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Intelligent water marketing with using learning techniques machines for extraction (producing) water marketing in images with use of SVM algorithm.

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ABSTRACT

In last decats. Intelligent water marketing is used for securiting digital datas with importance of the images more interact was shown on Intelligent water marketing. The aim of intelligent water marketing with use of machine learning is to produce water marketing on image. The offered method is a comprehensive method for water marketing in images was introduced. To assessed this method meny images in two sizes 2000 and 3000 was saved in TiF farmat. About 2000 images were cated to different sizes with different quality Photoshop such as 650,500,500,650,750,950,750. This images are different in content & complexity. The offered method of water marketing by using RG/B information. The water marketing was offered. In this method according to channels round the images was produced which is very accurate to find and fix and compare LSB. In this method after checking the different output of water marketing method for the image, special property for the image was found. That is capable to find the difference between two groups, the natural images and water marketing. More of this producing water marketing images were discussed. In addition to produce the property, producing water marketing images in a subtic design were checked. In addition water marketing method can show what are weak points of each image against stastical attacts and how can be safe, and for producing water marketing support vector machine (SVMS) in used for observation Learning, beacause of its ability and reliable margins of support vector machine the images that are attacted were discussed.

Key Words : Smart water marking , Machine learning , Water marking , The picture

Introduction

Water marketing helps to hide agiven data to have a privet property which is some of steganography staganograply to hide one data inside another data in both methods they use more covering this covering can be sound image. Photo ur even a text, because they can have extra covering we can hide secret in a noise in cover, water marketing is a branch of hiding that in 1996 for the first time was introduced.

Water marketing as a protective method for copyright for the classification of water marketing we can categorize them in to two groups of them come open & hidden water marketing that each of them has got its specific.

It is difficult to remove open water marketing and it may damage the image. Hoever water marketing and it's contain is known to all, even the product owner does not want the watermarks to be obious, other type of open water marks include hard and non-transparent watermarks, including television logo designs but the secret watermarks, a the name implies are hidden and connot be easily ascertain these types of water marks can be used to Identify the ownership as well as the integrity of an image. Learning machine means how a program can be made for computer. Learning maybe make changes in stracture of program on a data. The definition of learning maching was given in 1959 by Artour samoal.

Its ascience which helps to computer to learn without any program. Learning machine is a new field of intelligence water marketing that is in proceeding. Learning machine it's an investigation in computer sciences. There are many other methods in order to learning computer, like intelligent water market, psychology- philasofy, information theory control theory learning machine try to finde methods and algorithms that can help computer to learn.

Water market means hiding a data (watermark) in the overlary (cover). Digital media (specialy will moving in internet information web said. There was more ways to create strong watermarks. In the other hand the methods to detect suspicious links are in progress.

Blind source detection means to find a hidden massage in a digital media. Which may known as classification item. Watermarketing is used to find information which are hiden market and made by algorithm market. There are more methods in this case. That have their species vector machine is the best for classification.

Water market researchers they intend to find a full method for water market. There methods are a kind of classification methods for extracting specific characteristics from the image without using algorithm methods. The most important specific of watermarket is to find mathematical (specification of an image in two groups, natural and watermarket, to an image in two groups, natural and watermarket, to find hidden images by blined methods which is very important to watermarket, because any changes in image can be deviated which is different with the image. We can say the Specific characteristics for watermarket has two conditions.

1- must be sensitive to water market

2- must be unsenetive to the signals.

These two are important when the statistical community of the covered image is found by the statistical of water market image.

In this research we show you intelligent water market how can use machine learning techniques for producing water market in image.

Water market by use of learning machine, design a valiable isolate classification with two classes these classification by the separated specific from image be discussed and learned. The result is a machine which. Each tested signals must be put in a one of the two class as water market. The first out put of water market. Is to get specifics of an image.

These specifics must be very special to be a delegation of image in classification. In second term the operation of classification of dates must be devided two classes one clear and the other unclear different algorithms for classification are introduced.

1- vector machine introduces one types of classification for mathers of two class.

This method is common in water market.

The discusses paints in multiple spaces will be made and in learning terms try to make a seprate page for marked datas in each class.

Offered Method

The vector machine is a algorithm theory which is newly has been made and its aim is to be constant against noise and to extend new semplesin theaching SVM carnels, paramiters carnels and selecting specifics is important. Thus the selection must be best till the classification of SVM be better.

