Analysis and Encryption of Medical Image using Genetic Algorithm

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Abstract: In technological world, security of information is very beneficial. To secure the information, encryption algorithm is used. Digital medical image plays an important role in daily life and is a great source of information as it tells the main cause of any disease. The safety of these images is a major concern especially when these are sent over communication channels. This paper has proposed a method of encoding grey scale based medical image using genetic algorithm. The pixels of an image acts as chromosomes which are further encrypted using random number generator.

Keywords- Genetic algorithm, medical image protection, encryption, random number generator, grey scale image.

I. INTRODUCTION

Data privacy has become unacceptable for data access and has increased the demand for digital signal transmission. Different cryptographic methods have been used to protect information from unauthorised access. Greater complexity involved in the central generation process makes it difficult for the glass attackers to break the key.

Genetic algorithm is the new paradigms for adaptive algorithm based on natural selection and mechanism of natural genetics and mechanism of natural genetics. This can solve optimization problems which are based on mechanism of biological evolution, such as mutation, intersection, selection and inheritance.

Genetic algorithm is the process of biological simulation of evolution and intersection of mutation. These algorithm use payment value known as search ability. This quality make genetic algorithm better than other local search procedure, such as gradient descent or greedy corrupt methods used for optimization. Genetic algorithm was used for a variety of image processing programs, image segmentation, image compression etc.

II. GENETIC ALGORITHM

Genetic algorithm simulates the process of biological evolution using the survival principle of the fittest. Genetic algorithm has been used for image fragmentation including extraction of remote sensing and medicinal properties. In contrast to the traditional improvement methods, genetic algorithm uses parallel random search to arrive at optimal solution.

III. RANDOM NUMBER GENERATOR

Random number generator is a modern application used to generate randomness in devices such as dice, cards, coins etc. In modern computing, random number generator is implemented through programming based on computation. The value generated by these generator are not truly random as it can be predicted if all seed values are known so this is called pseudorandom number generator.

A true random number generator does not rely on mathematical equation and computing algorithm. Here pseudorandom codes are generated which act as key for encryption.

IV. PIXEL BASED FRAGMENTATION

In pixel based fragmentation, each pixel of an image is being analysed by the spectral information that they contain. A pixel is the fundamental unit of an image. An image is formed by number of pixels. In this method we are analysing the medical image which are in grey scale. Grey scale pixel ranges from 0 to 255. Each pixel of an image is encoded with the help of pseudorandom code and then fragmented in block size of N×N.

V. PROPOSED METHOD

In this medical image processing pixels are considered corresponding to the chromosomes. Chromosomes are used to produce offsprings. Offspring will be the encoded form of an image.

A. Process of image encryption

- Population Growth- In this process, a new set of population is generated from existing population by applying various sets of operation.

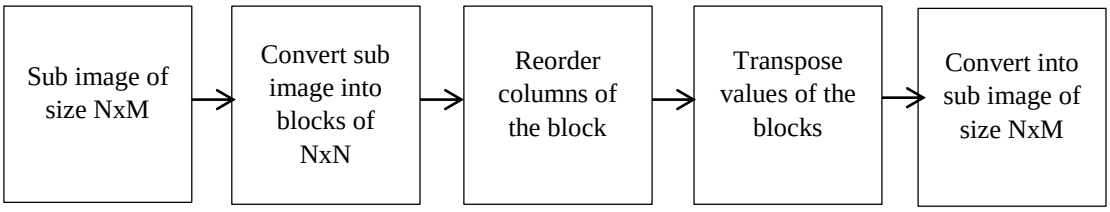

Fig 1: Initial Population Growth

- Crossover- In genetic algorithm, crossover is the process or genetic operator that is used to join two chromosomes. The newly generated chromosome is known as offspring which is replaced by the parent. This implies that there is no need for the selection operator as well as fitness function.

Chromosome 1	11011 00100110110
Chromosome 2	11011 1100011110
Offspring1	11011 1100011110
Offspring 2	11011 00100110110

Table 1: Crossover Process

- Generation of key- Pseudorandom key is generated in the range of 1 to N using random number generator. The offspring produced acts as new set of chromosomes and are now crossovered with generated keys.
  For example two chromosomes (01011001 & 01110011) to be crossover using session key 11001011 and newly generated chromosomes are shown in the table.

Chromosome 1	01011001
Chromosome 2	01110011
Offspring1	01111001
Offspring 2	01010011

Table 2: Key Dependent crossover operation

- Mutation process- Mutation randomly changes child from what's its parents produce in crossover. It is a genetic operator which changes one or more bit in a chromosome. In this algorithm, swapping mutation is used.

