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Assessment and Improvement the Quality of the Medical Angina Pectoris Images

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ABSTRACT: Using image enhancement algorithm for Medical image and with color and black&white Medical images, by using matlab Programs.image enhancement is one of the most important and default components in image research. The aim of image enhancement is to improve the visual appearance of the image, or to provide abetter transform representation for future automated image processing, such as analysis, detection, segmentation, recognition, surveillance, tract, criminal justice systems. The existing techniques of image enhancement can be classified into two categories: Self-enhancement and Context based fusion enhancement. More specifically, we categorize processing methods based representative techniques of image enhancement.
Keywords: Angina images; MATLAB; Image Enhancement; Type of wavelet transform

1. INTRODUCTION

Digital images may be partly helpful during inquiries and tests owing to their bad perceptual quality, which does not allow the extraction or comprehension of appropriate information transmitted by digital data. For instance, bad lighting circumstances, blur, color overlay, compression artifacts can compromise the achievement of activities such as reading a license plate or facial recognition [1].

The drastic growth of information technology has resulted to enhanced use of digital images and enhanced need for the growth and growth of numerous digital processing methods. For the purpose of analyzing and extracting important information from images for use in multiple areas of implementation (industrial, military and agricultural). The proliferation of digital image processing techniques has been the result of extensive research and studies conducted in the last three decades of the last century [2].

The development of communication and information exchange systems is in line with the development of computer systems, increasing the capacity of the treasury and the speed of processing of digital data, facilitating the circulation of information and processing, whether audio, text or visual. The image is one of the most important and most important diagnostic information. The picture is a description of the visual sensitivity change of the surface to be visually recorded, and the standard images resulting from the change of light intensity at the 2-D level usually produced in the sensor of the reflection signals (Reflection or

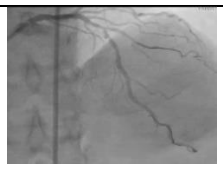
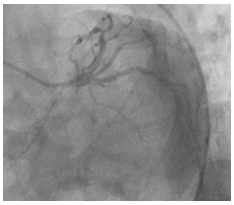
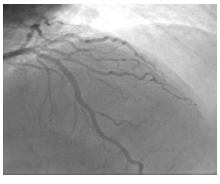
Permeability), And the collection and recording of images and objects by chemical sensors film segments or electronic sensors such as CCD camera The development of technology in recent decades led to the development and development of multi-image recording devices such as thermal cameras, radars, X-ray and ultrasound The image cannot usually be obtained from its source with perfect accuracy for many reasons, including the limitations of the visual system and its lack of idealism, due to unavoidable defects in imaging systems as well as external influences from atmospheric conditions, body movement or imaging [3].

During the image capture process, these defects all reduce image quality (IQ) resulting from imaging systems, so these distortions must be addressed to obtain good images that can be analyzed and used. It has developed and developed many deformation techniques, and many filtering techniques have been used to eliminate the noise associated with digital images and reduce their impact. However, most of the processing processes are not completely flawless, but sometimes improve locations and distort other locations [4].

2. DATA BASE OF THE STUDY

The database contains the types of programs through which the images are played Table 1.1 shows the study database (images) representing the medical images taken using various imaging techniques used in the study in terms of number, size and gender.

Table 1. Images Describe at table .

Age	Sex	Medical imaging techniques	Image type and size (KB)
65	Man		JPG 22.4 KB
54	woman		PNG 64.9KB
70	woman		PNG 58.1KB
52	Man		PNG 5.3KB
63	Man		PNG 62.8 KB

3. Wavelet Transform (WT)

The idea of the Muweiji conversion dates back to 1807 in his theory of Iterative Analysis, now known as Fourier Transform, which was the basis for the first idea of the Haerian conversion of the researcher Haar in 1909 in his thesis through the use of functions After 1930, a group of researchers began to study the concepts of basic functions and the variable variable core functions called the basic Haar, which were the key to understanding the theory of Muweiji conversion. This research resulted in an effective algorithm To conduct digital bass image processing The Moiji transformations have advantages and properties that rely on statistical guesses, which play a large role in digital processing, which researchers have helped to use in many applications, and the fact that it analyzes the signal, or the image to multiple levels of detail And clarity in both the temporal and the temporal domains, which is one of the most important characteristics used in the strengthening of the edges of digital images The waveguide gives strength in analysis compared to Fourier transform because it represents a variable analysis in terms of frequency window division over time, Make it fit For many applications, as well as its advantage in the multi resolution analysis method, where the images are treated through the details resulting from the analysis of the image to several levels, and to a number of sub-images, Muweiji is a practical application directly on the digital computer is one of the most important applications in the field of digital image processing.[11][5]

