International Journal on Future Revolution in Computer Science & Communication Engineering (IJFRCSCE)
ISSN: 2454-4248 Volume: 8 Issue: 1
DOI: https://doi.org/10.17762/ijfrcsce.v8i1.2108
***Article Received**: 24 December 2021 **Revised**: 16 February 2022 **Accepted**: 22 February 2022 **Publication**: 31 March 2022*

Design and Analysis of Reversible Data Hiding Using Hybrid Cryptographic and Steganographic approaches for Multiple Images

[1]Bhumika Singh, [2]Saroj Hiranwal
[1]M. Tech. Scholar, Department of Computer Science & Engineering, RIET, Jaipur, Rajasthan
[2]Professor, Department of Computer Science & Engineering, RIET, Jaipur, Rajasthan
E-Mail: bhumi09.com@gmail.com

.

Abstract

Data concealing is the process of including some helpful information on images. The majority of sensitive applications, such sending authentication data, benefit from data hiding. Reversible data hiding (RDH), also known as invertible or lossless data hiding in the field of signal processing, has been the subject of a lot of study. A piece of data that may be recovered from an image to disclose the original image is inserted into the image during the RDH process to generate a watermarked image. Lossless data hiding is being investigated as a strong and popular way to protect copyright in many sensitive applications, such as law enforcement, medical diagnostics, and remote sensing. Visible and invisible watermarking are the two types of watermarking algorithms. The watermark must be bold and clearly apparent in order to be visible. To be utilized for invisible watermarking, the watermark must be robust and visibly transparent. Reversible data hiding (RDH) creates a marked signal by encoding a piece of data into the host signal. Once the embedded data has been recovered, the original signal may be accurately retrieved. For photos shot in poor illumination, visual quality is more important than a high PSNR number. The DH method increases the contrast of the host picture while maintaining a high PSNR value. Histogram equalization may also be done concurrently by repeating the embedding process in order to relocate the top two bins in the input image's histogram for data embedding. It's critical to assess the images after data concealment to see how much the contrast has increased. Common picture quality assessments include peak signal to noise ratio (PSNR), relative structural similarity (RSS), relative mean brightness error (RMBE), relative entropy error (REE), relative contrast error (RCE), and global contrast factor (GCF). The main objective of this paper is to investigate the various quantitative metrics for evaluating contrast enhancement. The results show that the visual quality may be preserved by including a sufficient number of message bits in the input photographs.

***Keywords –** Image Processing, Cryptography, Reversible Data Hiding, Histogram, Enhancement.*

1. INTRODUCTION

At a specific site, the processing of pictures is known as the input images production process. It consists of metric and topological edges that may be examined and cracked to enable the construction of structures between picture pixels. The little border of pixels around the collected amplitude differs from it. Processing this pixel border in this image is a crucial idea. From the sinkhole, the picture is visible, and all image processing is done based on knowledge. The decisions are made utilizing an information-based method of human cognition. The image quality is used to calculate the percentage of deterioration.

International Journal on Future Revolution in Computer Science & Communication Engineering (IJFRCSCE)
ISSN: 2454-4248 Volume: 8 Issue: 1
DOI: https://doi.org/10.17762/ijfrcsce.v8i1.2108
***Article Received**: 24 December 2021 **Revised**: 16 February 2022 **Accepted**: 22 February 2022 **Publication**: 31 March 2022*

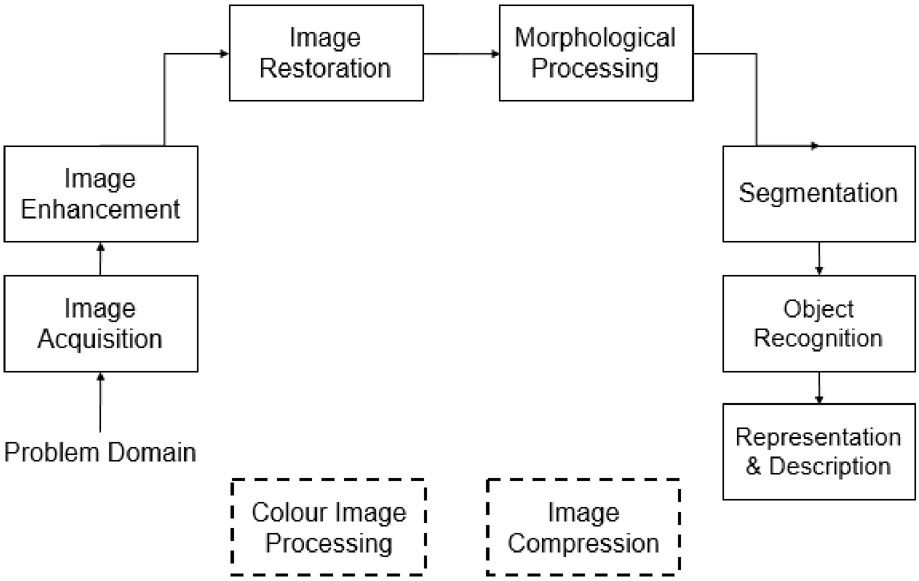

Figure 1.1: Block Diagram of Image Processing

The quality of the image is determined by two factors:

• Depending on TV technology

• For our objectives, objective quantitative assessment procedures are more appealing.

Similar photos are crucial since they make it easier to obtain images from the right database. Background noise ruins and degrades the recorded or original material. When taking pictures or moving materials, this happens. Understanding face color is a crucial component of study into electromagnetic radiation's properties in relation to human physical appearance. Both the server and the client are transmittable. Additionally, it keeps visual data, and each graph node displays the processing parameter.

To acquire printed tangible copies of data, picture processing requires analog techniques like Photostat. The user employs visual techniques to visualize large volumes of data. Mage processing is broadly disseminated for the goal of information analysis and is not confined to a certain region that is only required for the research. It is one of the most crucial tools for processing images using visual approaches. Because personal information is used and gathered in image processing, computations and graphic pictures are directly related to the processing of photographs.

The five groups of image processing objectives are as follows:

• Delusional state (monitor not visible objects)

• Enhance and restore pictures (for better photo creation.)

• Repossession of photos (photo search).

• Pattern assessment (measures a variety of items in a picture).

• Image recognition (distinguish objects in an image)

Processing Images with Security

The imaging system is one of several strategies used for the transport of picture data. However, most individuals upload their photos to various social media platforms where unauthorized users might copy and steal them. People utilize these software on their PCs or mobile devices for greater usability. These frames either employ or combine the stenographic or encryption processes. There are several encoding techniques that are available that are made expressly to protect photos from hackers. Because there is a lot [5] of traceable data. Many authentication or security mechanisms can safeguard the data from being hacked.

