

**

*

(BMP, PNG)
(GA) (Blokes)
Least (LSB) Genetic Algorithm
Standard Deviation (STD) , Significant Bit
,
Peak Signal to Noise Ratio (PSNR)
Mean Square Error (MSE) Bit Error Rate (BER)
Matlab 9b . (PSNR)
.GA

An Optimized Genetic Algorithm-based Approach for Steganography

Abstract

In this paper, a new steganographic technique was proposed. First, the cover colored image (of type BMP, PNG) transferred to a gray image, then the result divided into many blocks to embed the secret message in an optimaized method by GA (Genetic Algorithm) after using the LSB (Least Significant Bit) technique. The STD (Standard Deviation) was calculated for each block of the image blocks before and after

/ مدرس
/ مدرس**
/ مدرس مساعد***

تاريخ التسلم: 2011/10/1 تاريخ القبول : 2011/ 12/ 21

embedding operation besides that the results were compared together, then the GA was used to obtain the Optimized value for the PSNR (Peak Signal-to-Noise Ratio) measure. To improve the performance of the results many measures were used such as BER (Bit Error Rate), MSE (Mean Square Error) and PSNR. The implementation was done using Matlab 9b as a programming language because of it's perfect Library of GA.

_1

(Cryptography)

(Internet)

. (Information Steganography)

()

(Information Embedding)

(Imperceptible)

.[3][1]()

()

Covered)

. [1]

(Steganography)

(Steganography Writing)

(Writing

(Graph)

(Steganos)

Security)

. [5] (Covered Writing)

(Writing

_2

(GA)

El-Zouka,H.

(2010)

, LSB

Hsing,C.,

.[3](%57)

Wang, Sh.

.[5]

LSB

()

LSB

Mohamed,M.

(2011)

.[10]

LSB

.[6]

: _3

•

(GA)

()

.[10][4]

:

:(Selection) .1

Goldberg

)

. (

.2 (Crossover):

.3 (Mutation):

[7][8].

Gaussian

)

(

(

)

[3][9].

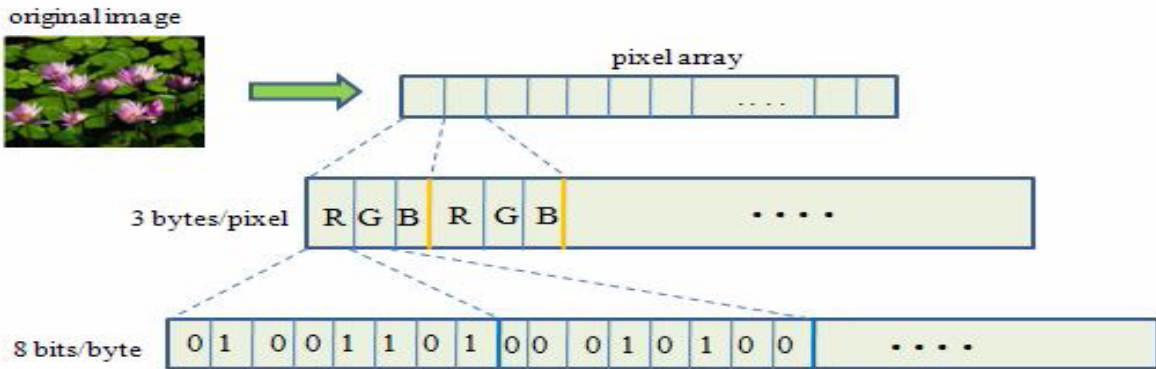
(

)

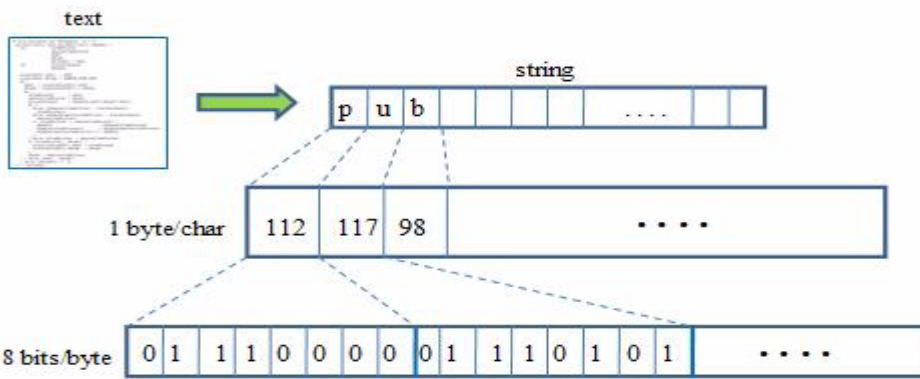
(LSB)

