IMAGE CRYPTOGRAPHY BASED ON SCAN PATTERN AND 4 OUT OF 8 CODES

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*Abstract :*In the present scenario, the world has been digitalized and the data security plays a key role in the data Communication through mobiles, internet etc., hence data or image encryption methods are essential to provide security. In this regard, there are various existing methods for image encryption in which original image is scrambled by using SCAN patterns that are generated by the SCAN methodology. But, the novelty of the proposed method lies in generating a carrier image with the help of Alpha-numeric keyword. Each alpha-numeric key consists of a unique 8-bit code that is created by a 4 out of 8 codes. The proposed method now generates encrypted image by hybridizing this newly generated carrier image with the original image. Hence, from the results, it is shown that the proposed method produces highly distorted encrypted image. Also, it provides the decryption method to get back the original image.

IndexTerms - **Image encryption, 4 out of 8 codes, Alpha-numeric keyword, SCAN methodology, scan key, Image decryption.**

I. INTRODUCTION

Image encryption and decryption techniques have been increasingly developed to provide more security for the transmission and reception of data or information on the communication channels. Now days the problem of hackings are being increased and it became necessary to secure data in many applications like military image database, confidential video conferencing and medical imaging systems. There are many methods of image encryption and decryption and each of it has its own advantage. The practice and study of hiding messages or images is known as "Cryptography". Cryptography is achieving security for the information by encoding the original data and making in un-readable. These days cryptography's techniques became the immediate solution to protect the information against hackings. Cryptography uses encryption and decryption techniques to transmit and receive information through an insecure communication channel. Encryption is a process which use a finite set of instructions called algorithm for converting the original message called plain text into cipher text which is its encrypted form. Decryption is the process of converting cipher text into plain text that is it is the reverse process of encryption [1]. Based on the keys used in cipher there are two methods. They are symmetric key algorithm and asymmetric key algorithm. Symmetric key algorithm uses one single key that is to be shared among people who need to receive the messages while asymmetric key algorithm uses public key and private key to encrypt and decrypt the messages. Generally data encryption standards (DES), advanced encryption standards (AES), international data encryption algorithm (IDEA) are the popular symmetric key algorithms to protect sensitive data [2]. S.R.M. Prasanna, Y.V. Subbarao and A. Mitra have presented method which employs magnitude and phase manipulation using carrier images [3]. The paper explains the concept of carrier images for encryption purpose. Chao Shen Chen and RongJian Chen have proposed image encryption and decryption algorithms based on SCAN patterns generated by SCAN methodology [4]. Scan is a formal language-based two-dimensional spatial accessing methodology which can efficiently specify and generate wide range of paths or space filling curves and it is used for interchanging the pixel values. There are several scan letters and each letter generates different secret images. When scan is applied to an image the traces of the original image gets changed and makes the image more secure. S.S. Maniccam and N.G. Bourbakis proposed a method for image and video encryption based on scan patterns on pattern recognition [5]. AlokaSinha and KeharSingh proposed a new method to encrypt an image for secure image transmission [6]. The carrier image is generated by the key word given as input to the user. The key word consists of alphanumeric values and some special characters. Each and every alphabet and numerical value have their unique grey codes. In order to perform descan process the same key which have been given to scan should be applied in reverse order. This paper uses the technique of scan patterns and carrier images for both encryption and decryption processes to make data more secure.

In this paper, a novel image encryption and decryption method is proposed using scan pattern & 4 out of 8 codes. To provide secure information transmission, original scribbled with the carrier image developed from text by using 4 out of 8code. Later for the resultant image, scan pattern is performed using pixel permutation phenomenon. In this phenomenon, the positions of pixels are arranged as accordingly their pattern. This pattern with secured with one secure key for efficient transmission. The complete reverse process of encryption is decryption. There is a secure key while decrypting the encrypted image.

The rest of paper is organizing into various sections. Carrier image creation using 4 out of 8 codes is explained in section II. The preliminary basics of scan pattern techniques are described in section III. Section IV provides the proposed block diagram and its algorithm steps. The simulated results are explained in section V. Conclusion is given in section VI.