One of connect filld with SVM is to make good structure of SVM Algorithm. Which uses short time to act. Will teaching, and the combination of SVM with the other methods has became subtic.

In this reaserch after checking vector machine we will check algorithms which are common with this method and important paramitters which are usefull for correctness. Errors of classification. Will be discussed. A set of points in space n called vector which shows the border of classes and making borders and changing one of these two may cause change in SVM or vector machine the best class between datas can be finding vector machine. And in SVM the start of start of learning machine and making a modle of it dates will be in vector machine.

The aim of algorithm SVM is to find the best border between datecs.

Vector control according to opinion of statistical learning is. The aim of this classification is to find a carrect page for disiding about two edges between class. If datas are in line and un seprate able, the dates lay line corner will shift to a big place and super page will be a pointed suppose I is given data in teaching which is each one shown as (X_i-Y_i). X_i is vector with specific (n) and Y_iE (-1/1) is sticker of it, the aim is to find super page which can separate two class with sticker 1 and -1 this super page can be called as (1).

$$WT\,\phi(x) + b = 0 \tag{1}$$

In this case the weight of vector W is vertical against super page (b) far measuring distance of super page up to the start point and $\phi(0)$ is a carnal for transferring data to big space (fig 1).

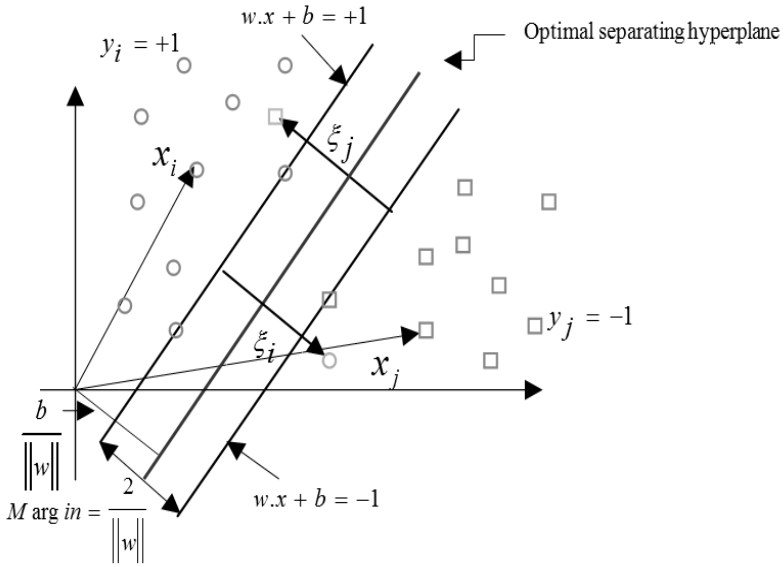

Figure 1: Classified datas in line which are unsepratable

To make a large between tow classes equal to w which is useful for solving to equation (2) min

$$\begin{aligned} &\min\left(\frac{1}{2}\|u\|^2 + c\sum_{|a|}^{k}\varepsilon, i \quad i = 1000\ \ k\right. \\ &\text{than} = y_i(w\phi(x_i) + b) > 1 - \varepsilon, i \quad i = 1000\,k \end{aligned} \tag{2}$$

That c parameter is an adjesting parameter in vector machine. We use $\varepsilon, i > 0$ that any dato will not be in edge, however for stoping noise we use $\varepsilon\, i$.

The optional design by solving problem (2) according to lagranj equation (3) will be measured.

$$f(x) = \sum_{xiesv} y_i a_i \phi(x_i)\phi(x) + b \tag{3}$$

In this case (ai) is coefficient of lagranj wahioh is accounted in optimal project.

SV are protect vectors the coefficicent of lagranj is biger then zero. Thses teaching datas lagranj is biger then zero. These teaching datas are the closest type to super page as the equation (3) the internal coefficient between two carnal is mentiond and can be accounted two types of cornal.

The most useable carnals are goss is and polin moinal the defind by equation (5), (4).

$$\phi(x_1, x) = \left(\frac{||x_i - x|}{e2a^2}\right) \tag{4}$$

$$\phi(x_1, x) = (x_i, x+1)^d \tag{5}$$

In this case (a) is cornal Gossis parameter and (d) is polynomial cornal.