2. OBJECTIVES

- To implement image encoding methods for effective preprocessing and methodology of image enhancement and image processing.
- To propose improved reversible data hiding for aerial satellite and color images.
- To implement and analyze the performance of proposed hybrid method of reversible data hiding and image enhancement methodology.

International Journal on Future Revolution in Computer Science & Communication Engineering (IJFRCSCE)
ISSN: 2454-4248 Volume: 8 Issue: 1
DOI: https://doi.org/10.17762/ijfrcsce.v8i1.2108
***Article Received**: 24 December 2021 **Revised**: 16 February 2022 **Accepted**: 22 February 2022 **Publication**: 31 March 2022*

- Comparative analysis of proposed approach under various images with respect to contemporary methods.

3. LITERATURE REVIEW

The study program for the use of watermarking technology and identifying such technology that is challenging to replicate, simple to detect, less expensive, and less polluting is summarized by Wen Zhang et al. [2018]. The authors described three steps that were split during the watermarking process: printing, scanning, extracting, and identifying watermarks. The research is unstable due to the digital watermarking technology used on digital photographs, which also precludes any form of connection to be made between the characteristics of the printing process and the watermarking algorithm. The researchers came to the conclusion that invisibility and resilience to fend against printing-scanning assaults may coexist in harmony. The color space is transformed during printing and scanning.

A solid watermarking framework for the encoding of color watermark was given by David-Octavio Muoz-Ramirez et al in 2018. Color image watermarking is done using the discrete cosine transform (DCT) and quantization index modulation (QIM) techniques. The color watermark is encoded in a way that minimizes the amount of data needed to represent the color. Additionally, to ensure the watermark's resilience, the coded watermark is converted into mid frequency coefficients of DCT. In terms of Peak-Signal-to-Noise Ratio, the effectiveness of the most popular assaults, including JPEG compression, impulsive and Gaussian noises, scaling, etc., has been compared with the suggested approach (PSNR). The average PSNR and SSIM values for the suggested system are 40 dB and 0.994, respectively, leading to the conclusion that it achieves excellent imperceptibility. In comparison to JPEG compression, impulsive noise, and Gaussian noise, the resilience is likewise quite good; even the watermark might be retrieved to a certain extent.

Using alpha blending, Anirban Patra et al. [2018] suggested a novel method for concealing watermarks on photographs. Alpha blending is used to show bitmaps, which are made up of transparent and semitransparent pixels. The researchers have experimented with both color and grayscale images, with the grayscale serving as a watermark picture that is hidden within the main scale image by utilizing various alpha blending values. Each plane in the picture is subjected to this technique. The original photos are therefore hidden in the final image, which contains information about both the color and grayscale images. Thus, the researcher came to the conclusion that with post-processing, this approach may be applied to picture stenography.

Block-based SVD image watermarking in spatial and transform domains is the name of the approach that Irshad Ahmad Ansari et al. presented for picture watermarking in their article from [2018]. The digital photographs are secured using the suggested method against unauthorized users. Using a strong picture watermarking approach, the owner of the host image may be identified. The robust watermarking system is found to have flaws by the researcher, and these flaws are examined in this work. The system is full of flaws, thus determining who owns a watermarked image is not the best course of action. As a result, the SVD-based suggested technique enhances resilience and imperceptibility. Unfortunately, the inclusion of false positives renders this technique useless and meaningless. Block-based SVD approach enhances robustness and imperceptibly, but this enhancement is rendered worthless by the security problem (false positive error) that is left unaddressed in their scheme.

An adaptive probability thresholding approach was presented by Alexander S. Komarov et al. [2018] for the automatic identification of ice and open water from RADARSAT-2. When applying 0.95 threshold static probabilities to the analysis of misclassified ice and water samples, it was discovered that the threshold probability needed to be changed. It was decided which ice and water samples should be appropriately categorised and which ones should be identified by distribution analysis. When the original ice and water detection technique is proposed with a static probability threshold value of 0.95, this classification is carried out. Accordingly, the researcher draws the conclusion from the study that the initial probability threshold, which was used to develop the ice and water detection algorithm, may be enhanced, detected, and improved.

The water marking embedding technology suggested by Aoshuang Dong et al. [2017] changes the two-dimensional picture domain and enables 3D model copyright protection. The primary components, normalization, and projection choice are examined during the embedding process. On the basis of picture projections into three dimensions, a digital watermarking technique was suggested. The results of the trials conducted indicate that the suggested method was resistant to three-dimensional models. The study came to the conclusion that the watermark's invisibility in the three-dimensional water marking model is rather excellent and capable of resisting rotation, translation, and noise attack.

International Journal on Future Revolution in Computer Science & Communication Engineering (IJFRCSCE)
ISSN: 2454-4248 Volume: 8 Issue: 1
DOI: https://doi.org/10.17762/ijfrcsce.v8i1.2108
Article Received: 24 December 2021 Revised: 16 February 2022 Accepted: 22 February 2022 Publication: 31 March 2022

New clock controlled generator (NCCG) approach for the shrinking generator and self-shrinking generator was proposed by Enjian Bai et al. in 2017. The suggested methodology served as the foundation for the development of another digital watermarking method for images. The results of the studies reveal that the suggested method accurately predicts the signal to noise ratio of watermarked photos. As a result, the researcher has come to the conclusion that the suggested technique exhibits excellent performance when it comes to pseudo-random characters, where a long period of time and high linear complexity play a crucial part, as well as the ability to survive frequent attacks.

4. METHODOLOGY

The satellite data contains pictures of the practice fields that a certain satellite took. There are several different resolutions available for satellite photography. Because SPOT imaging has been successfully used in research on urban categorization in the past, it was chosen for this inquiry. The resolution of the images utilized for this classification normally ranges from 10 to 15 meters. It is used for categorization because it is an easy and reliable way to calculate the separation between two classes.

The satellite data contains pictures of the practice fields that a certain satellite took. There are several different resolutions available for satellite photography. Because SPOT imaging has been successfully used in research on urban categorization in the past, it was chosen for this inquiry. The resolution of the images utilized for this classification normally ranges from 10 to 15 meters.

Pre-processing

Pre-processing involves making fixes for geometric and atmospheric issues with satellite data. A range of image-enhancing methods are used in this investigation. Before being utilized in the study, the color photographs were converted to grayscale copies. The contrast of the image is increased using a particular filter by lowering the lighting and background effects.

Specifications

MatLab Editor on the front end

Used language: Matlab

Database: The USC SIPI image database (http://sipi.usc.edu/database/) will be used to provide the standard test pictures (color images) that are 512 by 512 in size.

Modules

The following modules will be included in the implementation:

- User Sign-In
- Preprocessing
- Calculating a histogram
- Embedding
- Extraction and Recuperation

Algorithm

Pre-processing

An interactive location map is created to eliminate unneeded underflow and overflow. To create a location map, all the pixels with values 0 and 256 are added to another picture of the same size, and all other pixels are treated as zero. Additionally, every pixel in the original image with a value of 0 is increased by one, and every pixel with a value of 255 is dropped by one. And two of the most frequently occurring pixel values are chosen for data embedding.