1.1 TYPES OF WAVELET TRANSFORM

Wavelet Transform-WT is divided into three types depending on the type of functions used, and by the nature of the input function to this conversion, and the division is as follows:[12][5]

CWT-Wavelet Transform Caller.
Semi-intermittent waveguide (SDWT- (Sub- Discrete Wavelet Transform- SDWT)
Discrete -Wavelet Transform -DWT .

2.2 NOISE

In general, noise can be defined as undesirable information distributed in random images at the image level that distort the image and weaken its clarity. Images are often accompanied by different types of interference in image signals or signals of external influences such as signals resulting from environmental changes or changes in Sensitivity of Detector, as well as errors during transport and numbering.

2.2.1 Noise Types

The noise can be categorized mathematically into the following types:

1. Additive Noise.
2. Multiplicative Noise.
3. Salt And Pepper Noise.

1. Additive Noise

This noise is random and does not depend on the signal and is characterized by the following qualities:

a. White noise and spectral density are constant.
b. Additive linear The distorted image is the result of the original image (pure R (x, y) with noise values

c. added as in the following equation:[13][6]

$$I(X,Y)=R(X,Y)+N(X,Y) \quad (1)$$

N (x, y): the non-signal-dependent noise is usually equal to zero (n).
I (x, y): distorted image (view).
R(x, y) :The original image is noise-free.
c) Statistical approximations of noise distribution.

There are two main types of collective noise: Gaussian distribution, uniform distribution noise and noise distribution have a close association with the physical cause of their appearance.[7]

2. Multiplicative Noise

Which is a random noise based on the signal that the areas of high intensity in the picture are high noise, where the lower the intensity of the light decreased noise with them and this indicates that there is a relationship between the amount of noise and intensity of the signal and this relationship is proportionate and the statistical characteristics of this type of Noise from added noise is expressed mathematically as it comes:[14][9][8]

$$I(X,Y)=R(X,Y)\times F(X,Y) \quad (2)$$

I (x, y): distorted image (viewing).
R (x, y): Original noise-free image.
F (x, y): random noise variable (not supported by signal and usually average).

3. Salt and pepper noise.

This type of noise differs from its predecessor because in its case some of the image points are replaced with new values, which are the noise in the form of white dots (Salt) and black (Pepper). This noise does not depend on the original values in terms of intensity and location.[14][11]

2.2.1 PHYSICAL NOISE MODES

There are many mathematical models of noise that distort the image resulting from different imaging systems depending on the type of system and the circumstances surrounding the imaging process and may all contribute to the poor quality of the image produced by the imaging system. There are two types of noise types that can distort digital images.[10]

a. Gaussain Noise

This noise is caused by the dispersion and emission of electromagnetic waves in different directions due to the presence of particles or minutes of dust or impurities with relatively small diameters in the air and the imaging system, causing the blocking of light at a location and increase in light elsewhere. This noise is subject to normal distribution, which has a kaussie shape (the shape of a bell) and its mathematical expression is:[11][12]

$$P(N) = \frac{1}{\sqrt{2\pi\sigma_n^2}} \quad (3)$$

N: represents a random variable (noise).
μn: represents the average value of the random variable or the noise rate.
Variance represents the variant of the random variable or the noise variance.