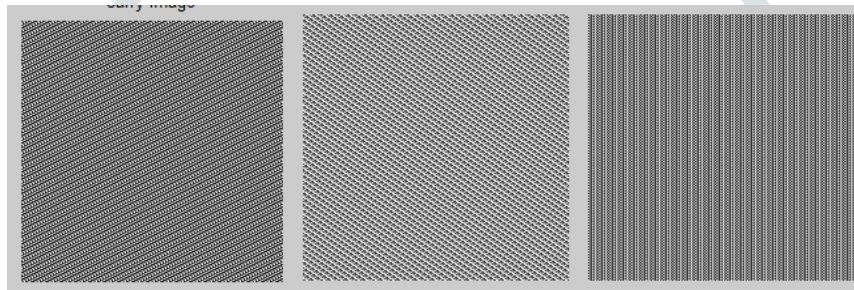## II. CARRIER IMAGE GENERATION USING 4 OUT OF 8CODES

Here a code is defined called as 4 out of 8 code which is of 8 bit length and consists of four 0s and four 1s in the code. As one can assign different binary values called keys, then the uniqueness increases. Keys are used to generate a carrier image. When different keywords are entered, different carrier images are generated. Keywords that are entered are rearranged in the form of a matrix. The length of the matrix should be equal to the length of original image. The keyword is repeated, if the length is small when compared to the original image.

This carrier from text can be converted by using alphanumeric and 4 out of 8codes as given in table 1. Figure 1 show the generation of carrier images for text Electronics, Communication, Engineering12345.

Table 1: 4 out of 8codes along with alphanumeric codeword

S.No.	Binary	Hexa decimal	Decimal	Alphanu meric	S.No.	Binary	Hexa decimal	Decimal	Alphanu meric
1	00110011	33	51	A,a	19	10010011	93	147	S,s
2	00110101	35	53	B,b	20	10010101	95	149	T,t
3	00110110	36	54	C,c	21	10010110	96	150	U,u
4	00111001	39	57	D,d	22	10011001	99	153	V,v
5	00111010	3A	58	E,e	23	10011010	9A	154	W,w
6	00111100	3C	60	F,f	24	10011100	9C	156	X,x
7	01010011	53	83	G,g	25	10100011	A3	163	Y,y
8	01010101	55	85	H,h	26	10100101	A5	165	Z,z
9	01010110	56	86	I,i	27	10100110	A6	166	0
10	01011001	59	89	J,j	28	10101001	A9	169	1
11	01011010	5A	90	K,k	29	10101010	AA	170	2
12	01011100	5C	92	L,l	30	10101100	AC	172	3
13	01100011	63	99	M,m	31	11000011	C3	195	4
14	01100101	65	101	N,n	32	11000101	C5	197	5
15	01100110	66	102	O,o	33	11000110	C6	198	6
16	01101001	69	105	P,p	34	11001001	C9	201	7
17	01101010	6A	106	Q,q	35	11001010	CA	202	8
18	01101100	6C	108	R,r	36	11001100	CC	204	9

(a) Electronics   (b) Communication   (c) Engineering12345
Fig 1: Carrier image generation from text using 4 out of 8 codes

III. SCAN PATTERN METHODOLOGY

Scan is a formal-language based methodology and is capable of creating a huge number scan patterns by accessing its spatial properties. Based on different applications there are different scan methods such as simple scan, extended scan and generalized scan. Each of it has a specific type of scan patterns. Each scan pattern has its own grammar. Each basic scan pattern has a set of transformation and set of laws to obtain complex scan patterns from basic ones if necessary.

