees with PSO particles, it is trusted that the individual particles update their molecule positions and speeds via looking for their past best position expected up until now. It at long last leads them to an ideal arrangement where the particles merge.

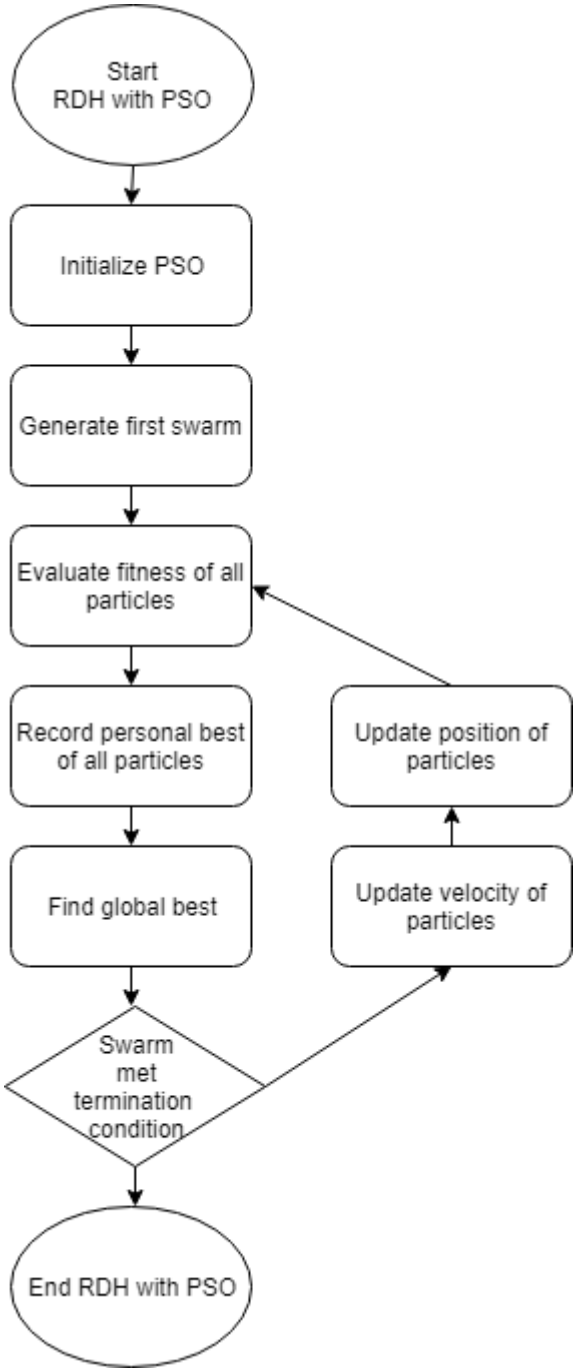

Fig 6: Flow chart

The point of this technique is to locate the best performing individual among the entire gathering. It is utilized to illuminate more extensive scopes of complex distinctive streamlining issues, for example, work minimization and augmentation. Coming up next are key terms related with PSO: Particle: A person inside the swarm. Position: A molecule's dimensional directions speaking to the answer for the Problem. Swarm: Total populace of particles. Wellness: A capacity that gives the interface between the streamlining issue and that physical issue, and intensifies the precision of the arrangement inside the situation in the arrangement space. For blunder minimization in high limit RDH we can fluctuate numerous things to acquire least mistake results.

Factors like c1 and c2 can be moved to control the development of particles and idleness can be differed to control the union in PSO.

V. OTHER REFINED METHODS OF DATA HIDING

In our literature survey some other method were found in researches and surveys. A histogram [15] based method was found, a method with hiding based ion embedding domain [16] was found. One of the methods was based on difference expansion [17] and on cryptography [18]. A novel method of selective encryption [19] of uncompressed images was found along with prediction error based [20], Separable error free [21], Estimation based encryption [22] and other major surveys [23] of the data hiding techniques. Apart from these a lossless and reversible method [24] and a secure method based on key modulation [25] was found.

Some latest methods were also reviewed. One of them is MHM i.e. multiple histogram modification [26]. This technique has been in practice in latest developments. This new technique has found big attention in recent years. This technique can be modified to get excellent hiding capacity in normal domains. Despite the fact the maximum hiding per pair is one the performance of the method in very good in general images and in critical image locations. This can be taken as negative point for the also but still it performs very well. To improve on this point an improved MHM algorithm was made which seeds only one pixel out of the pair, hence removing the disadvantage. Further the embedding process is enhanced using bin selection in this technique. Further multiple PEH are allowed to embed for more enhanced process. Results depict the better performance of this technique.

Another technique which is latest is contrast enhancement [27]. In reversible data hiding several contrast enhancement (CE) methods are produced in the past but this technique is bit different because of the fact that this does not use one dimensional histogram. In these particular technique 2 dimensional techniques has been used. A preprocessing strategy is used to merge 2 dimensional bins. The changes are minimized using the lowest bins. The testing of two different sets has proved the better performance of CE method of this type.

Other latest methods include histogram methods. There is a work on Multiple histogram method [28] and one on two dimensional histogram method [29].

VI. COMPARISON

After careful study the following predictive improvements can be predicted in high capacity RDH with PSO**.**

TABLE II: Comparison of Proposed work to be done and previous work

Parameter	**HCRDH**	**HCRDH with PSO in Error Prediction**
Error prediction	Slow	Fast
Precision	Low	High
Parallel computation	No	Yes
Robustness	Low	High
PSNR	Moderate	Expected to increase
Entropy	Moderate	Expected to increase

VII. CONCLUSION

This proposal paper tries to show the advantages that using PSO is going to have if used in error prediction high capacity reversible data hiding. We have given full description of the previously proposed HCRDH and also stated how PSO can help in reducing the error in the same. In the prediction model it was seen the six parameter can be seen improving after we implement HCRDH in future which are Error prediction, Precision, Parallel computation, Robustness, PSNR and Entropy.

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