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# Considering the effect of using JPEG images on accuracy results of radiology images and application programs

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***Abstract*— With hardware and software algorithms development, necessity of methods with accuracy and velocity are more attention. For example edge detection is one of the most important operations in machine vision and the main purpose of edge detection is reducing the volume of data with preserving main structure and original form of images. For these purpose the accuracy of edge detection with retrieval edges by minimum position error rate and losing edges is one of more important approach in recent decades. It is clear those raw images because of no losing many features than JPEG images have better results. In this research consider a simulation neural network program and compare three famous edge detection "Sobel, Prewitt, Canny" with raw images and shows efficiency on results.**

***Keywords* — Medical image processing, Edge detection, Raw image, Neural network.**

## I. INTRODUCTION

Raw images have intact pixels that obtain with camera and scanners. These images have many advantages like bit depth and this depth more than Jpeg images [1]. Raw images because of direct obtaining have no information waste and no changing, so they have good result in image processing. This paper considers three edge detection algorithm and a simulation of signature recognition program with neural network and affection of these files in error rate reduction. It is also considered dramatic differences between raw and JPEG images results in signature recognition and fingerprint identification programs. Of course raw images take more memory than JPEG images but this problem solve with today's large memories [1]. JPEG images with low volume storage are good for visual purpose and web transferring, but in image processing time and the operations which need high accuracy; JPEG images have no good results [2]. JPEG images with high compression rate make bad effect and these effects lose some geometric features that have direct affection on edge detection [2].

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## II. JEPG

Scanned and photograph images for storing in computer must be changed in to other form. The most common form using for this purpose is JPEG standard. This standard is kind of coding method with these properties:

Determine that how an original image convert to sequence of compressed bits and how could convert these compressed bits to image mode.

This format allows an image compress with different coefficients. When compressed image convert to first state loss some feature that has little drop in visual quality and it is no mater in vision mode.

This method called lost image compression; hence some features in raw image lost and irrecoverable. This image is not good for image processing.

## III. EDGE DETECTION

The human visual system before color recognition and intensity has kind of edge detection, so edge detection before image interpretation in automated systems is a logical work. The main goal in edge detection is reduce data volume with main structure preservation. In this part introduce some edge detection method and consider error rate when they use JPEG images.

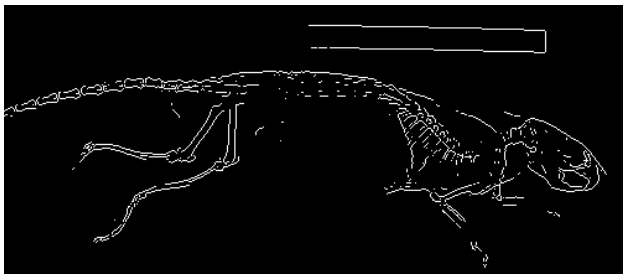
### *A. Sobel edge detection*

Sobel edge detection uses Sobel masks. Sobel masks provides both of smoothing and differentiation. Because of increasing noises after differentiation, smoothing efficacy is a better property for noise reduction. Sobel edge detection convolves these masks for detecting the edges [3]:

$$h_y = \begin{bmatrix} -1 & -2 & -1 \\ 0 & 0 & 0 \\ 1 & 2 & 1 \end{bmatrix} \qquad h_x = \begin{bmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{bmatrix} \qquad (1)$$

The importance of Sobel edge detection is that it good for radiographic images [4], [5], [6], [7], [8]. When an image save with JPEG format, because of changing in intensity Sobel edge detection method haven't a good result.

Figure 1 shows Sobel edge detection result on raw image (a) And the same JPEG image result with high compression rate (b).



(a) Sobel edge detection result on raw image

(b) Sobel edge detection result on JPEG image

**Figure 1: Sobel edge detection**

Figure 2 shows the comparison between different compression modes. Quality=0 shows JPEG file with high level compressing with poor quality and quality=9 shows JPEG file with low compression with high quality. This diagram shows the error rate between difference quality JPEG images in radiology images.


**Figure 2: Comparing Sobel edge detection error rate with different compression rate jpeg images**

*B. Prewitt edge detection*

This method like Sobel uses a simple mask. These are Prewitt masks [3]:

$$h_y = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 0 & 0 \\ -1 & -1 & -1 \end{bmatrix} \qquad h_x = \begin{bmatrix} -1 & 0 & 1 \\ -1 & 0 & 1 \\ -1 & 0 & 1 \end{bmatrix} \qquad (2)$$

In this edge detection method with increasing compression rate in JPEG the error rate is also increase.

This method tested on fingerprint images and showed compression rate on JPEG images has bad effect on edge detection. Figure 3 illustrate the variation of edges in raw and JPEG images.