Secret Message Incorporation

Only a limited number of pixels are used for embedding. For data embedding, the highest two bins (highest two pixels that appear most frequently) in the histogram are chosen. The highest index having pixel between these two chosen pixel values is shown by IL, while the second highest index having pixel is indicated by IR.

Algorithm for Embedding

Currently, algorithms are used to add and remove binary data. Red component is utilized first. As previously said, IL and IR are chosen. All of the image's pixels with the values IL and IR are added and subtracted with the associated secret message binary values. All pixels in the picture with values less than IR are removed by matching binary ones, and all pixels with values higher than IL are added by binary ones. The values of pixels with values between IL and IR are left alone and unaltered.

Only the IL and IR of the watermarked image have the secret information contained; all other modifications are for contrast enhancement. After all of the IL and IR in the red component have been embedded, the remaining secret message bits will be embedded in the green component using the above-described procedure, followed by the blue

International Journal on Future Revolution in Computer Science & Communication Engineering (IJFRCSCE)
ISSN: 2454-4248 Volume: 8 Issue: 1
DOI: https://doi.org/10.17762/ijfrcsce.v8i1.2108
***Article Received**: 24 December 2021 **Revised**: 16 February 2022 **Accepted**: 22 February 2022 **Publication**: 31 March 2022*

component. A new adjusted histogram produced by the red component is utilized for embedding once all of the chosen pixels from these three components have been embedded.

Process of Extraction and Recovery

The least significant bits (LSBs) of the 16 excluded pixels are first extracted for the extraction and recovery procedure, replacing the LSBs of the 16 excluded pixels. The final embedding pair of IL and IR is found from these removed pixels.

Extraction of Secret Messages

The IL and IR pixels are recovered first since they are the only ones on which all information bit embedding has been performed. The technique for extracting secret messages has now been used. Binary 0s are present in all pixels with values of IL and IR, while binary 1s are present in pixels with values lower than IL or IR. All binary values are taken out and organized using the inverse random permutation technique.

Recovery of the original image

16 LSBs were discarded from this procedure, and all IR and IL were eliminated to create a watermarked picture. Inverse embedding approach for the recovery process. The value of IR or one less than IR is used to build all pixels. All pixels that have a value of IL or one higher than IL are built as IL. Binary one is added to all pixels with values one less than IR and binary one is deleted from all pixels with values one greater than IL. In this manner, the original positions of all changed pixels are restored.

.

Architectural Design

Any non-Critical Information called cover data (C) acts as a carrier of Critical Information (CI). A Secrete Key (K) is used by the Steganographic embedding function (fEm) to hide CI and gives Stego data (S) as an output (device at Transmitting end DT) as shown in figure:

$(DT) \rightarrow fEm\ (C, CI,)$

where S is Stego data, C is cover data, CI is Critical Information, and K is Secrete Key.

The same Secrete Key (K) is used by the Steganographicextraction function (fEx) to extract CI (as a device at receiving end DR) as shown in

$DR \rightarrow fEx\ (S,)$

where S is Stego data, CIisExtracted Critical Information, and K is Secrete Key. Typical generalized hardware Steganographic data hiding mechanism is as shown in Figure. Proposed reversible data hiding system to implement data hiding system consists of both cryptographic and Steganographic approach and therefore is called Crypto-StegoSystem. Figure outlines the proposed methodology.

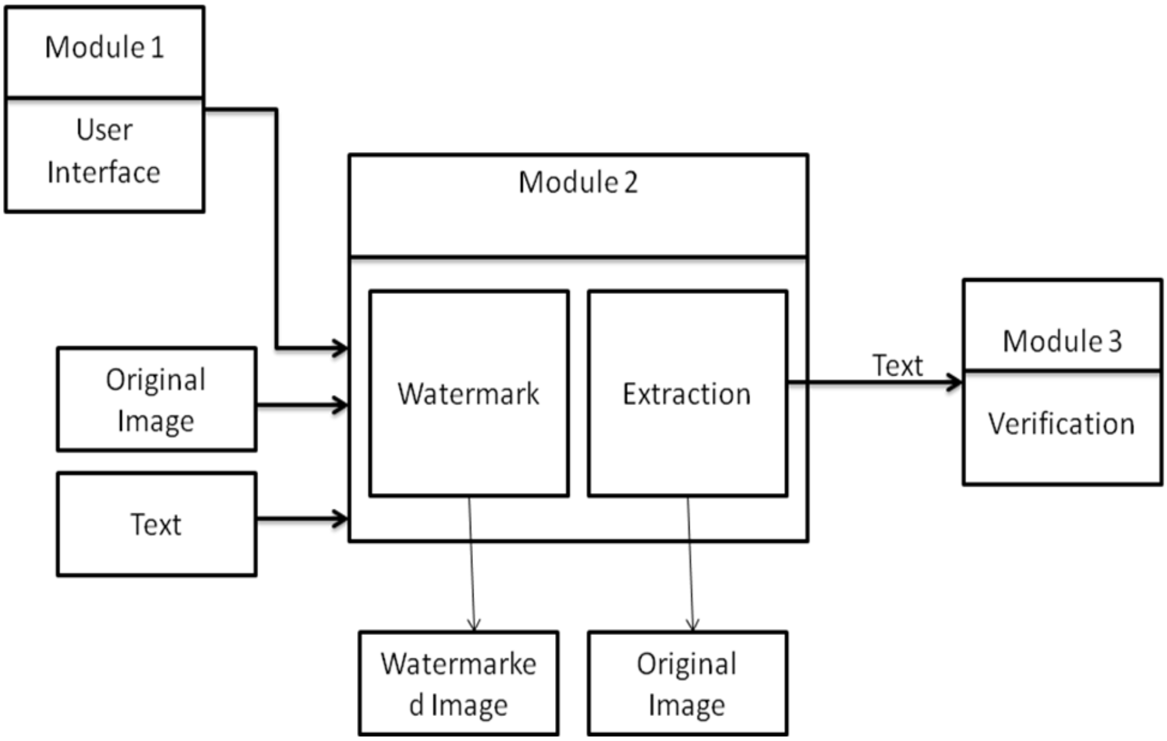

Figure 4.1: Proposed Architecture

International Journal on Future Revolution in Computer Science & Communication Engineering (IJFRCSCE)
ISSN: 2454-4248 Volume: 8 Issue: 1
DOI: https://doi.org/10.17762/ijfrcsce.v8i1.2108
***Article Received**: 24 December 2021 **Revised**: 16 February 2022 **Accepted**: 22 February 2022 **Publication**: 31 March 2022*