The proposed image encryption and decryption method is based on the rearrangement of the digital image which is nothing but a 2-d array of pixels. The rearrangement is done by using scan pattern technique and it acts as a key for both encryption and decryption. Scan pattern of a 2-d array is nothing but the order in which each and every element of that respective array is accessed only and exactly once. So as an array is processed only once. An (n*n) array will have (n*n) scanning.
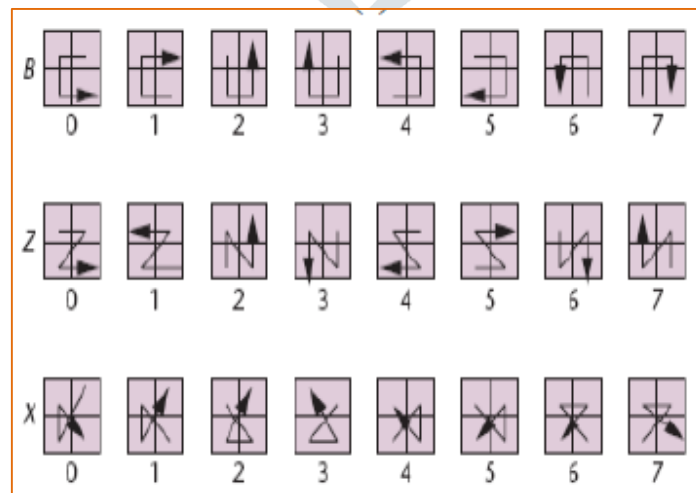
(a) Partition patterns & transformation
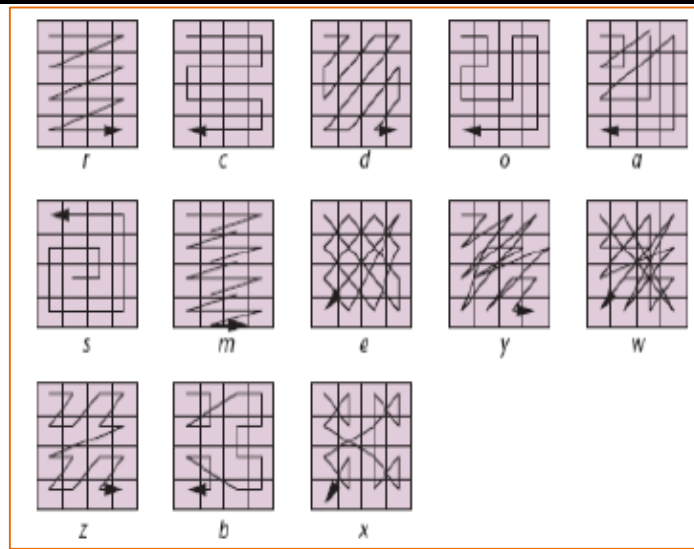
(b) Basic scan patterns

