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Removal of High and Low Density Impulse Noise from IRIS Images By 5*5 Matrix

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***Abstract*:-** In the field of processing of images in a digital format, the suppression of noise by image of IRIS is the main point to focus. Noise of impulsion may be incurred while the process of accession of image, storage or relay. The defamation of noise should be done by adopting such methodology that the data which is cardinal must not be lost. A several quantity of algorithms are deployed to attain the actual image & removal of noises from pepper & salt from the images which are vandalized. In this document, we will suggest an algorithm that will refurnish the images on scale of gray which are erupted by noise of impulse. Here a matrix of 5*5 is recommended that will identify the addition of noise in the pixels. This algorithm is comprised of two sections. The section one identifies if there is any alteration in pixel which is being processed. While reformation of pixel is done in second section of the algorithm. The outcomes of images attained on various grayscales attained by this reveals that this algorithm as suggested furnish greater PSNR & minimal time in computation. It also works finely for removal of pepper & salt noises and densities of various levels.

Keywords: *median of based on decisions, filter of median, filter at mid point & pepper & slat noise.*

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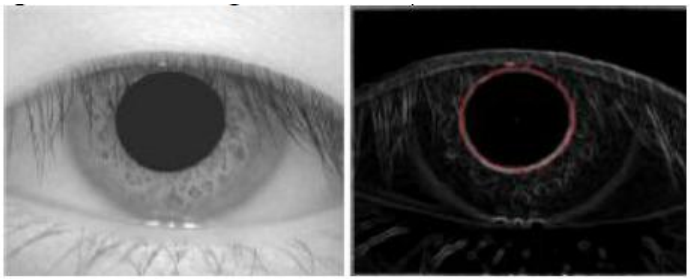
I. INTRODUCTION

A branch of science that deals with identification of people automatically on the base of several attributes of behavior & physiology. The possibly encountered methodologies of biometrics comprise iris, gait, fingerprint, signature, face etc. Variegated applications like evaluation of transactions based on finance, protection from fraud, enforcement of law, immigration, control on assess requires the biometrics. In is the only technique developed so far that could identify a person based on his real characteristics rather than the belongings or knowledge. The identification by iris is accounted as the secure & dependent technology from all biometrics modules. Though even the algorithms of matching in the identification by iris have a straightforward approach, processing of signal that is prior to match a presentable power of processing.

The method of identification by iris is automatic in nature that makes use mathematical techniques for evaluation of patterns on the irises of eyes on images of which the complicated patterns are different from others 7 can be visualized from a bit distance.

There are some other tasks which are cardinal which can be done in the segment of iris which is comprised of enhancement of quality & deduction in noise along the boundaries of iris.

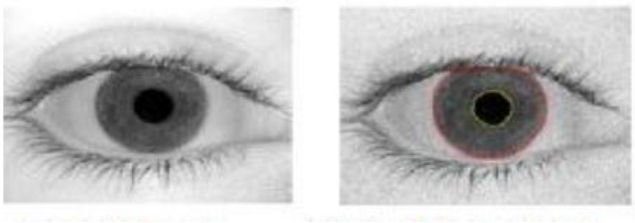


(a) (b)

Fig.1:- Picture of input (a), Identified edge of pupil

II. SALT AND PEPPER NOISE

The noise of pepper & salt is a type of noise that is visualized on images. It is presented as pixels of color black & white that incurred automatically. A technique which is effective for deduction of noise is comprised of making use of a filter of median, morphological or contra mean harmonic. Where ever the switching with faults, immediate transients occur, noise of pepper & salt is invaded into it.



(a) Actual Image (b) Paper & Salt noise

Fig.2:- Image of Iris with noise & paper

III. PROBLEM STATEMENT

In a filter which is trimmed in a window of 3*3 which is chosen & the pixels which are contaminated are not selected. The filter ATMF trims the pixels from both sides. As the pixels which are not contaminated are trimmed in this methodology & this the loss in details of pictures & blurring of picture will be incurred. An algorithm of UTMF is suggested to come over the displayed drawback. Here a window of size of 3*3 is chosen & the elements which are sorted in either descending or ascending order are done. Here the pixels of values of 0 & 255 are taken out & the pixels left are taken in. As this window takes out the pixels of 0 & 255, so it is termed as a median filter which is trimmed. The pixel which is contaminated will then be replaced the value of median. This is superior to ATMF as it discovers the noise & eliminates it.