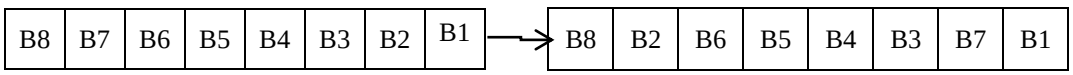

Fig 2: Mutation Operation

- Flowchart of Proposed Design-

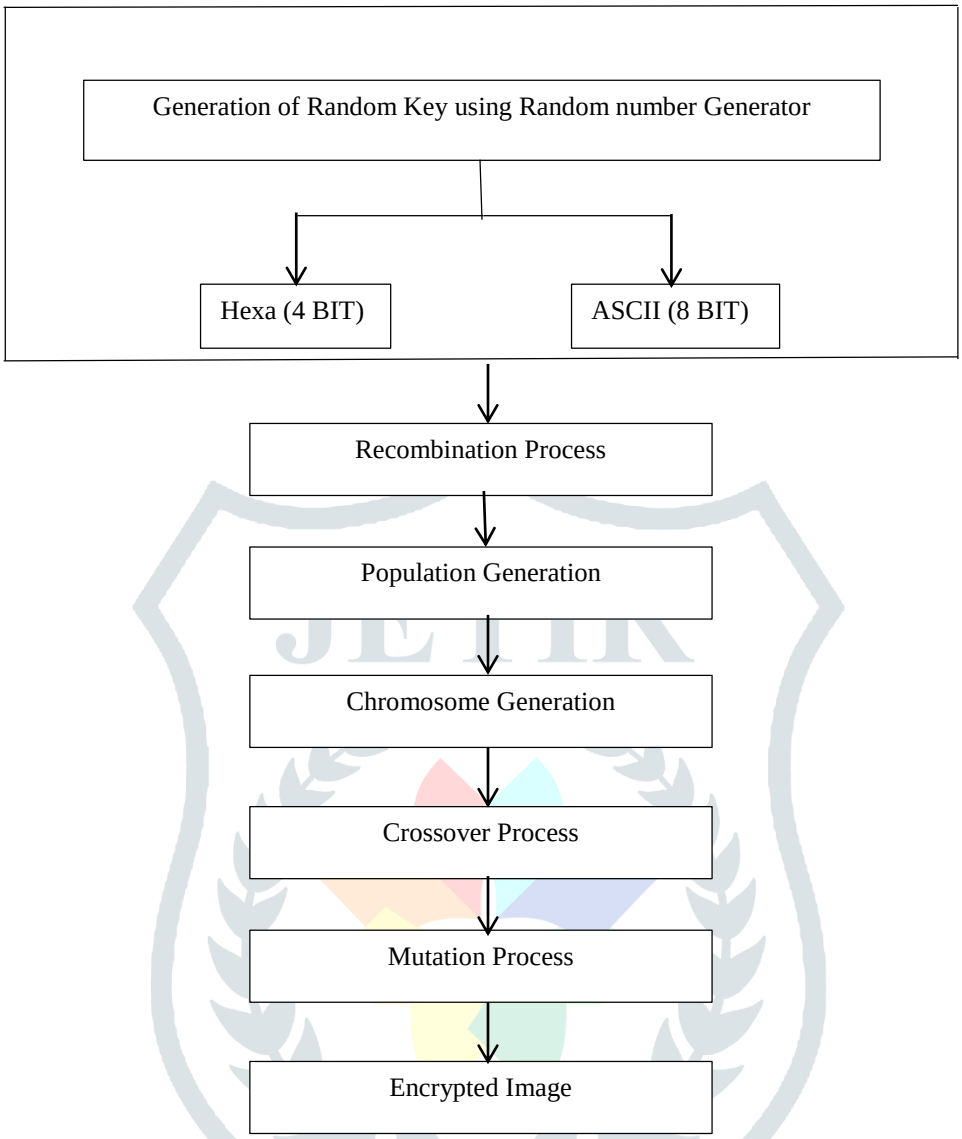

Fig 3: Flowchart of Proposed Design

B. Process of Image Decryption
Encryption keys are used to decrypt the image. Decryption algorithm is reverse of encryption algorithm.

V. EXPERIMENTAL RESULTS

The Image is transfer after the encryption of the medical image, at the time of communicating or transfer the medical image we transfer the encrypted image for the protection of the original medical image because from this process only that person will be get the original in which we want to transfer it. Only that person gets the original image after decryption process of the encrypted medical image.

The figure 3(a) shown a original medical image and the figure 3(b) shown the it's encrypted image. From the encrypted image no one can get the original image before decrypted it properly.

Fig 3(a): Original Medical Image

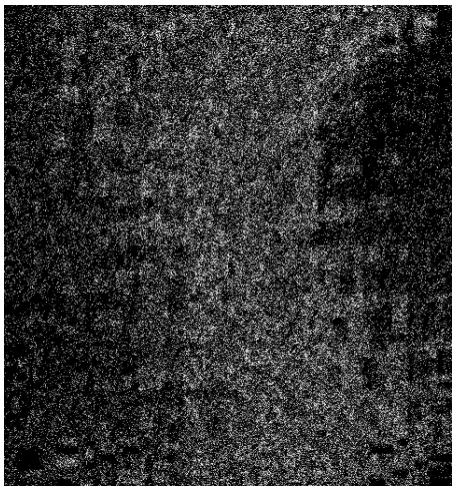
Fig 3(b): Encrypted Medical Image

VI. REFERENCES

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