Fig 2: Scan pattern phenomenon

IV. PROPOSED IMAGE ENCRYPTION APPROACH ALGORITHM

Figure 3 shows the proposed block diagram of Image encryption. Initially, original image is xored with the carrier image, which is generated from various texts as shown in figure 1. Later this scribbled image scanned with orthogonal d scan pattern with help of scan key for more secure purpose. Finally, proposed encrypted image obtained which is more difficult to understand the image and decrypt this image also. In this procedure, orthogonal d scan pattern used for data scribbling. This scribbled process as shown in figure 4. Figure 5 shows the simulated results of various images as per the block diagram process.
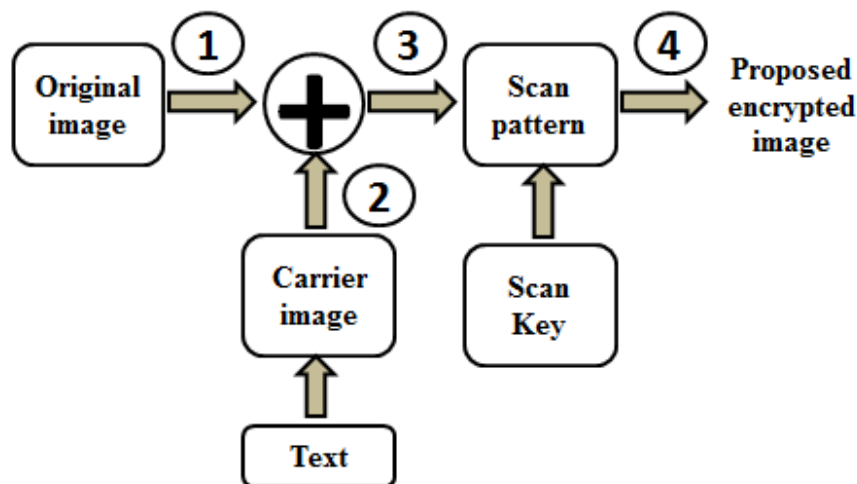
Fig 3: Block diagram of proposed encryption algorithm
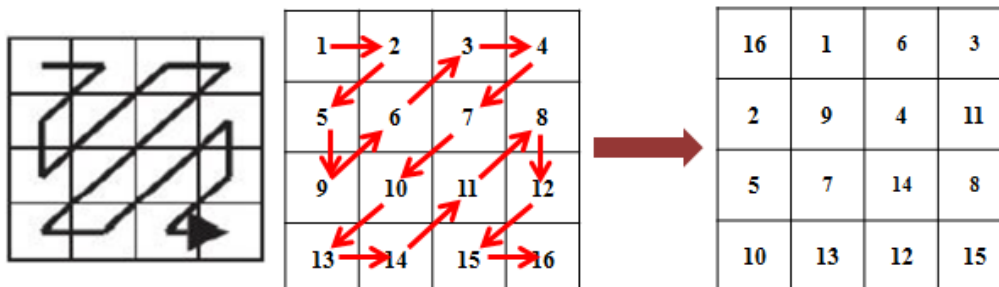
Fig 4: Orthogonal d-scan pattern & its process
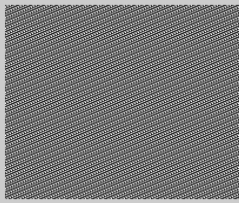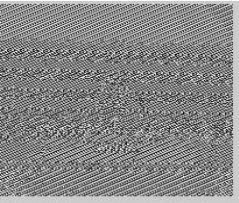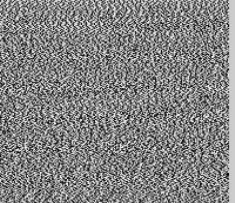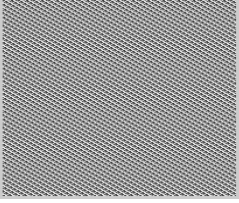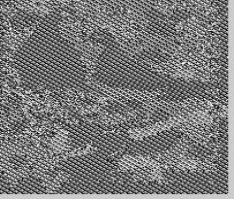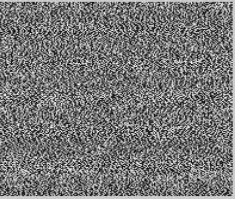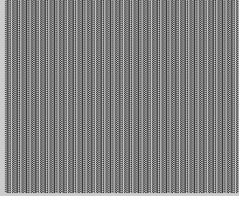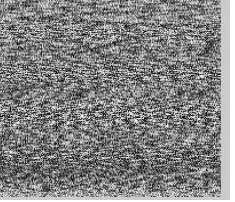
Text	Original image (1)	Carrier image (2)	Xored image (3)	Proposed encrypted image (4)
Electronics				
Communication				
Engineering12345				