Degradation of picture can be done by noise when it is captured or when picture is transmitted. Noise is that, pixels of image present various values of intensities as the actual values of pixels.

Invasion of noise is in the picture when the image is captured or is transmitted. There may be several factors that can put noise in the picture. Quantity of pixels that are affected in image will quantify the noise. Main source of invading noise in images of digital format are:

a) Sensor of image may get impacted because of circumstances of environment during capturing of picture.

b) Lessen light & temperature of sensors may lead to invasion of noise in picture.

c) Intervention in path of transmission may also lead to corruptions in picture.

d) Presence of particles of dust on screen of scanner may also put noise in picture.

During processing of image recognition by iris, there is a requirement for improvisation. The processing of pixel is done to identify if it is contaminated by corruptions. If value of level of gray is in between 0-255, there is no corruption & it is left as it is. If it is contaminated by noise, its processing is done & it is transferred to filters suggested. The algorithm is explained as:

ALGORITHM

Step 1: A 2 dimensional window of 3*3 size is taken. Let the pixel (i,j) be the one that is processed.

Step 2: identify if the pixel is contaminated.

Step 3: if it don't have any noise, no changes are made.

Step 4: if it has noise, there are 2 schemas that can be applied.

Case 1) if all elements of the window chose are of value 0 & 255, then each of them is replaced by their associates by the value of median.

Case 2) if all the elements are not of value of 0 or 255. Then the pixels with this value are not taken into account & median value of the others is taken. Then these all contaminated pixels are replaced by that median value.

Step 5: whole above steps are repeated again & again till the whole image don't get processed.

Every single pixel is checked for noise. Various cases are mentioned as below. As if in a case the pixel that is processed contains noise where values of other pixels is 0 or 255.

Case 1) the pixel is of value 0 or 255 as mentioned.

Case 2) if the pixel doesn't have noise & value is in between 255 & 0.

Case 3) a) If the window has noise b) the associated pixels are comprised of noise that adds up noise to window.

0	255	0
0	255	255
255	0	255

Table 1: window of 3*3 matrix m of processing

Here 255 is the pixel that is being processed. P(i,j). As the elements around the 0's are 255. If the median value is taken that will be also o or 255. Thus the median of the pixels which are already processed is taken. And a filter of median is employed to find the mean. The table suggests these illustrations:

P' (i-1,j-1)	**P' (i-1,j)**	**P'(i-1,j+1)**
P' (i,j-1)	< P (i,j) >	P (i,j+1)
P (i+1,j-1)	P (i+1,j)	P (i+1,j+1)

Table 2: window of 3*3 matrix m of processing

In a scenario where the pixel as processed is contaminated & the pixels which are associated contains noise, & that pixels will be replaced by taking the mean of the past associated neighbors. Here mean of the past elements i taken with help of filter that will transform the value of this pixel that is being processed.

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IV. PROPOSED METHODOLOGY

The proportion of PSNR is the ratio of the maximum power in a signal & power in the contaminated noise that impacts the fidelity of presentation. As there are several signals that possess a dynamic range, it can also be represented as a scale of logarithmic decibel.

$$\text{PSNR in dB} = 10 \log_{10} \frac{255^2}{MSE} \quad (1)$$

$$\text{MSE} = \frac{\Sigma_i \Sigma_j (Y(i,j) - \hat{Y}(i,j))^2}{M \times N} \quad (2)$$

A matrix of 5x5 is suggested by replacing a matrix of 3x3. The replacing of matrix furnishes the document & noise of salt in a greater quantity of pixels. The methodologies of elimination of noise are improvised. In the basic document, emphasis is put on the matrix of 3x3 which defines that only 9 pixels are viewed at one instance which will take some greater time to eliminate the noise.