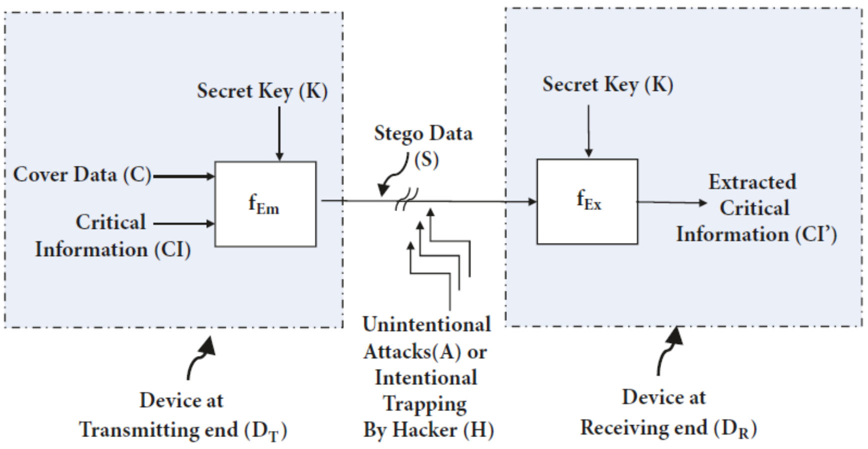

Figure 4.2: Steps Involved in Reversible Hiding Algorithm

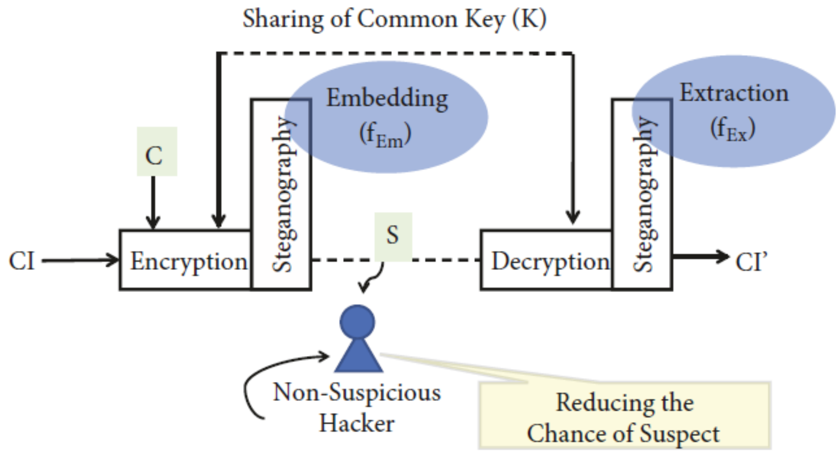

Figure 4.3: Steps Involved in Key Sharing in Proposed Algorithm

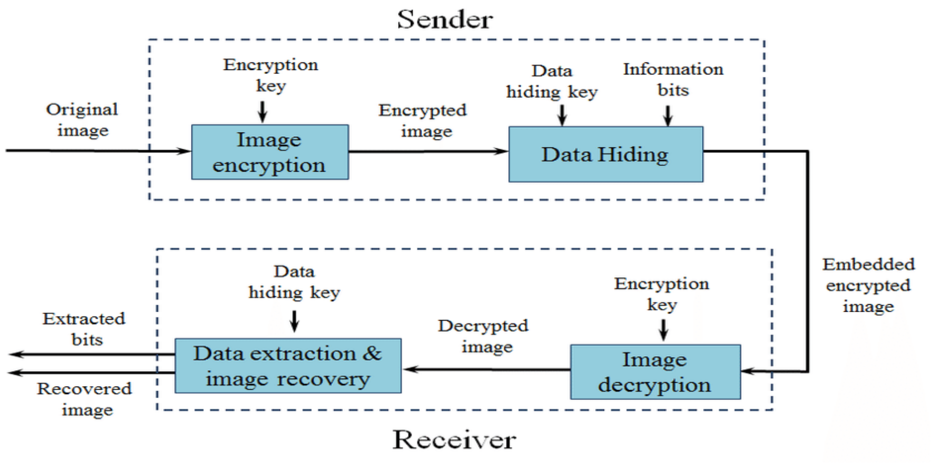

Figure 4.4: Steps Involved in Key Sharing in Proposed Algorithm

International Journal on Future Revolution in Computer Science & Communication Engineering (IJFRCSCE)
ISSN: 2454-4248 Volume: 8 Issue: 1
DOI: https://doi.org/10.17762/ijfrcsce.v8i1.2108
***Article Received**: 24 December 2021 **Revised**: 16 February 2022 **Accepted**: 22 February 2022 **Publication**: 31 March 2022*

The overall process is explained as follows:-

1. Accept into Message Cache
2. Accept LOOK-UP Tableas an EmbeddingKey(K)
3. Accept8-bytecoverdata(C)
4. ComputeDWTof8bytesofcoverdata
5. Randomlyselectbyte(Y_m)fromMessageCache
6. Selecteditusing3LSBsofcontentsofselectedbyteLOOK-UPTable
7. EmbedtheselectedbitatDWTcoefficientC3
8. ComputeIDWTof8bytesofcoveredatatogetStegodata
9. RepeatStep-3toStep-8forallthebitsofallthecharactersMessageCache
10. Stop.

5. SIMULATION AND RESULT ANALYSIS

The overall contrast is given by the global contrast factor, which measures the contrast at different resolutions. The results show that the contrast of images that have been marked has improved in a clear way. After the secret data is taken out, the original image is fully restored.