The base Algorithm of vector machain for classification are developed.

The different algorithms were use to solve the problem. The common method used is to analyse different problems to different bynery classification algorithm against on and one against the others. These two are most useable.

In one by one method far each coaple class may use one binery vector machine, In this for m class $\frac{m(m-1)}{2}$ we need a classification binery vector machine at the end all the binery machine by selecting method will be combined.

The one by other method it is another method that cach binery vector machine separate datas of different classes. In this method for M classification: which has go more positive reasalt belongs to that classification.

- **selecting specific**

Selecting specific is one of the most important is in classification forward images according to vector machine, that by removing noise and un suitable cases the function of classification can be faster and better.

The method offered in this research, selecting specifics according to SVM elgorithm by using of covering techic will be done. In preprocessing the offered method is first of with the presence of all bands the quantity in the main process is to select the specifics.

- **vector machine algorithm**

This was introduced for the first time by vipening I was a method of classification of type.

- ✓ **maximum like hood algorithm classification**

In this elgorithm is according toi pixel that belongs to that class. Assuming that disterbutin like hood for class normally is multiple the uses the role of Gossis. In this method finidng pixel which is helongs to a class. Wi inx from multiple space will be selected by below equation.

$$\text{Max}\ [-\frac{1}{2}\sum_{i-1}^{L}\sum_{i=1}^{L}\lambda_i y_i(x_i, x_j)\, y_1\, \lambda_1 + \sum_{i}^{L} = 1\ \lambda_i] \tag{6}$$

In 1965 a rassian reasercher veladymire peing he designed classification and made vector machine according to his design. Protection vector machine is a classified machine for two classes- method of SVM tries to create a super page which makes the distance more.

The dot data given which are close to super page for measuring used distances, and these dot data given are called protection border – In figure 2 two classes and their border are shown.

Suppose the given datas are in two class and these classes are in Xi point that i=1000 L and I has Yi = ± 1 these two classes are equal to 1 for accounting the border of two class in separate time, we use the method edge – In this method line border between two classosi counted by this egnation.

$$Y_i \frac{(wxitb)}{|w|} \tag{7}$$

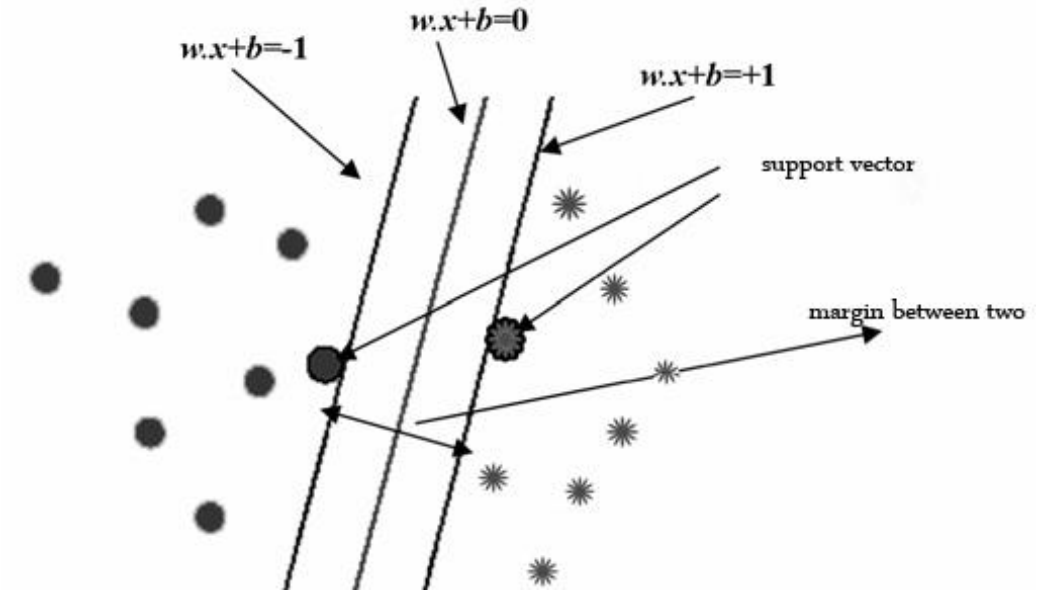

Figure 2: Line border for two classes when they are separated

A line border desigen can be written as

$$w_0 x + b = 0 \tag{8}$$

x-is a point on vector decision.

w- one vector is perpendicular an border of design.