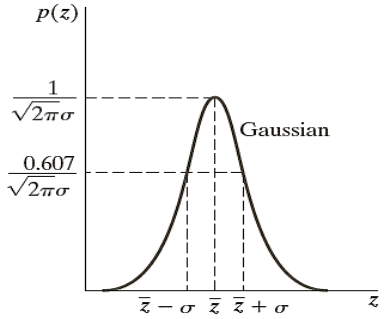


Figure 1: Distribution of gaussian[11]

b.Uniform Noise

This type of noise is due to the presence of distorted signals with random values with a regular frequency distribution that has a probability distribution equal to each value of incoming noise values.The systematic noise distribution of the noise values confined between the value of a and the value b, which have the same probability as in the following

$$\text{equation:} P(N) = \begin{cases} \frac{1}{b-a}, & for \quad a < N < B \\ 0 & else \end{cases}, \qquad (4)$$

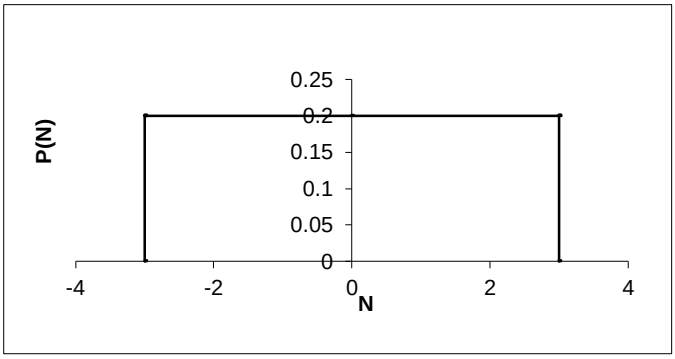


Figure 2 : Regular distribution of noise

2.3 CONTRAST AND BRIGHTNESSCB

2.3.1 BRIGHTNESS

It is defined as the self-visual sense of light emitted from a surface or from a pointless source. It is also known as an element of the sense of sight in which a source appears to radiate or reflect light. That is, the brightness is the realization of a source of light. It is a measure of the reflected or scattered part of the white beam falling on the colored material.[77]The term brightness was used in optical measurement as a synonym for the term "luminance" and an error in radiometric science was used as synonym for radiological term. Therefore, the term "brightness" should be used only to indicate the perception and sense of light. In the color space, the brightness can be understood as the arithmetic mean (μ for the three red, green and blue coordinates). Some of the three elements make the light appear brighter than other colors, which may be automatically modified in some show systems (M) is expressed as follows:[11]

$$\mu = \frac{R+G+B}{3} \quad (5)$$

μ: the arithmetic mean of the three color coordinates (R, G, B).

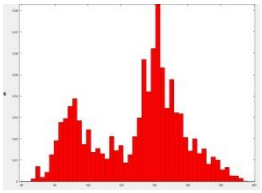
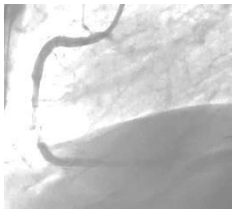
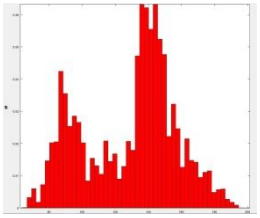
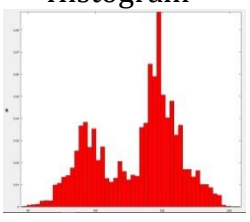
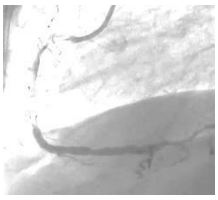
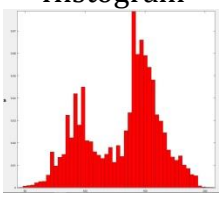
2.3.2 Contrast

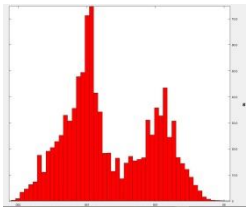
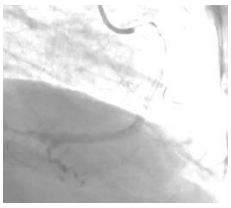
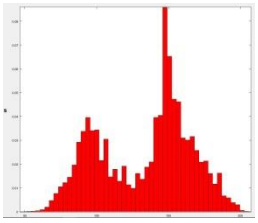
Contrast is the ratio between object lighting and background lighting on which objects are located. The sensitivity of the contrast depends on the spatial distribution of the dark and dark areas of the image and the images can be improved using this property. The contrast feature can be used to compress and encrypt images by selecting the most frequented data and allocating them to areas most sensitive to spatial frequency.[11]

2.4 ENHANCEMENT OF IMAGE

First Method Wavelet Type (Haar)
Path 1: Results of enhanced Image quality measurements using Wavelet Type (Haar) .