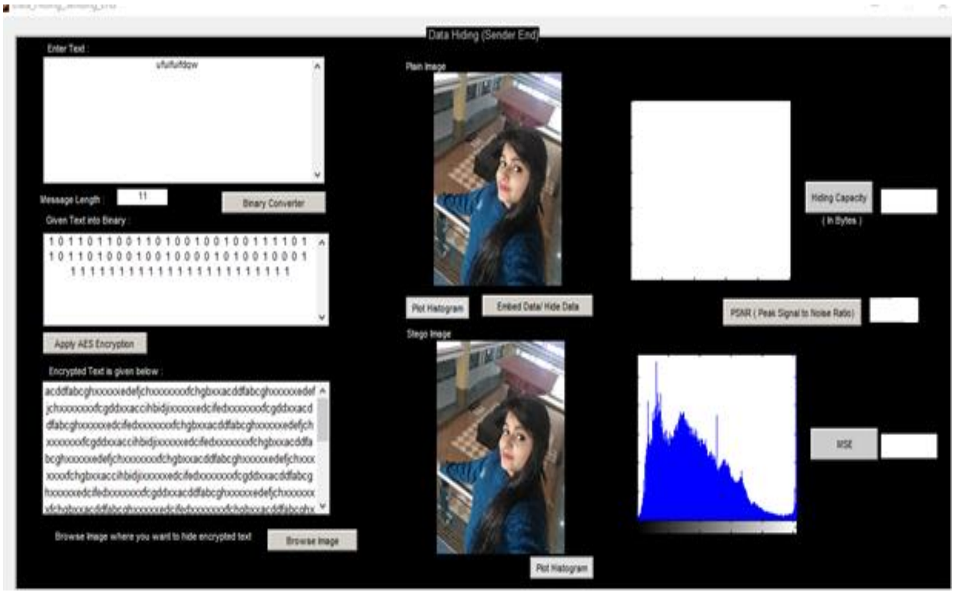

Figure 5.1: Graphical Analysis of Reversible Data Hiding at Sending End

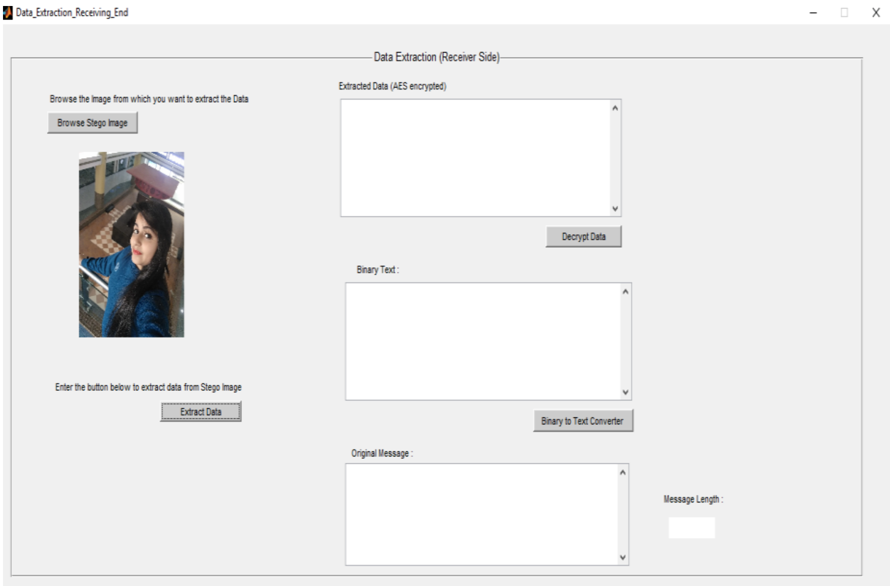

Figure 5.2: Graphical Analysis of Reversible Data Hiding at Receiving End

International Journal on Future Revolution in Computer Science & Communication Engineering (IJFRCSCE)
ISSN: 2454-4248 Volume: 8 Issue: 1
DOI: https://doi.org/10.17762/ijfrcsce.v8i1.2108
***Article Received**: 24 December 2021 **Revised**: 16 February 2022 **Accepted**: 22 February 2022 **Publication**: 31 March 2022*

Table-5.1

Analysis of Result for Reversible Data Hiding

Type of Image	PSNR	MSE
.JPEG	61.10	0.023
.JPEG-2000	62.21	0.012
.PNG	61.21	0.011
.BMP	62.13	0.031
.GIF	63.12	0.011

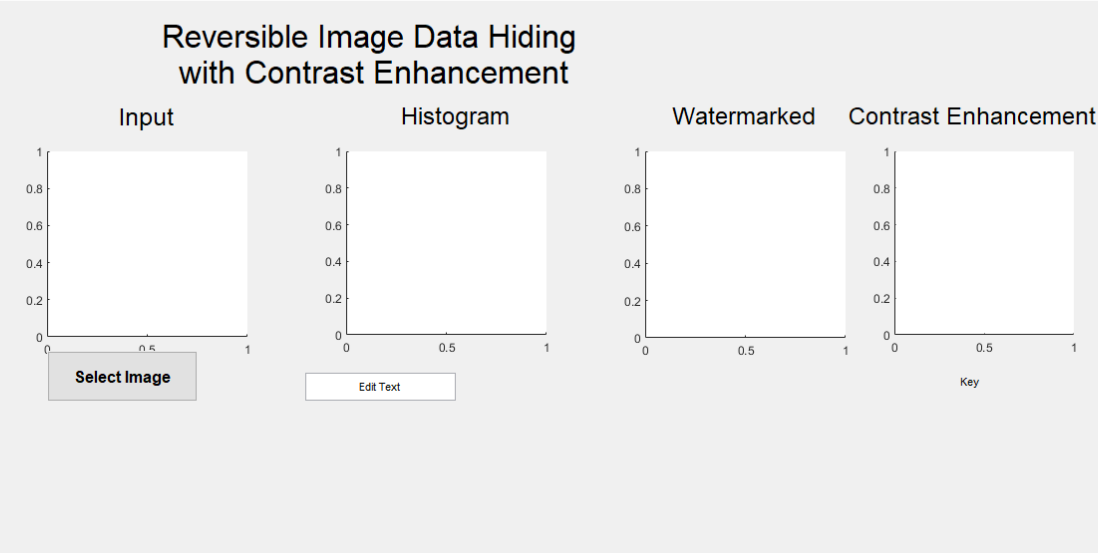

Figure 5.3: Graphical Analysis of Reversible Data Hiding at Receiving End

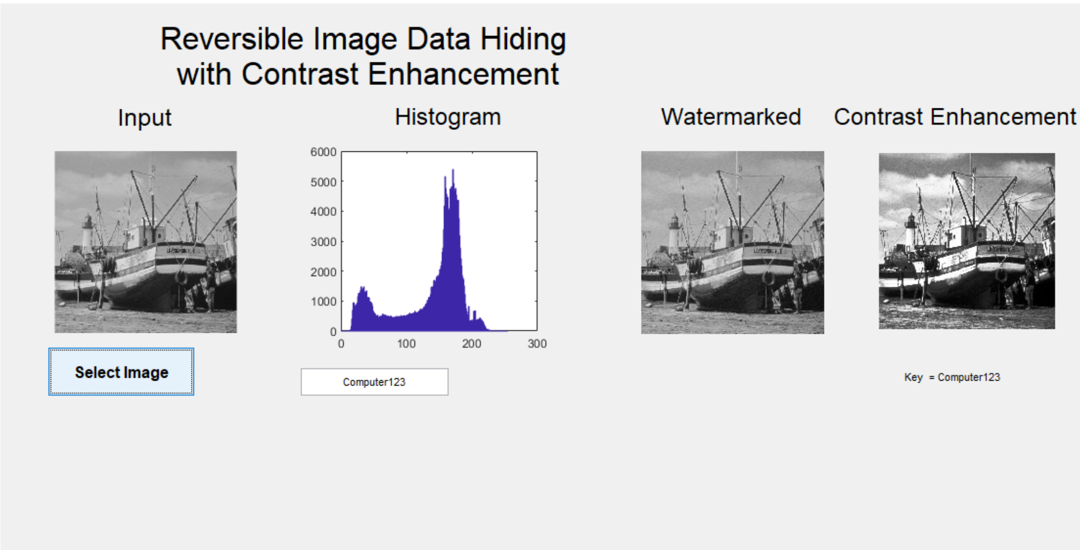

Figure 5.4: Hybrid Proposed GUI for Data Hiding and Image Enhancement

International Journal on Future Revolution in Computer Science & Communication Engineering (IJFRCSCE)
ISSN: 2454-4248 Volume: 8 Issue: 1
DOI: https://doi.org/10.17762/ijfrcsce.v8i1.2108
***Article Received**: 24 December 2021 **Revised**: 16 February 2022 **Accepted**: 22 February 2022 **Publication**: 31 March 2022*