Bw-distance between the start point up to vector decision wx sheuws the multiple result ty,x.

1) All type of class (+1) at one said of vector and the other types of (-1) class an the other said of vector will be.

2) the line vector must be closest to sample type of two class and must be perpendicular to line border of decision multiple one to both said (9) is equal by b,w.

Protection vector	xi if → yi (WiXi+b) = 1	(9)
Protection vector	xi if → yi (WiXi+b)=1	

The border of decision is a border with maximum edges and the solution is by

$$\max \min [y_i \frac{(w_i x_i + b)}{|w|}] \tag{10}$$

According to (10) and a series of mathematical functions the above equation will be changed to equation down

$$\min \frac{1}{2} | w |, (w, xi + b) - 1 >, i = 1,\ldots,L \tag{11}$$

Solving the optimization problem is difficult to make it simple we should use unknown coefficients.

$$\sum_1^L 1 \; y_i \lambda_i = 0 \tag{12}$$

After solving the above equation and finding coefficients of lagranj, w is accounted by down equation.

$$w = \sum_i^L = 1 \;\; y_i \lambda_i x_i \tag{13}$$

λ is bigger then ziro in other parts λ_i is ziro thus according to (Y) and λ_i ziro to x_i that are net protuction vector to get border decigion we need some learning limites point that are protuction vector thus the final classifications (9) will be fined.

Classifications of images needs limited points of learning by production vector machine. After finding w by equation B can be find by vector machine and B by minimizing b cam be find.

$$i = 1,\ldots,L \; [\, y_i (w.x_i + b) - 1] = 0 \tag{14}$$

λ which are not protection machine, for getting Xi. Border decision needs limited points learning that are protection machine. Which all are not needed.

$$f(x_i w_i b) = Sag(W_i x + b) \tag{15}$$

Classifications of images needs limited points of learning by production vector machine After finding why equation b can be find by vector machine and b by minimizing.

B can be find. Above Algorithm & hows borderline of two classes in sepration but class should not be same.

The sepration of two classes by border decision line may have Error, for this you cum transfer datas from R^n by unliner ϕ to Rmin big size which in new space the class could have less interference for hiding informations cam use cheap efficiency which changes to casions for saiving.

Changes in coefficients to cosinos on effect all 64 pixels block. Vector machine is a usefull tool that used in most of classifications of images.

In this thesis learning machine is used as a technic for repairing hidden informations in changing coefficient to cosinos. In this method for hiding information, meny coefficient to change hidden will b used. That makes efficiency of information and visable signals which were hidden against change of image more. And in this thesis, informations will be placed in three frequency positions such as low frequency middle frequence high frequence In recovering by Algorithm SVM informations will be shown in output. Hidding informations in all three frecance couses that all efficients changes in hiding informations are used, and the attacker 11 should not be able to destroyed the quality of informations. This will be guard for same systems.

For using Algorithm first of all we must change the main image cosinos and them using it for recovering information After that the information Algorithm in three frequency area frequency will hidden the information will be recovering from three area then the reliable informations will be found and we will get nine images.

- **Hidding information**

Changing main image to cosinos by suing equation (1) the cancequence of changing each of this small parts of 10×10 image of a matrix 10×10 contain double coefficient coginos. In said of each matrix there is

100 efficient that according to fig (2) have got mony frequency area and efficiency 1 to 9 has low frequency 10 to 53 midel frequency and more than 54 frequency has high frequency. To select soficient efficiency for hiding water market by DCT we must know two points. First high frequencies gets noise and are not saficient for hiding informations secondly. Changes in low frequencies may cause some changes on main image. Thus efficient with one frequency in middle area for hiding (efficiency 12/24/39/51) is saficient, incuse the low frequency shold have any damages. Inprobability the integrity efficiency of 12 is well. Thus efficiency 12 of each block changes to casinose for finding hidden information by using 9 efficiency in low area frquancy and because of similarity to efficiency 51 each block. Changes to cosinos for finding hidden information by using 9 efficiency in high frequency will be selected. from efficiency 24, 39, the efficiency 24 is selected for cach block to change to cosinos for finding hidden information by using 9 efficioncies in middle area.