[1] [5]:

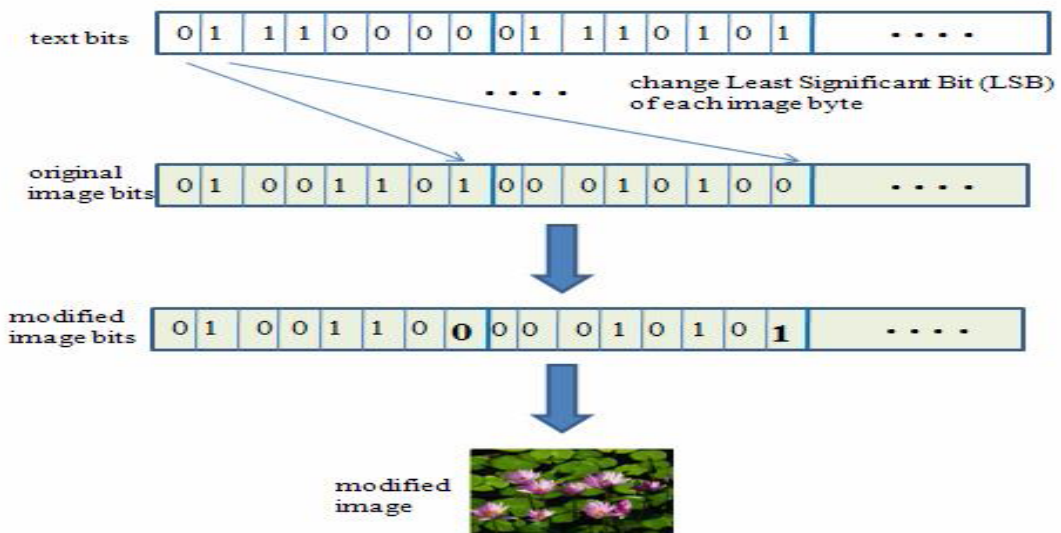
خطأ!



PNG 24-bit : (1)



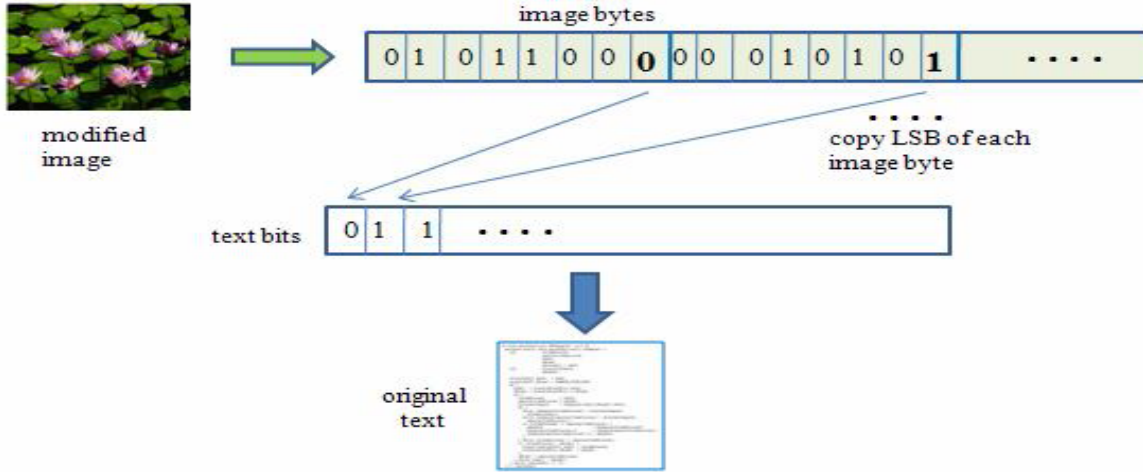
: (2)



(3) :

في هذه الطريقة تبدو الصورة الناتجة بعد عملية الاخفاء مماثلة للصورة الغطاء بالنسبة للعين البشرية [10]

خطأ!