Table 2.4 A . The quality measurements of the image

Case 1	Imaging Techniques		Wavelet Type(Haar)	
Image	Original 	Histogram 	Enhancement 	Histogram 
IF	1			
SSIM	0.985			
RMSE	0.7729			
PSNR	50.3678			
AD	0.0705			
CQ	135.0745			
UQI	1			
Image	Original 	Histogram 	Enhancement 	Histogram 
IF	1.0000			
SSIM	0.9827			
RMSE	0.9124			
PSNR	48.9271			
AD	0.0987			
CQ	138.6238			

UQI	1.0000			
Image	Original 	Histogram 	Enhancement 	Histogram 
IF	1.0000			
SSIM	0.9872			
RMSE	0.6080			
PSNR	52.4521			
AD	0.0533			
CQ	141.2909			
UQI	1.0000			

1. second Method Wavelet Type (db2)

Path 2: Results of enhanced Image quality measurements using Wavelet Type (db2) .

Table 2.4 B. The quality measurements of the image

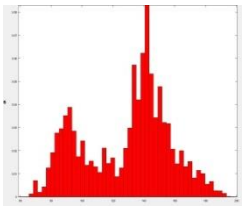
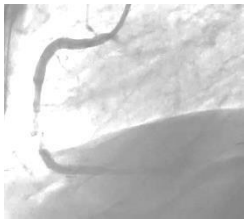
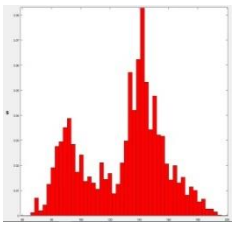
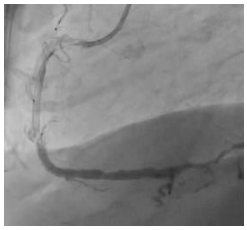
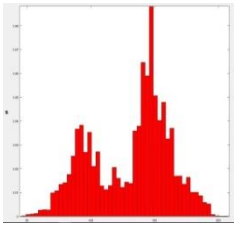
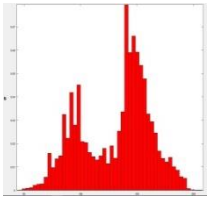
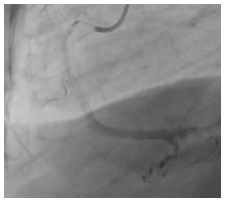
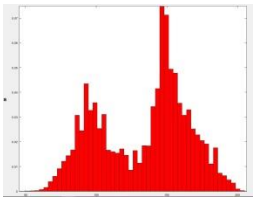
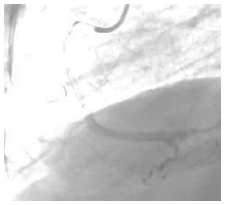
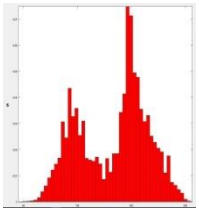
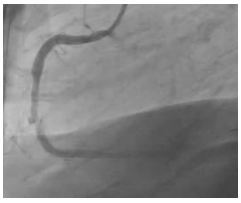
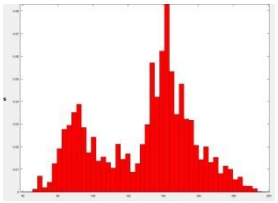
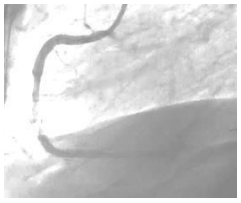
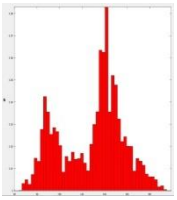
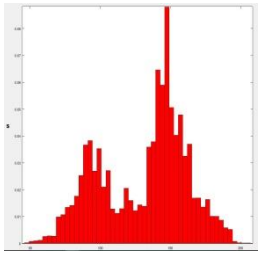
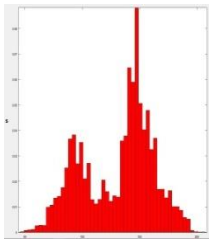
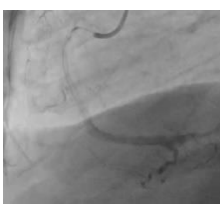
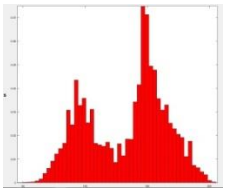
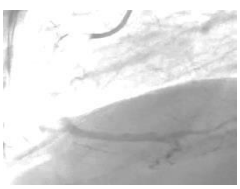
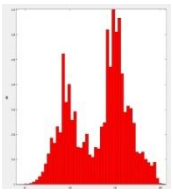
Case 2	Imaging Techniques		Wavelet Type(Db2)	
Image	Original 	Histogram 	Enhancement 	Histogram 
IF	1			
SSIM	1			
RMSE	0			
PSNR	99			
AD	0			
CQ	135.051			
UQI	1			