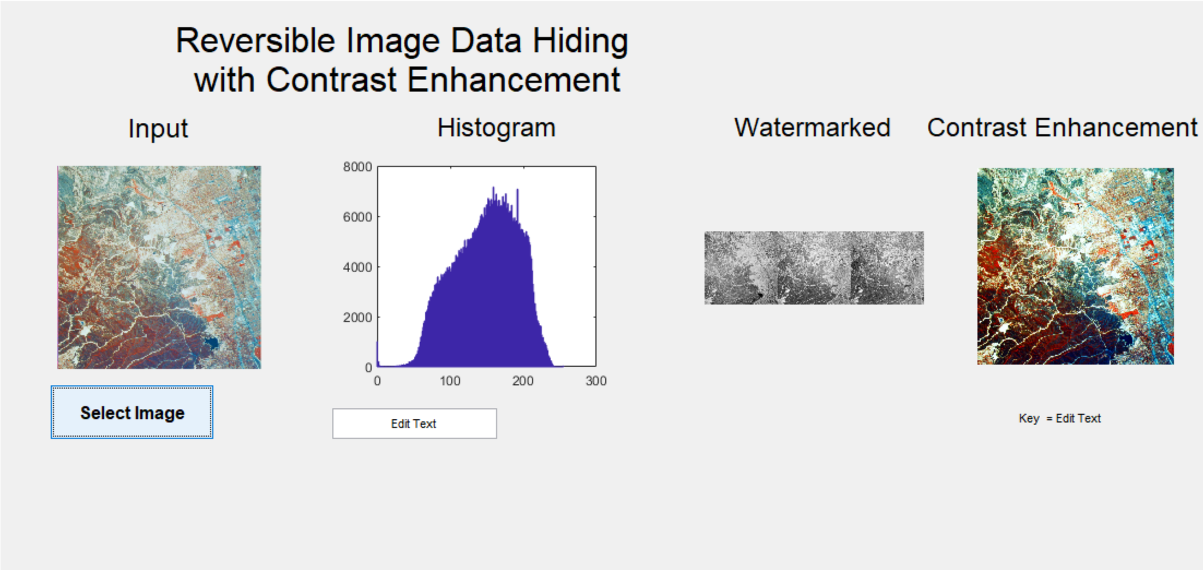

Figure 5.5: Proposed Methodology for Aerial Images

The majority of frequently used measures fall short of accurately describing the improved image's aesthetic quality. Image quality is assessed using six characteristics. The six indicators are peak signal to noise ratio (PSNR), relative structural error (RSS), relative contrast error (RCE), relative mean brightness error (RMBE), relative entropy error (REE), and global contrast factor (CCF) (GCF). It is suggested that a global contrast factor measure be used to assess the contrast improvement. It may be used to any form of image and is computationally straightforward. The four proxies [11] The values of REE, RCE, RMBE, and RSS fall between zero and one.

Quantified entropy values are used by REE to calculate the degree of improvement between the original and changed images. The entropy of the original image is E orizal, while the entropy of the updated image is E rion. The necessary range is increased by a value of 5, if needed. RFE should be higher than.5 for better quality. If not, the image deteriorates.

$$\mathrm{REE} = \frac{\mathrm{ENew} - \mathrm{EOriginal}}{2 \times \log_2 \mathrm{L}} + 0.5$$

RCE measures the amount of contrast enhancement between the original and changed images using standard deviation. RCE may be higher than.5. The are calculated from the standard deviations of the original and modified images, respectively.

$$\mathrm{RCE} = \frac{\mathrm{STDnew} - \mathrm{STDoriginal}}{2 \times \log_2 \mathrm{L}} + 0.5$$

Mean brightness is used by RMBE to gauge how much the contrast between the original picture and nodified image has been enhanced. The standard deviation of the original image is M "ore en," while the standard deviation of the changed image is M original." RMBE ought to be higher than.5.

$$\mathrm{RMBE} = 1 - \frac{|\ \mathrm{Moriginal} - \mathrm{Mnew}\ |}{\mathrm{L} - 1}$$

RSS reveals how structurally similar the images are. The root mean square error between the original and contrast-enhanced pictures is used to quantify it. Its value ought to be higher than 5.

$$\mathrm{RSS} = 1 - \frac{\mathrm{RMSE}}{L - 1}$$

The menn square error between the original and watermarked picture is used to compute PSNR. A good grade image will have a higher PSNR rating. MAX is the image's highest level of intensity.

$$\mathrm{PSNR} = 10 + \log_{10}\left(\frac{\mathrm{MAX}^2}{\mathrm{MSE}}\right)$$

GCF [12] employs local contrasts at multiple resolution levels rather than concentrating just on the ratio of the darkest to the brightest area. Visul system's sensitivity to variations at different frequencies varies. Therefore, we are unable to simply calculate the global contrast as the sum of the local contrasts. Building a weighted average of local contrasts is the answer. Let I be the image's pixel intensity, with values ranging from 0 to 255. At first, ganma correlation is used with a value of 2.2 for y. Input values are then scaled to [0, 1].