الشكل (4): عملية استرجاع النص من الصورة بعد الاخفاء

(Seed)

[6][5]

_4

(Embedded Message)

(Hidden Message)

(Stego-Message)

(.PNG) (.BMP)

(I)

.1

(I)

.2

:

.3

M

(I)

•

4

•

(STD)

.4

(.TXT)

.5

: PSNR

(fitness function)

.6

$$psnr = 10 \log\left(\frac{c \max^2}{MSE}\right) \dots\dots\dots(1)$$

$$MSE = \frac{1}{n * m * (s - c)^2} \dots\dots\dots(2)$$

: n,m

: C,S

: c max

()

(Blocks)

.7

عدد خاص بوقائع المؤتمر العلمي الرابع لكلية علوم الحاسوب والرياضيات

= (=)

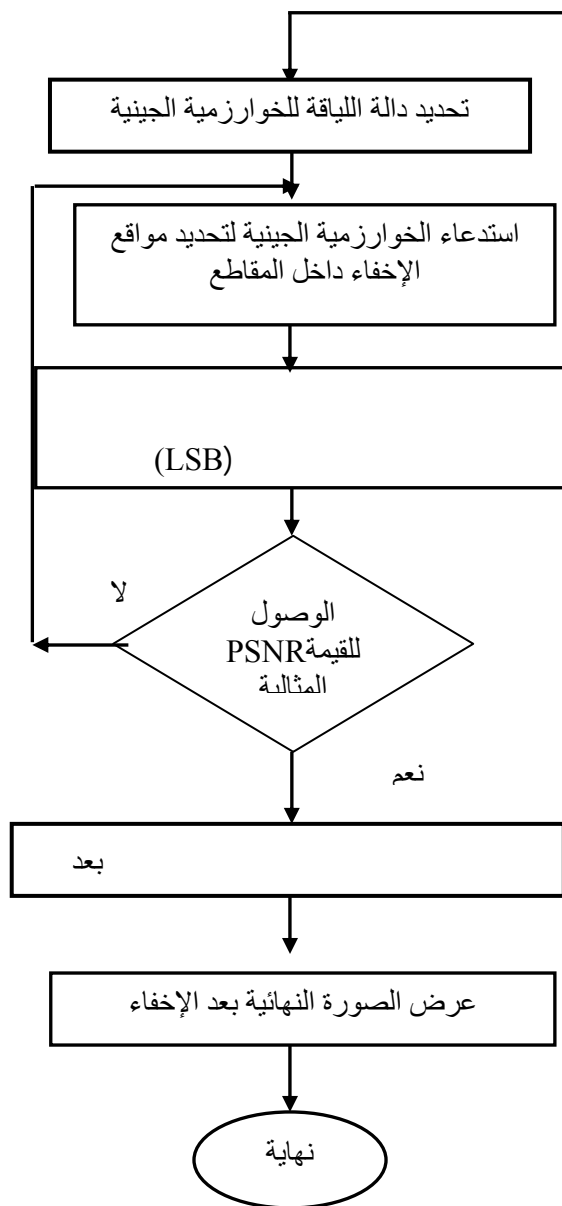
.8

.9 (Stego-image)

stego_key

والشكل الآتي يبين المخطط الانسيابي

(BMP) أو (PNG) .



(BMP) أو)

(PNG

(Stego-Message).

(Stego-Message)

()