Now, the size of matrix is raised to 5x5 & now 25 pixels can be viewed at one instance. So figures of MSE & PSNR will be enhanced as more pixels can be viewed in lesser time.

ALGORITHM

Step 1: A 2 dimensional window of 5*5 size is taken. Let the pixel (i,j) be the one that is processed.

Step 2: Check identify if the pixel is contaminated.

Step 3: if it don't have any noise, no changes are made.

Step 4: if it has noise, there are 2 schemas that can be applied. if all elements of the window chose are of value 0 & 255, then each of them is replaced. if all the elements are not of value of 0 or 255. Then the pixels with this value are not taken into account & median value of the others is taken. Then these all contaminated pixels are replaced by that median value.

Step 5: whole above steps are repeated again & again till the whole image don't get processed.

```
for i=3:a-2
    for j=3:b-2
        if B(i,j)==255 || B(i,j)==0
            X = [B(i-2,j-2),B(i-2,j-1),B(i-2,j),B(i-2,j+1),B(i-2,j+2),...
                B(i-1,j-2),B(i-1,j-1),B(i-1,j),B(i-1,j+1),B(i-1,j+2),...
                B(i,j-2),B(i,j-1),B(i,j+1),B(i,j+2),...
                B(i+1,j-2),B(i+1,j-1),B(i+1,j),B(i+1,j+1),B(i+1,j+2)...
                B(i+2,j-2),B(i+2,j-1),B(i+2,j),B(i+2,j+1),B(i+2,j+2)];
            B(i,j) = mean(X);
        end
        MSE2(i,j)=(B(i,j)-I(i,j))^2;
```

As per description of code presented describe B(i,j) = 0 or 255 then all adjoined pixels are accumulated in X. Mean of all values of pixels are accumulated in B(i,j).

MSE22 (k) = sum(sum(MSE2))/(c*d);

The computation of MSE for suggested terms involve 2nd equation.
PSNR22 (k) = 10*log10(double(max(max(B))^2/MSE22(k)));

For computation of PSNR 1st equation is used.

V. RESULTS

The sample IRIS image are shown in figure 3 . Introducing the impulse noise in fig 3 . Set the level of the impulse noise at 0, 0.001, 0.02, 0.05, 0.1, 0.2, 0.5, 0.8, 0.9,1 . The value of MSE and PSNR are checking at below given values .

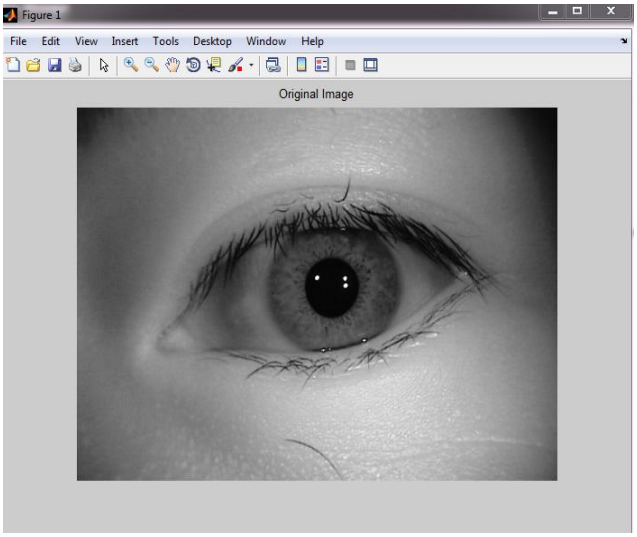

Figure 3:- Picture as Sample

```
ND = [0,0.001,0.02,0.05,0.1,0.2,0.5,0.8,0.9,1];  % NOISE ADD
```