International Journal on Future Revolution in Computer Science & Communication Engineering (IJFRCSCE)
ISSN: 2454-4248 Volume: 8 Issue: 1
DOI: https://doi.org/10.17762/ijfrcsce.v8i1.2108
***Article Received**: 24 December 2021 **Revised**: 16 February 2022 **Accepted**: 22 February 2022 **Publication**: 31 March 2022*

Linear huminance 1R (1=1) is the name given to the scaled and correlated value.

$$I = \left(\frac{i}{255}\right)Y$$

The perceptual hminance R is

$$R = 100 \times \sqrt{I} = 100 \times \sqrt{\left(\frac{i}{255}\right)Y}$$

The local contrast is computed as the average of differences obtained by calculating R between each pixel and its four neighbours. Assoming the image is having w pivels wide and h pivels high.

$$lc_1 = \frac{|R_\varepsilon - R_{L_1}| + |R_1 - R_{\varepsilon_1}| + |R_e - R_{l_e}| + |R_\varepsilon - R_4|}{4}$$

Table 5.2

Analysis of Result for Standard Images

Type of Image	REE	RCE	RMBE	PSNR
Sample-1	0.64	0.79	0.98	32.11
Sample-2	0.61	0.71	0.91	30.23
Sample-3	0.67	0.70	0.92	33.10
Sample-4	0.60	0.62	0.92	35.18

Table 5.3

Analysis of Result for Low Contrast Images

Type of Image	REE	RCE	RMBE	PSNR
Sample-1	0.6	0.68	0.92	30.13
Sample-2	0.6	0.7	0.94	31.23
Sample-3	0.57	0.69	0.98	31.43
Sample-4	0.61	0.76	0.97	30.78

Table 5.4

Analysis of Result for Aerial Satellite Images

Type of Image	REE	RCE	RMBE	PSNR
Sample-1	0.61	0.7	0.92	30.19
Sample-2	0.58	0.72	0.9	30.32
Sample-3	0.57	0.79	0.92	29.21
Sample-4	0.64	0.7	0.97	31.31

A crucial step after processing the picture is qualitative evaluation in order to gauge how successfully the processing was done. Image quality measures are typically used to determine an image's quality. The main focus of picture enhancement is raising the image quality for clearer eyesight. One of the key difficulties in image processing is contrast augmentation. Poor contrast is caused by inadequate lighting, incorrect lens aperture settings, a lack of dynamic range in the image sensor, etc. The concept behind contrast enhancement is to increase the dynamic range of the pixels in the image to enhance the visual quality. Histogram equalization is a commonly used method for enhancing an image's contrast. After histogram equalization, a few tiny features are lost.

6. CONCLUSION & FUTURE SCOPE

- ***Conclusion***

A novel approach for data concealing that is reversible and improves contrast has been proposed in this study. In order to repeat the process of histogram equalization at the same time, the two highest points (bins) in the histogram are selected for data embedding. The results of the studies demonstrate that dividing a number of histogram peaks one at a time can improve the contrast of a picture. The contrast-enhanced pictures created by our method maintain a better sense of how things seem compared to the specialized MATLAB routines. Additionally, the original image may be restored in its entirety without the need for additional data. Therefore, it is now feasible to disable the augmentation of picture contrast thanks to the suggested approach. Our effort has focused on making the algorithm more reliable and applying it to use it to increase the sharpness of satellite and medical photos. Over the last 60 years, satellite imagery has been successfully utilized in a wide range of businesses and has grown to be an essential part of our daily life. There is a huge quantity of geographic data present on the surface of the world in the satellite photos that are delivered. These days, satellite

International Journal on Future Revolution in Computer Science & Communication Engineering (IJFRCSCE)
ISSN: 2454-4248 Volume: 8 Issue: 1
DOI: https://doi.org/10.17762/ijfrcsce.v8i1.2108
***Article Received**: 24 December 2021 **Revised**: 16 February 2022 **Accepted**: 22 February 2022 **Publication**: 31 March 2022*

images are used for a broad range of scientific purposes, one of which is the assessment of environmental change. A remote sensing system cannot function without satellite imaging, because the images captured by the satellites are incredibly data-rich. The amount of information that can be gleaned from these photographs has also considerably increased.

- ***Future Work***

Software for detection and image processing is a continuous work in progress for engineers. An essential technique is picture segmentation. Many experts and researchers are involved in the development and improvement of this technology. Hybrid techniques may also be used to increase the proposed scheme's accuracy. An adaptive neurofuzzy classification system. adding the sophisticated categorization system learning system. Real-time classification framework growth the inclusion of a real-time hardware interface system with the Internet of Things for better application***s.***

REFERENCES

[1]. Wen Zhang, Jie Men, Conglong Ma, “Research progress of applying digital watermarking technology for printing,” 2018.

[2]. David-Octavio Munoz-Ramirez, Volodymyr Ponomaryo, Rogelio Reyes-Reyes, Volodymyr Kyrychenko, OleksandrPechenin, Alexander Totsky ,“A Robust Watermarking Scheme to JPEG Compression for Embedding a Color Watermark into Digital Images,” 2018.

[3]. AnirbanPatra, ArijitSaha, Ajoy Kumar Chakraborty, Kallol Bhattacharya, “A New Approach to Invisible Water Marking of Color Images using Alpha Blending,” 2018.

[4]. Irshad Ahmad Ansari, Chang WookAhn and Millie Pant, “On the Security of “Block-based SVD image watermarking in spatial and transform domains”, 2018.

[5]. Alexander S. Komarov, “Adaptive Probability Thresholding in Automated Ice and Open Water Detection From RADARSAT-2 Images,” 2018.

[6]. Aoshuang Dong, RuiZeng, “Research and Implementation Based on Three-dimensional Model Watermarking Algorithm,” 2017.

[7]. EnjianBai, Yiyu Yang and Xueqin Jiang, “Image Digital Watermarking Based on a Novel Clock-controlled Generator,” 2017.

[8]. Oleg Evsutin, Roman Meshcheryakov, Viktor Genrikh, Denis Nekrasov and Nikolai Yugov, “An Improved Algorithm of Digital Watermarking Based on Wavelet Transform Using Learning Automata,” 2017.

[9]. Ritu Gill and Rishi Soni, “Digital Image Watermarking using 2-DCT and 2- DWT in Gray Images,” 2017.

[10]. Mohammad ShahabGoli and AlirezaNaghsh, “Introducing a New Method Robust Against Crop Attack In Digital Image Watermarking Using Two-Step Sudoku,” 2017.

[11]. Muhammad Usman, Irfan Ahmed, Shujaat khan, “SIT: A light weight encryption algorithm for secure internet of things,” international Journal of advanced computer science and applications, vol. 8, no.1, 2017.

[12]. Maria Almulhim, Noor Zaman, “Proposing secure and the lightweight authentication scheme for IOT based E health applications” International conference on advance communication technology; 2018.

[13]. Muhammad NaveedAman, KeeChaing Chua, “A light weight mutual authentication protocol for IOT system, 2017.

[14]. Krishnaveni, S. ., A. . Lakkireddy, S. . Vasavi, and A. . Gokhale. “Multi-Objective Virtual Machine Placement Using Order Exchange and Migration Ant Colony System Algorithm”. International Journal on Recent and Innovation Trends in Computing and Communication, vol. 10, no. 6, June 2022, pp. 01-09, doi:10.17762/ijritcc.v10i6.5618.

[15]. Mehdi Baahrami, Dong Li, MukeshSinghal, “Efficient parallel implementation of light weight data privacy method for cloud users; seventh international workshop on data intensive computing in clouds, 2016.