In this thesis instead of efficiency 12, 24 , 51 we use one but of water market according to below equations.

$$AC_i'(3,3)=\begin{Bmatrix} AC_i 3,3)-\delta_{12} & if \quad w_i=0 \\ AC_i(3,3)+\delta_{12} & if\ w_i=1 \end{Bmatrix} \tag{16}$$

$$AC_i'(3,3)=\begin{Bmatrix} AC_i 4,4)-\delta_{24} & if \quad w_i=0 \\ AC_i(4,4)+\delta_{24} & if\ w_i=1 \end{Bmatrix} \tag{17}$$

$$AC_i'(6,6)=\begin{Bmatrix} AC_i(6,6)-\delta_{51} & if \quad w_i=0 \\ AC_i(6,6)+\delta_{51} & if\ w_i=1 \end{Bmatrix} \tag{18}$$

In above equations δ is constant Algorithm and if it is bigger ability of water market will be more the quality of image will be low.

- ✓ **Recovering information algorithm.**

In this water market the image is used as input and hidden image will be recovered. The informations resives from three frequency area and the best result will be chosen by an Algorithm in this Algorithm.

Recavering Algorithm is as fallow.

1- Getting fast change of casinos in watermarket image

2- comparing efficiency from second round with efficiency in watermarket image $\mathrm{Ac}_{\mathrm{i}}^{1}$ which is needed for block i.

$$\Delta_j=\left|\frac{Ac_{ii}^1-Ac_1^1 i}{Ac_i^1}\right|*\frac{\chi\delta}{\delta_j} \qquad for \quad j=12,24,51 \tag{19}$$

3- If the information has of one area has been lost the quantities of Ac $\mathrm{Ac}_{\mathrm{i}}^{1}$ of that area will be reduced and the difference of to quantities will be less than δ area.

By comparing quantity of Δ_{j} of each black of I and selection of area with more Δ_{j} area frequency which less damage hoppend in that block will be known.

$$\max(\Delta_i j)\ for\ j=12,24,51 \tag{20}$$

4- Inselected area in (20) each block the efficiency of SVM Algorithm with efficiency in watermarket will be campaired, and the quantity of hidden pixel will be taken out.

$$w_i = 0 \quad if \quad AC'_{network} > AC_{water} \quad image \tag{21}$$

$$w_i = 1 \quad \text{if} \quad AC'_{network} < AC_{water} \quad \text{image} \tag{22}$$

The usefull of this method to other method is to find better frequency area, i_d the input efficiencies like filtering frequency has been lost. The output of SVM Algorithm and the bitin watermarket image was close to water market information were losted in this way with checking efficiency of each block of image the best area of frequency out of three area will be taken for finding the best watermarket image in each block will be selected. Even in this method all the efficiens of changing cosios to hidden information will becused.

Demovlation Method and Obtaind Result to Get Images

for test and to assess offered water market. The images which are taken by cammora in size 3000 and 2000 were seved.

These images were saved informat TIF.

From the images about 2000 imager were culted in sizes 650, 500, 500, 650, 750-750,950 this method was demodulation the water market image was putted four time in four parts.

Figure 3: main water mark image

Figure 4: main image and water market

Figure 5: water marking image and watermark extraction

As you see in main image and water market image there is no differences, the ratio of signals to noise between main image and water market image is 50/542. For getting the similarity of water mark and the main water mark we should use equation DCT and the result was made was 1, after this the effect of attackment of jpeg and the cats. Size changes and ratring on water market image wers discusted first the attack of jpeg discusted. The results are in fig (6) and polemic are shown.

The results show that this method against the attack of JPEG are copable. The main image was devided to four parts and each part was water market by one Algorithm, we can foresight that this method against the attack is capable. Because a damaged part of water market can be repaired by other water markets.

Chart 1: The effect of compression JPEG with different quality can water market

PSNR	DCT	Quality of compression
49.8594	0.1	95
46.6542	0.1	90
42.5624	0.9865	85
40.6354	0.9865	75
38.6532	0.9265	50
35.5621	0.8562	25

Figure 6: a compression image with 90 compressed quality and water market made

Figure 7: a compression image with 50 compressed quality and water marketing made

Figure 8: compressed image with 25 quality and water market extracted

After different tests we have a result that 8 hows by removing %75 from emage & water mark with DCT=0.9865 could be recoverd.