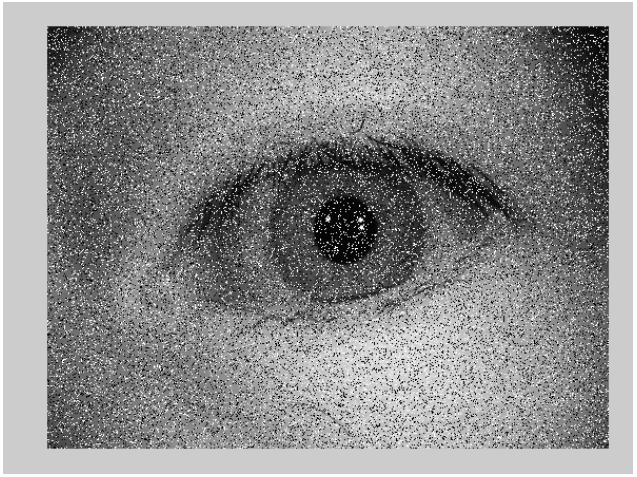

Fig 4:- Image containing Noise

Noise Level	Proposed Algorithm		Base Paper Algorithm	
	MSE	PSNR	MSE	PSNR
0	0	24.0654	0	24.0654
0.001	0.0261	24.0654	0.0205	24.0654
0.02	0.5467	24.0654	0.4090	24.0654
0.05	1.6406	21.9033	1.5050	22.2789
0.1	4.0887	17.9239	4.3460	17.7085
0.2	11.2209	13.6173	12.9976	13.0103
0.5	43.1076	7.7815	47.8327	6.9897
0.8	82.1463	4.7712	87.2308	4.7712
0.9	96.0008	4.7712	101.5913	4.7712
1	109.8962	3.0103	115.5774	3.0103

Table 3:- Table of Contrast

Table of contrasts are presented that reveals the outcomes of PSNR & MSE in the suggested & basic document.

1. Comparison of MSE

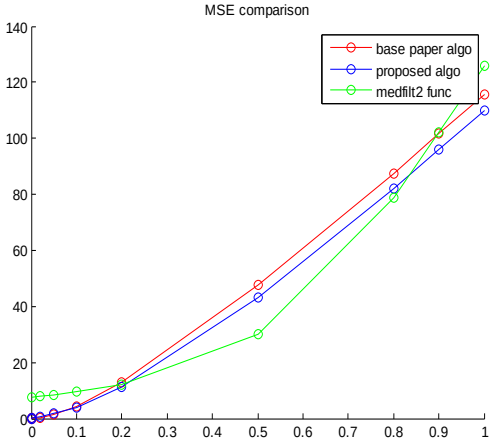

Fig 5:- MSE comparisons for suggested & basic values of paper

As per the graph of MSE is presented the figures of suggested algorithm is minimal from MSE values.

2. Comparison of PSNR

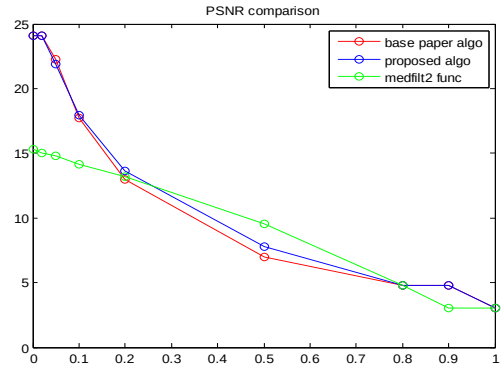

Fig 6:- MSE comparisons for suggested & basic values of paper

AS by the graph of PSNR presents the values of suggested algorithin that has values greater than of PSNR.

VI. CONCLUSION

In this research, the algorithm as suggested furnish a new way for improvisation of PSNR that have pictures which are contaminated to a large extent. This methodology provides a presentable restoration of pictures that has a noise of even 90%. As there are some methods of filtration, not similar to them which needs iterations, takes more time & it is required to be implemented for one time only as it has much efficiency with computations. As per the outcomes, the methodology as suggested is much better than the traditional ones & posses a performance at a stable rate over a large number of pictures. This algorithm is greater than other traditional ones in the terms of quality of picture & gives a defined stability on quality over a large range of density. One other superiority is that there are no criteria of threshold. The outcomes of simulation reveal that the outcomes are fine even at greater noises. Thus it can compress the noise with high densities of noise & also retains the data & edges of picture. As there is probability of corruption of pictures with noise generally as images of camera of CCTV. Thus here this algorithm can be implemented very effectively.

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