

LSB  
RBF

(stego\_cover) (Least Significant Bit (LSB))  
(Radial Basis Function (cover)  
Network (RBF))  
(weight) (messages)  
(target) (stego-cover)  
(RBF)  
(RBF) (stego-cover)  
(Matlab R2008a)

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## Encrypted data hiding & retrieval of an image using LSB based on RBF network

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### Abstract

In this paper an image is hidden in another image using one of the hiding algorithms (Least Significant Bit) to produce the stego-cover image which used as an input with the cover to Radial basis function Network to produce the weights.

Cover is delivered once to the recipient who can use it for unlimited number of messages. The weights are delivered to the recipient for each hidden message as a key. The recipient uses the cover with the weights to unhide the message. So that this method include two levels of security. The first one is hiding the message in the cover to produce stego-cover image. The second one is ciphering the embedded image using RBF Neural Network. This Network is considered as a target and the input to the Neural Network is the cover image. Then the weights, which represent the encrypted information are reconstructed. The recipient can use RBF Network to unhide the message by having the stego-cover image then the message.

Matlab R2008a was used in this paper.

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-

[1][2]

(cover)

(RBF)

:

-

[3]

[4]

(Ycbr)

Counter-Propagation

Wavelet

[5]

(stego-cover)

**(Radial Basis Function Network)**

- -

(RBF)

[6]

RBF

[7]

-

DeMoivre (Gaussian function)  
 (Gauss 1777-1855)

[8]

(bell shape)

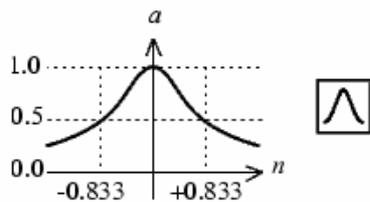
(radial basis) RBF [10][9]  
 :[11]

$$radbas(n) = e^{-n^2} \dots\dots (1)$$

( ) ( )

[7][6] Radial basis

[11] (radbas) (1)



:( )

(Basis function)

RBF

RBF

( )

:

RBF

.Function Approximation -

.Classification -

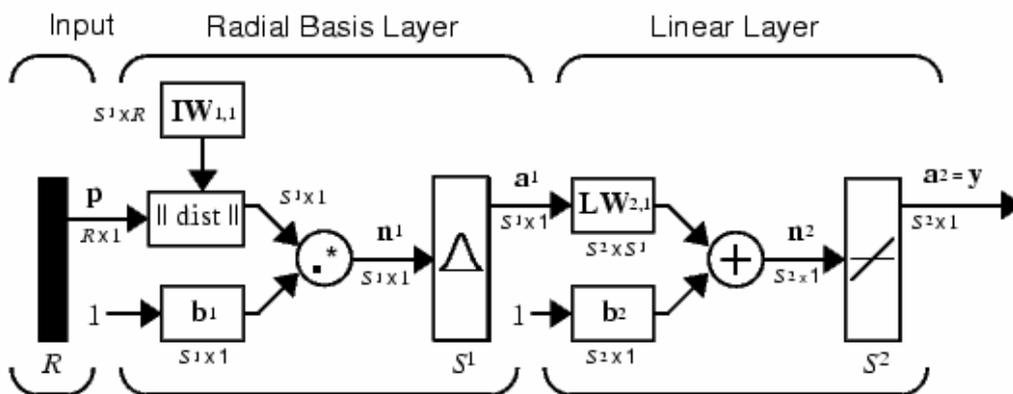
[6] -

**:RBF** - -

RBF

RBF

( )



RBF

( )

:R

:S<sup>1</sup>

:S<sup>2</sup>

:p

:IW<sup>1,1</sup>

.basis :b<sup>1</sup>,b<sup>2</sup>

:LW<sup>2,1</sup>

-

unsupervised )

(supervised)

(clustering technique

. [6]

:[11]

$$a_{l_i} = \text{radbas}\left(\left\|I W_{1,1} - p\right\| b_{l_i}\right) \dots\dots (2)$$

:[11]

$$a_2 = \text{purelin}(LW_{2,1} a_1 + b_2) \dots\dots (3)$$

(Bias node)

. [6] +

- :message

- : (cover)

(R,G,B)

(jpg) (bmp)

(Lossy

(bmp)