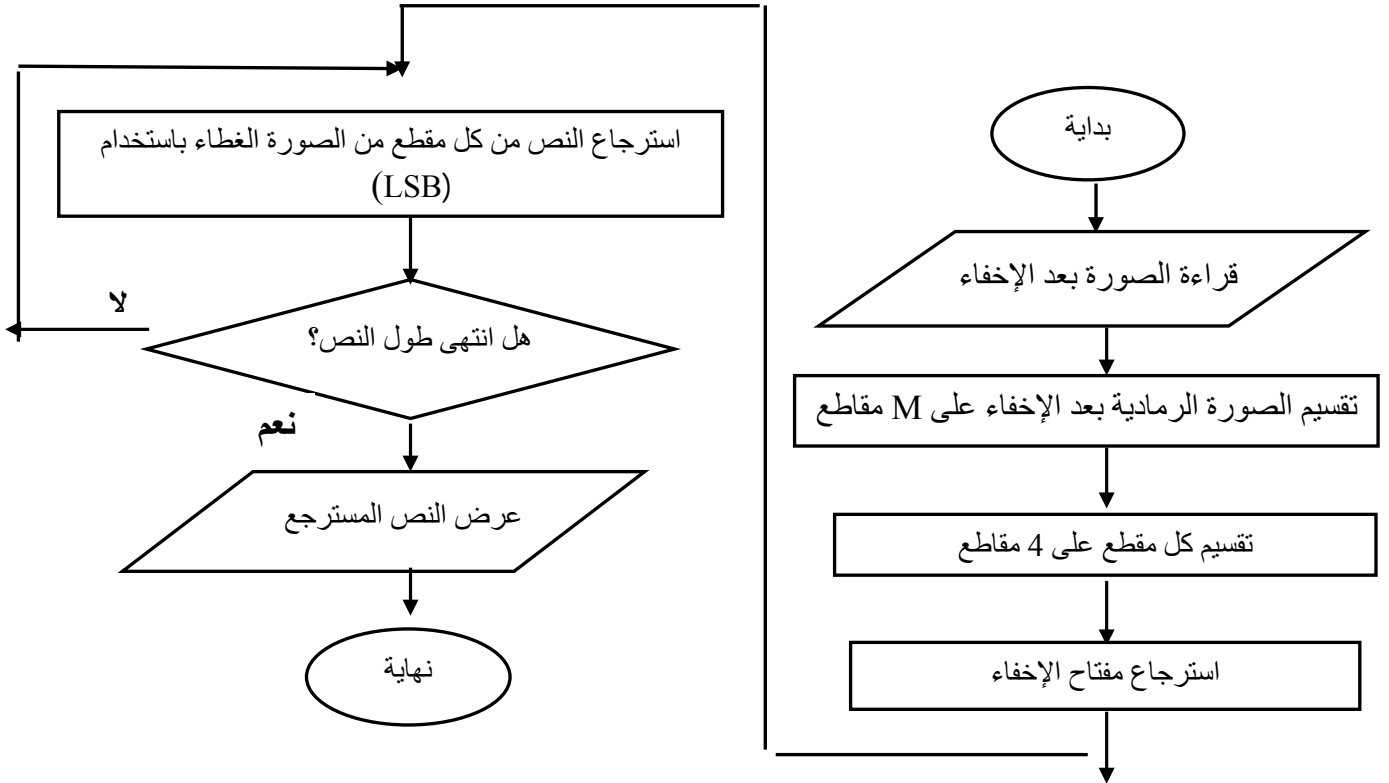
الشكل (5)

_5

[1][2].

- 1- قراءة الصورة بعد الإخفاء .
- 2-
- 3- () M
- 4- 4
- 5- ()
- 6- (bit) (byte)

الانسيابي لعملية استرجاع النص من الصورة :



الشكل (6): المخطط الانسيابي لعملية استرجاع النص من الصورة نوع (BMP) أو (PNG)

6_ :

256*256

:

(7)

(Paradise is Under Mothers Feet)



الشكل (7): صورة الغطاء

:

.1

.2

:

.() 50

stochastic uniform

•

•

scattered

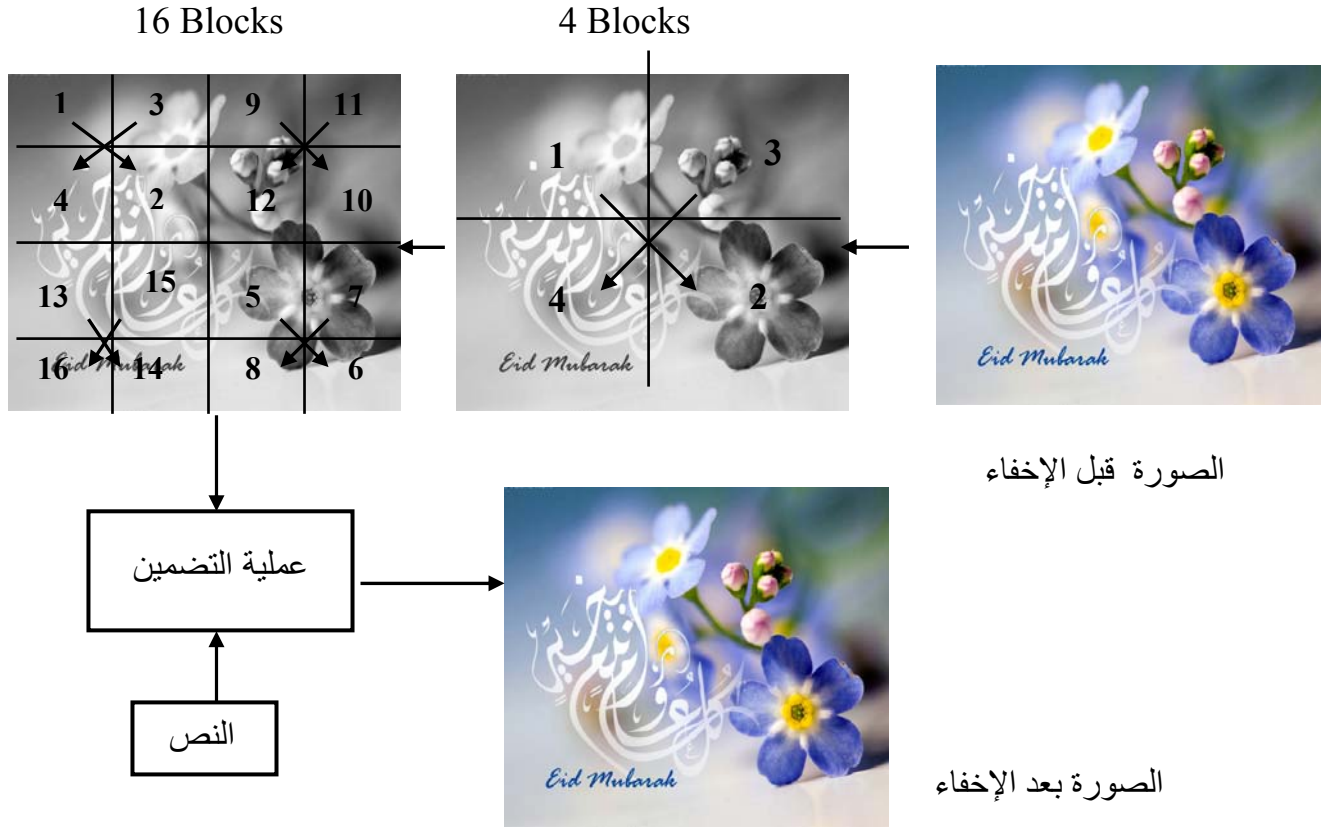
•

mask=[1 0]

adaptive feasible

•

:



(8):

3. تم استخدام المقاييس التالية لتوضيح النتائج بالإضافة إلى مقياس نسبة الضوضاء بالصورة PSNR ونسبة الخطأ بالصورة MSE المذكوران سلفاً:

• الانحراف المعياري (σ):

$$\left(\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n} \right)^{1/2}$$

$$\sigma = \sqrt{\left(\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n} \right)} \dots \dots \dots (3)$$

BER

() PSNR

) PSNR .1

. (GA
.2

, PSNR .3

, PSNR
(Scattered) .4

(Adaptive feasible) (Stochastic uniform)

) (GA)

.() (PSNR

.DWT DCT .1

.2

" (2008) -1

"

" (2011) -2

,"

- 3- El-Zouka,H.A,(2010) , "Distortion Free Steganography System Based on Genetic Algorithm " , Journal of Information Hiding and Multimedia Signal Processing . Vol. 1 , No. 1 .
- 4- GEN, M. , (2000) , " Genetic Algorithms and Engineering Optimization " , John Wiley and Sons, Inc.
- 5- Hsing,C., Jeng,S. , (2010) , "Transforming LSB Substitution for Image-based Steganography in Matching Algorithms" , Journal of Information Science and Engineering .
- 6- Mohamed ,M. & et.al. , (2011) , " Data Hiding by LSB Substitution Using Genetic Optimal Key permutation " , International Arab Journal of e-technology , Vol.2, No.1.
- 7- Pascal ,W.M. &et.al. , (2009) ," Matlab for Neuroscientists : An Introduction to Scientific Computing in Matlab " , Elsevier Inc .
- 8- Rutkowski, L.S.&et.al. , (2010) ," Artificial Intelligence and Soft Computing" Springer– Verlag Berlin .
- 9- Sivanaudom,S.N.,Deepa, S.N.,(2008) , "An Introduction to Genetic Algorithms " , Springer – Verlag Berlin Heidelberg.
- 10- Wang , B. & et.al. , (2010) , " A Secure Steganography Method based on Genetic Algorithm " , Journal of Information Hiding and Multimedia Signal Processing . Vol. 1 , No. 1 .

(الملحق)