Image	Original	Histogram	Enhancement	Histogram
				
IF	1.0000			
SSIM	0.9941			
RMSE	0.5172			
PSNR	53.8584			
AD	0.0451			
CQ	138.6082			
UQI	1.0000			
Image	Original	Histogram	Enhancement	Histogram
				
IF	1.0000			
SSIM	0.9953			
RMSE	0.3666			
PSNR	56.8463			
AD	0.0270			
CQ	141.2704			
UQI	1.0000			

2. Third Method Wavelet Type (Bior 2.2)

Path 3: Results of enhanced Image quality measurements using Wavelet Type (Bior2.2) .

Table 2.4 C. Results of the quality measurements of the image

Case 3	Imaging Techniques		Wavelet Type(Bior)	
Image	Original 	Histogram 	Enhancement 	Histogram 
IF	1			
SSIM	0.996			
RMSE	0.3392			
PSNR	57.5214			
AD	0.0263			
CQ	135.0509			
UQI	1			
Image	Original 	Histogram 	Enhancement 	Histogram 
IF	1.0000			
SSIM	0.9934			
RMSE	0.4949			
PSNR	54.2403			
AD	0.0459			
CQ	138.6099			
UQI	1.0000			
Image	Original 	Histogram 	Enhancement 	Histogram 

IF	0.9963
SSIM	0.2045
RMSE	8.3382
PSNR	29.7094
AD	3.0246
CQ	140.1475
UQI	0.9960

3. Path 4 : the results of improved image quality standards adding noise.

The tables show the results obtained through the application Two different categories. After addition, different types of noise are:-
- Noise Gaussian.
- Salt & Pepper Noise.

The table 2.4 D. The results of improved image quality standards after the addition of Gaussian noise.

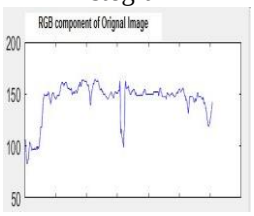
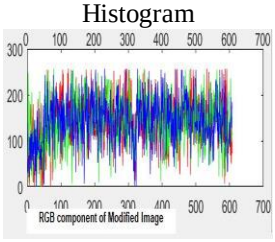
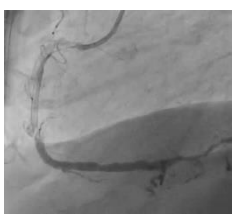
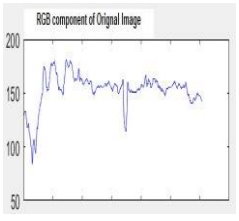
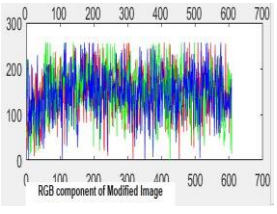
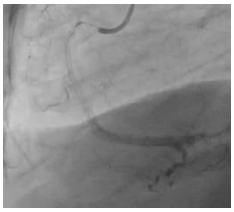
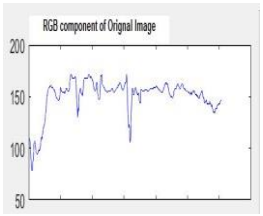
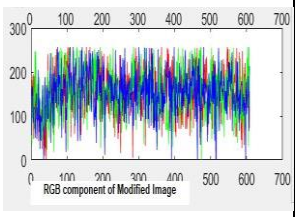
Case 4	Imaging Techniques		Type Noise(Gaussian)	Noise Ratio(0.01)
Image	Original 	Histogram 	Enhancement 	Histogram 
IF	0.9311			
SSIM	0.0104			
RMSE	34.6282			
PSNR	17.3422			
AD	13.9798			
CQ	134.7465			
UQI	0.9987			
Image	Original 	Histogram 	Enhancement 	Histogram 
IF	0.9349			
SSIM	0.0137			
RMSE	34.4390			
PSNR	17.3898			
AD	13.8263			
CQ	138.3980			
UQI	0.9987			