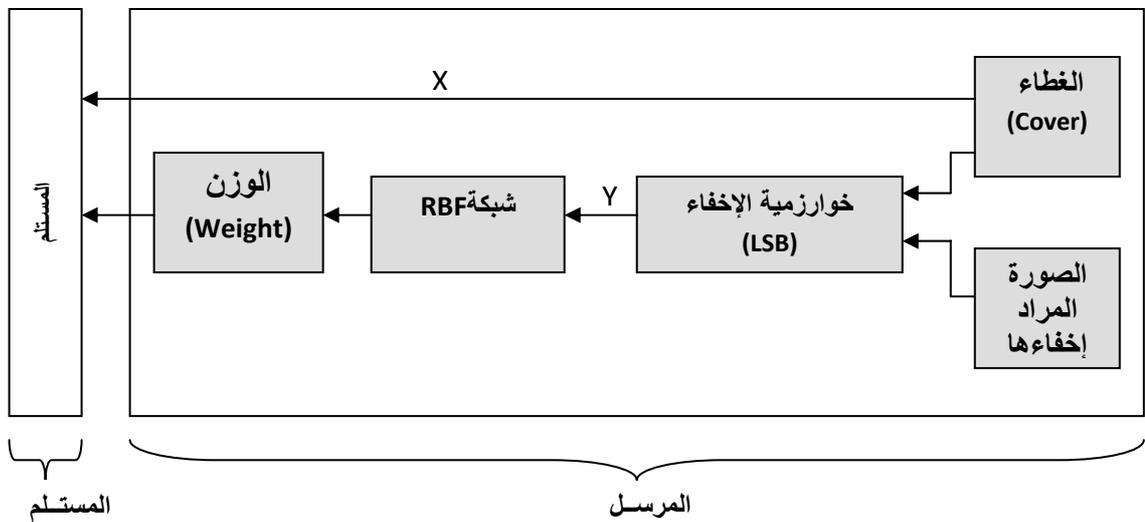
. [1] (jpg)

Compression)

-(message)-

(bmp) (message)  
 (cover)  
 (cover) (message)  
 (cover) (message)  
 (message) bits  
 bits (cover)  
 bits  
 :

.( )

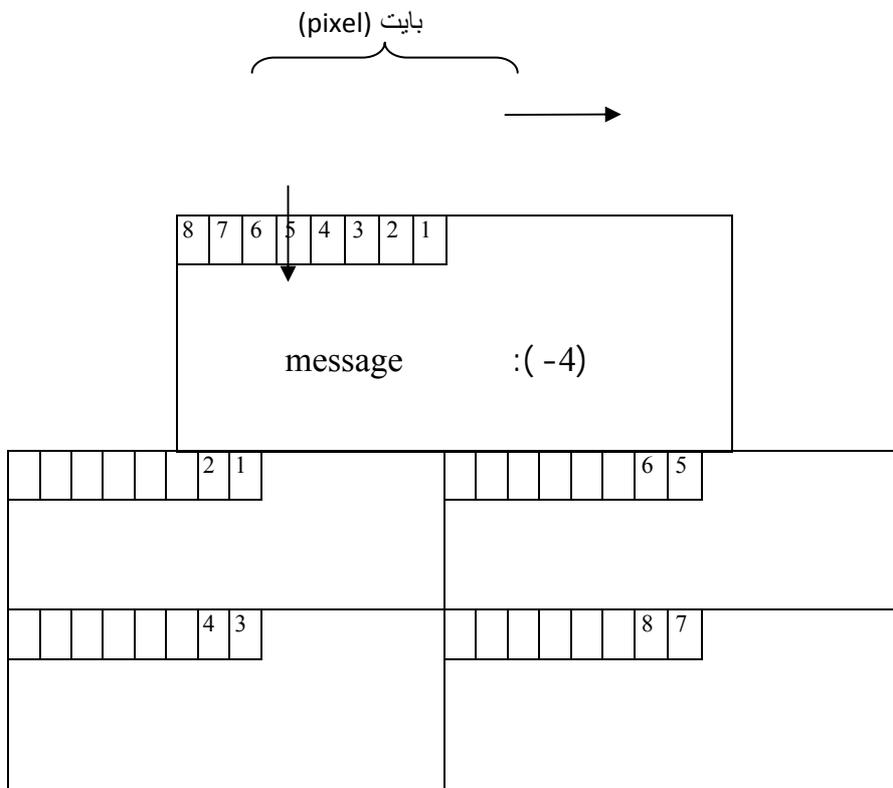


الشكل (3): مخطط خوارزمية الإخفاء

(cover) (message) (bits)  
 (message) (cover) (message)

(8 (message) (2bits) (cover) bits)

(message)  
 (4 bytes) (message) (byte) bits  
 2bit (byte)  
 . ( ) (cover)



:( -4)

bits :(4)

-

:

- -

(cover) (byte) (LSB)  
 .[2][1] (LSB) (byte) (2bit)  
 (message)  
 .(stego- (byte) (2bits) (cover)  
 cover)  
 (LSB)

:

**RBF**

- -

(X) (cover) RBF  
 (Y) (X) (Y) (stego-cover) RBF  
 ( ) ( ) ( ) RBF  
 ( ) (cover)  
 .(stego-cover)