(a) (b)

**Figure 3: (a) raw image edge detection, (b) JPEG image edge detection**

Diagram below show improving edge detection quality with compression reduction:

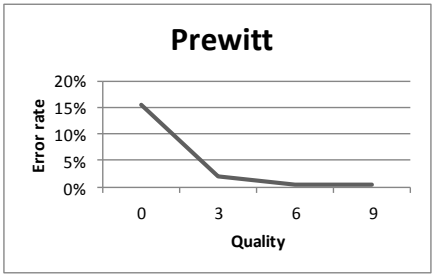
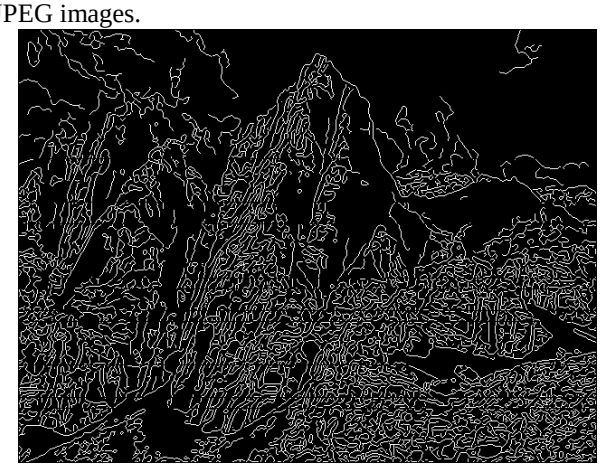


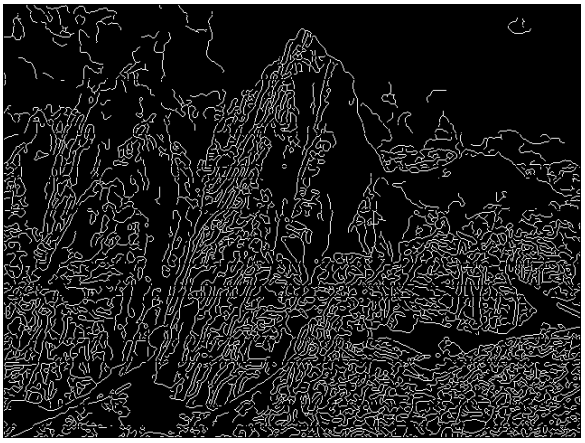

**Figure 4: Comparing Prewitt edge detection error rate with different compression rate jpeg images**

*C. Canny edge detection*

Canny edge detection is well-known with continuous and one pixel width edges. Canny uses four input parameter (an input image, sigma value for smoothing rate, high level threshold and low level threshold) and output a high level edge detected image and accuracy [9]. Here consider difference effect of this edge detection algorithm on different compression rate and figure 5 shows variation of raw and JPEG images.



(a) Canny edge detection result on raw image



(b) Canny edge detection result on JPEG image

**Figure 5: Canny edge detection**

Diagram below shows improving error rate by canny with reducing compression rate:

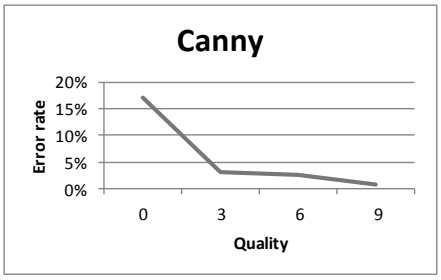



**Figure 6: Comparing Canny edge detection error rate with different compression rate jpeg images**

***Eccentricity***: The ratio of the distance between the foci of the ellipse and its major axis length

**Kurtosis**: It is a measure of flatness of distribution.

**Skewness**: The measure of asymmetry of distribution. When a distribution, or data set, is asymmetric if it is not looks the same to the left and right of the center point.

Parameters above are neural network inputs.

Table I shows the difference Geometric features between raw and JPEG images. Quality = 0 shows JPEG image result with high compression rate with low quality and Quality = 9 shows JPEG image result with low compression rate with high quality. It is reducing quality made high error rate.

**Table I: Different quality in Geometric features between different compressions rates in JPEG images**

| Quality | 0 | 3 | 6 | 9 |
|---|---|---|---|---|
| Area | 630 | 309 | 222 | 72 |
| Centroid X | 0 | 1 | 1 | 1 |
| Centroid Y | 1 | 0 | 0 | 0 |
| Eccentricity | 0 | 0 | 0 | 0 |
| Kurtosis | 1.19 | 0.60 | 0.43 | 0.14 |
| Skewness | 0.13 | 0.06 | 0.05 | 0.02 |

## IV. Neural Network

Human brain is a processing system that has parallel structure with millions of neuron. An Artificial Neural Network (ANN) is an information processing instance that is inspired by the way biological nervous systems, such as the brain, process information. The key element of this instance is the novel structure of the information processing system. It is composed of a large number of highly interconnected processing elements that called neuron and working together to solve specific problems. An ANN is used for a specific application, such as pattern recognition, data classification and learning process. Learning in biological systems involves adjustments to the synaptic connections that exist between the neurons. A neuron is the smallest unit of information processing in ANN and its inputs are kind of weighting.

In this paper a simulation neural network program is used for signature recognition effecting of differences between raw and JPEG images. this approach has two steps, first scan signature image and pre-processing on it and then extract some geometric parameters and used them for distinguish fake signature and original image.[10].

Geometric features that extract raw signature images are based on signature shape and dimension and they are [10], [11]:

***Area***: Actual number of pixels in the region.

***Centroid***: Horizontal and vertical canter's of gravity of the signature.

## V. Conclusion

JPEG images with high compression rate are good for storing and transferring in web. They are having good result only the time using for visual propose. But for processing proposes it is good using raw images. Because JPEG image lose some features in the compression time. Losing these features have bad outcome in edge detection. Edge detection is base of most image processing operations. This research shows the difference results in canny, Prewitt and Sobel edge detection with JPEG and raw images. In this research simulation of neural network is used for obtaining the results. It is also showed using raw images have better result than JPEG images.

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