[16]. GauravBansod, AbhijitPatil, “An Ultra light weight design for security in pervasive computing” IEEE second international conference on big data security cloud, 2016.

[17]. ZahidMahmood, HuanshengNing, “Light weight two level session key management for end user authentication in internet of things” IEEE international conference on IOT, 2016.

[18]. Ayaz Hassan moon, UmmerIqbal, “Light weight authentication framework for WSN” International conference on Electrical, Electronics and Optimization techniques, 2016.

[19]. D Jamuna Rani, “Light weight cryptographic algorithm for medical internet of things”, Online international conference on Green Engineering and Technology, 2016.

[20]. SudhirSatpathy, Sanu Mathew, “Ultra low energy security circuits for IOT applications”, IEEE 34th international conference on computer design, 2016.

[21]. SainandanBayya Vankata, PrabhkarYellai, “ A new light weight transport method for secured transmission of data for IOT”, international journal of electrical, electronic engineering, 2016.

[22]. Amber Sultan, Xuelin Yang, “Physical layer data encryption using chaotic constellation rotation in OFDM-PON” Proceedings of 15th international Bhurban conference on applied science and technology Islamabad Pakistan, 2018.

International Journal on Future Revolution in Computer Science & Communication Engineering (IJFRCSCE)
ISSN: 2454-4248 Volume: 8 Issue: 1
DOI: https://doi.org/10.17762/ijfrcsce.v8i1.2108
***Article Received**: 24 December 2021 **Revised**: 16 February 2022 **Accepted**: 22 February 2022 **Publication**: 31 March 2022*

[23]. Xuelin Yang, ZanweiShen, "Physical layer encryption algorithm for chaotic optical OFDM transmission against chosen plaintext attacks", in ICTON 2016.

[24]. Han Chen, Xuelin Yang, "Physical layer OFDM data encryption using chaotic ZCMT precoding matrix", IEEE, ICTON 2017.

[25]. Kabisha, M. S., Rahim, K. A., Khaliluzzaman, M., & Khan, S. I. (2022). Face and Hand Gesture Recognition Based Person Identification System using Convolutional Neural Network. International Journal of Intelligent Systems and Applications in Engineering, 10(1), 105–115. https://doi.org/10.18201/ijisae.2022.273

[26]. GaoBaojian, LuoYongling, HouAiqin, "New physical layer encryption algorithm based on DFT-S-OFDM system" International Conference on Mechatronic Sciences, Electric Engineering and Computer, Shenyang, China, 2013.

[27]. Meihua Bi, Xiaosong Fu, "A key space enhanced Chaotic encryption scheme for physical layer security in OFDM-PON", IEEE photonics Journel", 2017.

[28]. Dana Halabi, Salam Hamdan, "Enhance the security in smart home applications based on IOT-CoAP protocol.

[29]. Jongsoek Choi, Yongtae Shin, "study on information security sharing system among the industrial IOT service and product provider, IEEE ICOIN, 2018.

[30]. Jin HyeongJeon, Ki-Hyung Kim, "Block chain based data security enhanced IOT server platform, IEEE ICOIN, 2018.

[31]. MuhammetZekeriyaGunduz, Resul Das, "A comparision of cyber security oriented test beds for IOT based smart grids, IEEE 2016.

[32]. Himanshu Gupta, GarimaVarshney, "A security Framework for IOT devices against wireless threats, second international conference on telecommunication and networks, 2017.

[33]. Thomas Maurin, Lurent, George Caraiman, "IOT security assessment through the interfaces P-SCAN test bench platform, 2018.

[34]. Sanjay Kumar, AmbarDutta, "A Study on Robustness of Block Entropy Based Digital Image Watermarking Techniques with respect to Various Attacks," 2016.

[35]. N. SenthilKumaran, and S. Abinaya, "Comparison Analysis of Digital Image Watermarking using DWT and LSB Technique," 2016.

[36]. Harsha M. Patil and Prof .Baban U. Rindhe, "Study and Overview of Combined NSCT –DCT Digital Image Watermarking," 2016.

[37]. Ravita, R., & Rathi, S. (2022). Inductive Learning Approach in Job Recommendation. International Journal of Intelligent Systems and Applications in Engineering, 10(2), 242–251. Retrieved from https://ijisae.org/index.php/IJISAE/article/view/1829

[38]. Alaria, S. K. "A.. Raj, V. Sharma, and V. Kumar."Simulation and Analysis of Hand Gesture Recognition for Indian Sign Language Using CNN"." *International Journal on Recent and Innovation Trends in Computing and Communication* 10, no. 4 (2022): 10-14.

[39]. Dogiwal, Sanwta Ram, Y. S. Shishodia, Abhay Upadhyaya, Hanuman Ram, and Satish Kumar Alaria. "Image Preprocessing Methods in Image Recognition." *International Journal of Computers and Distributed Systems* 1, no. 3 (2012): 96-99.

[40]. Ashish Raj, Vijay Kumar, Satish Kumar Alaria, Vivek Sharma,. 2022. "Design Simulation and Assessment of Prediction of Mortality in Intensive Care Unit Using Intelligent Algorithms". *Mathematical Statistician and Engineering Applications* 71 (2):355-67. https://doi.org/10.17762/msea.v71i2.97

[41]. Deepali Koul, Satish Kumar Alaria. 2018. "A New Palm Print Recognition Approach by Using PCA &Amp; Gabor Filter". *International Journal on Future Revolution in Computer Science &Amp; Communication Engineering* 4 (4):38-45.

[42]. M. J. Traum, J. Fiorentine. (2021). Rapid Evaluation On-Line Assessment of Student Learning Gains for Just-In-Time Course Modification. Journal of Online Engineering Education, 12(1), 06–13. Retrieved from http://onlineengineeringeducation.com/index.php/joee/article/view/45

[43]. Rajput, B. S. ., Gangele, A. ., & Alaria, S. K. . (2022). Numerical Simulation and Assessment of Meta Heuristic Optimization Based Multi Objective Dynamic Job Shop Scheduling System. *International Journal on Future Revolution in Computer Science &Amp; Communication Engineering*, *8*(3), 92–98.

[44]. Rajput, B. S. ., Gangele, A. ., Alaria, S. K. ., & Raj, A. . (2022). Design Simulation and Analysis of Deep Convolutional Neural Network Based Complex Image Classification System. *International Journal on Future Revolution in Computer Science &Amp; Communication Engineering*, *8*(3), 86–91.

[45]. Alaria, S.K. and Kumar, Aashutosh, (2018). Implementation of new Cryptographic Encryption Approach for Trust as a Service (TAAS) in Cloud Environment. International Journal of Computer Application (2250-1797) Issue 8 Volume 4, July-August. Pp:18-35.