Figure 9: Image with %13.5 cutted and water mark extracted

Figure 10: Image of cutted with %20 and water mark extracted

Figure 11: Image with %75 cutled and water mark extracted

Table 2: extraction of water market after change of attacks in competition with different degrees

DCT water mark extracted	Changed sizes	Campere change with first image
0.9987	548348	%90
0.9862	512598	%80
0.9745	456328	%70
0.9652	403652	%60
0.6823	359865	%50
0.6589	302564	%40
0.8965	698563	%120
0.1	756895	%180

0.1	10256355	%200
0.1	16985655	%300
0.1	2965222	%500

Results of test for resistance

To exame the resistance of offered methods first each image of water mark by compression JPEG middle filter maximizing filter, nois and rutring of image will be attacted after that extraction water mark will be used and out put BER will be counted. Which shown in charts (4-4, 3-4).

Table 3: using different attacks on water mark image in first method

Water mark extraction from iamge 2	Water mark extraction from iamge 2	Water mark extraction from iamge 1	Attacks
0.1574	0.1635	0.1523	QF=80 (JPEG)
0.1563	0.1654	0.1517	QF=50 (JPEG)
0.1653	0.1986	0.1504	Middle filter
0.1752	0.1756	0.1634	Middle filter
0.1325	0.1432	0.1232	noise (%2)
0.12451	0.0956	0.09956	Rotation 90
0.1365	0.1325	0.1254	Rotation 270

Table 4: using different attacks

Water mark extraction from iamge 2	Water mark extraction from iamge 2	Water mark extraction from iamge 1	Attacks
0.1563	0.1752	0.1452	QF=80 (JPEG)
0.1514	0.1426	0.1400	QF=50 (JPEG)
0.0986	0.1096	0.0965	Middle filter
0.0931	0.1098	0.0967	Middle filter
0.0963	0.1236	0.0968	noise (%2)
0.0996	0.0989	0.0963	Rotation 90
0.1289	0.1398	0.1265	Rotation 270

Figure 12: image with one degree rotation to right and water mark extraction

Figure 13: image with one degree rotation to right and water mark extraction

After cheking different altacts on water mark extracted from images by offered algorithm, water marked the result got with result of same altacts in out put of Algorithm are compared, for this used method in (4) is method with wavelet discounnected. Offered method in (A) is a method with discounnected cosines and the method in (14) is with LBS these methods are selected 15 images were water marked by these methods after attacks we tried each of water mark image by the same method be water mark extraction. If the function of extraction was correct was given 1 distinction if not was distanced zero In fig (5) the result shown.

Table 5: The result of competition different methods

Attacks / Method	Extraction with delay	Change of compare	Cut	rotation
Method (4)	4	4	6	3
Method (8)	6	5	7	6
Method (14)	9	8	5	8
Offered method	11	10	10	2

As shown in chart against attacks of extraction with delate and cut and chage in compare is more capable from the other three methods, but against attacks compression to wavelet disconnected and cosines change is uncapable.

Conclusion

In last decate intelligence water marke was known as a Tool for protacting digital datas.

In this case because of valiolity of images in recent years attention were made on water mark image the aim of this research of intelligent water market with use of machine learning technics for extraction water mark in image is. In offered methods a full method was offered. For pripering need images for test and assess the water mark offered.

Some image that taken by camera from different said, with size 2000/3000 were saved.

Out of 2000 cuted images with size 750, 950, 950, 750-650, 500 by photoshop were selected these images were very complex and their countent were very diverse. The offered method by using information of RGB method. Which in these method according to chands in different area natural images were taken had very good subtic, replaicment of LSB and compare of LSB. In this method after checking different water marke on images, optimal species were extracted that has high capability in making difference between two groups of natural images and water mark.

More over extraction of optimal specific extraction of water mark image in one decision was checked with looking at different method of water mark the week point of each against different attacks what is it and how can find a safe method to replace. In this research the two methods of water mark image were compered. Both method of learning SVM taking time and that is one of the disadvantage of two method, As we said the best method is that has got high PSNR and Less BER. In second method the high PSNR was made far water mark image, and after attaches an different water market images. The amount of mistakes in second method was happened. That shows the capability of this method against attacks.

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