Image	Original	Histogram	Enhancement	Histogram
				
IF	0.9371			
SSIM	0.0098			
RMSE	34.4538			
PSNR	17.3861			
AD	13.9030			
CQ	140.9005			
UQI	0.9987			

3. **Path 5:** Results of improved image quality standards after adding salt and dazzle noise

Tables **2.4 E**. show the results of improved image quality measurements of Salt&Pepper noise .

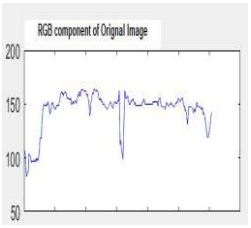
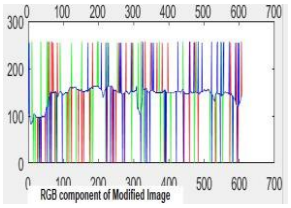
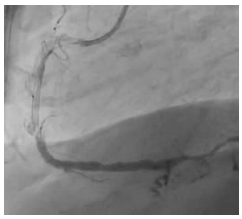
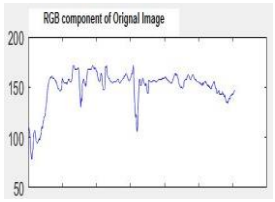
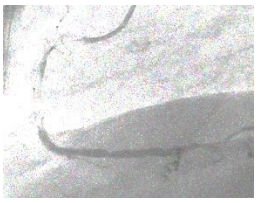
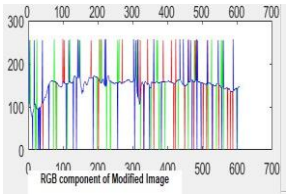
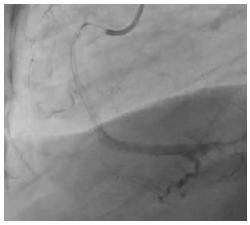
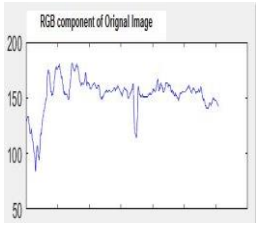
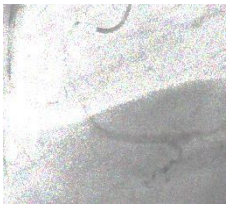
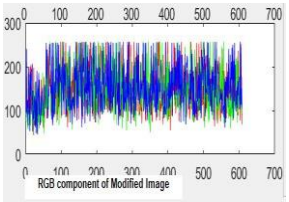
Case 5	Imaging Techniques		Type Noise(salt&pepper)	Noise Ratio(0.01)
Image	Original	Histogram	Enhancement	Histogram
				
IF	0.9613			
SSIM	0.0201			
RMSE	25.9482			
PSNR	19.8487			
AD	7.7358			
CQ	134.4534			
UQI	0.9990			

Image	Original 	Histogram 	Enhancement 	Histogram 
IF	0.9715			
SSIM	0.0352			
RMSE	22.7887			
PSNR	20.9764			
AD	6.7351			
CQ	137.9254			
UQI	0.9992			
Image	Original 	Histogram 	Enhancement 	Histogram 
IF	0.9471			
SSIM	0.0124			
RMSE	31.6037			
PSNR	18.1361			
AD	13.3601			
CQ	139.3635			
UQI	0.9989			

2.5 Conclusion

1.Enhancement of medical images has a significant impact on medical treatment and diagnosis.
2.The angina pectoris is very important in determining which artery to operate (important areas).
3.Wavelet transform has an important role in the initial rendering of images, in terms of highlighting the most important details of images, removing (or reducing) noise.
4.The Retinex method showed the best results for the enhancement of images through quality coefficients.
5.The angina pectoris can be directly enhancement within a short period of time.

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