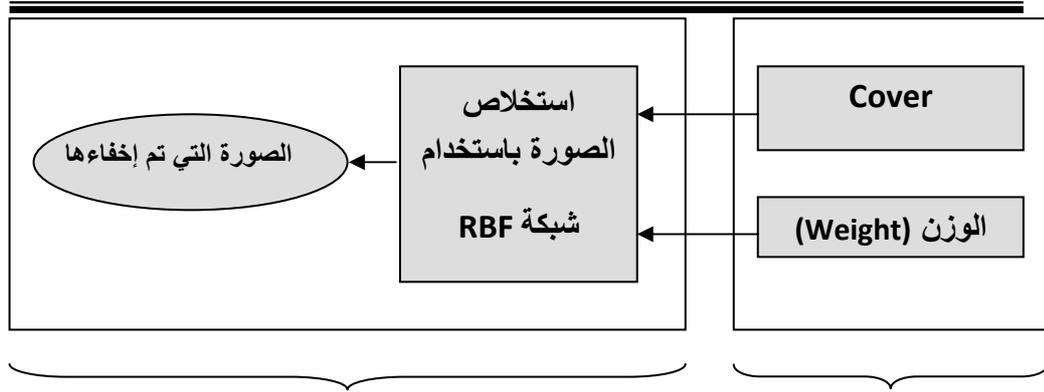
**:(Weights)**

- -

:

-

.( )



:(5)

: **RBF** - -

RBF (cover) (weight)

( ) ( )

. (cover)

:( ) - -

(stego-cover)

(message) (cover)

:

(message) (cover) -

.( )



(cover) : ( )

(message)

( ) .

(cover)



(message) الشكل (٧):

(stego-cover)

(message)

(cover)

( ) .



(message) (cover) : ( )

(stego-cover)

-

(stego-cover) (weight) -

(message) , -

(cover)

.( )



(message) :( )

(Cover)

(Cover)

(Weight)

(message)

.(messages)

(Cover)

.(message)

(stego-cover)

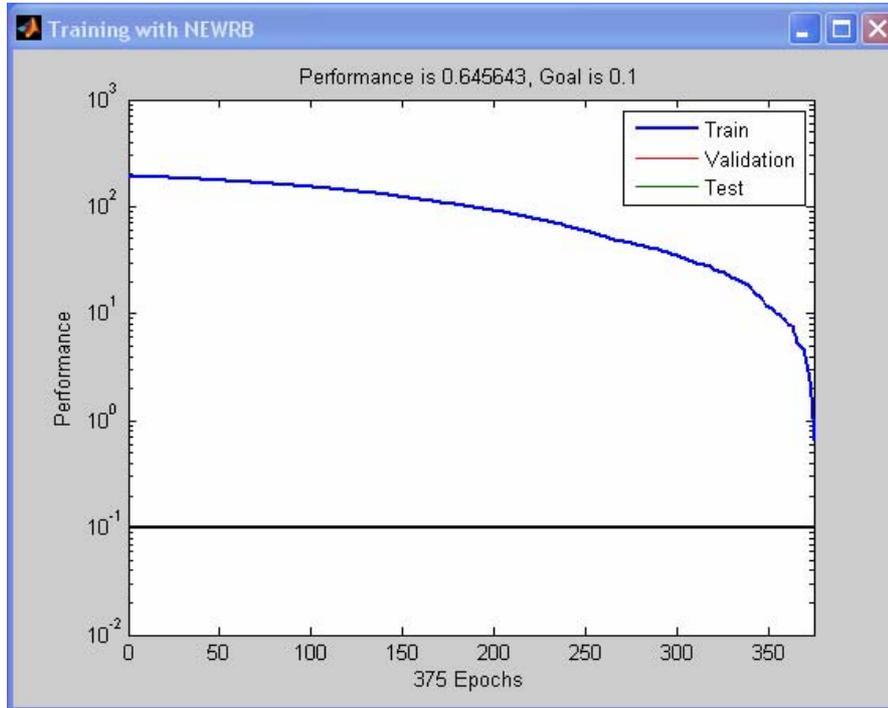
(Weight)

(Cover)

(Cover)

.(stego-cover)

(stego-cover) (Cover) RBF  
 .RBF (10)



RBF : ( )

(Cover) (stego-cover)

(Cover)

(Cover)

(Mean Square Error (MSE)) ( ) (PSNR)

(target) (RBF) (stego-cover)

(message)

" (2008)

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- A., Muhalim M., (2003), "Information Hiding Using Steganography", University Technology Malaysia.
3. K. Naoe, Takefuji, (2008), "Damage less Information Hiding using Neural network on Ycbcr Domain", IJCSNS, Vol 8 No. 9, September.
  4. W. Guohua, (2008), "A Fast Audio Digital Watermark Method Based on Counter-Propagation Neural Net Works", Hangzhou Dianzi University Institute of Graphics and Image Hangzhou, Chin 9.

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5. D. Jennifer, B. Clifford, (2005), "An Artificial Neural Network for Wavelet Steganalysis", Iowa State University, Ames Iowa, 50011.  
" ( ) .6
  7. Patterson D. (1996), "Artificial Networks", Singapore, Prentice Hall.  
" ( ) .8
  9. Huang J. Shimizu A. (2002), "Robust Face Detection Using A Modified Radial Basis Function Network", IEICE Trans. ,Inf. & Syst. Vol E85-D, No 10.
  10. Pao, Y.H., (1998), "Adaptive Pattern Recognition And Neural Networks", Wesley Publishing Company, Inc. New York.
  11. Howard D., Mark B., (2008), "Neural Network toolbox user's", The mathworks.