Fig 5: Original, carrier, Xored& scanned images for various texts

IV. PROPOSED IMAGE DECRYPTION MECHANISM

Figure 6 shows the block diagram of decrypted image. Initially, encrypted image descan by using scan key what were previously used in the encryption process. To obtain the original image, descaned image xored with carrier image. Figure 7 shows the simulated results of block diagram as mentioned in the figure 6.
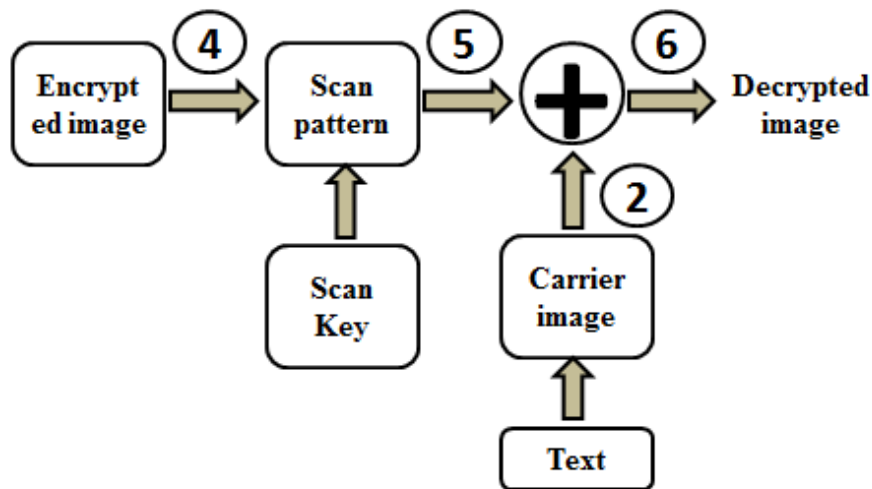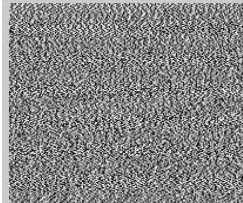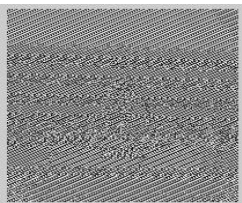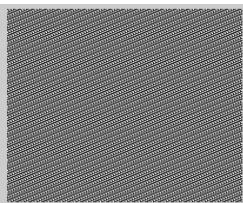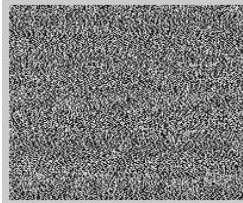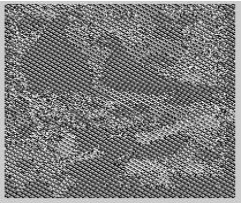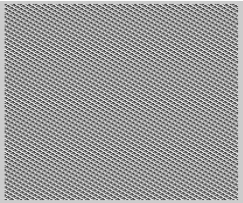

Fig 6: Block diagram of decrypted image

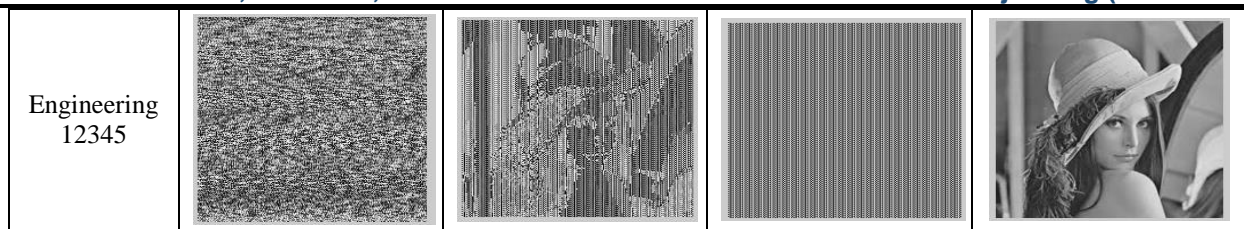| Text	Proposed encrypted image (4)	Descanned image (5)	Carrier image (2)	Recovered original image (6)
Electronics				
Communication				

Fig 7: Decrypted images for various texts

V. CONCLUSION

The proposed work shows the image encryption and decryption method using scan pattern and 4 out of 8 codes. It provides security through the carrier image developed from the text by using 4 out of 8 codes. Though we have many image encryption methods, the proposed work provides more scribbled image at the output which is very difficult to hack. Hence it provides high security and high efficient to the data given.

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