VIDEO ENHANCEMENT USING CONTOURLET TRANSFORM AND BILATERAL FILTER

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Abstract—Resolution and contrast are the two important attributes of an image. In this paper we developed a method to enhance the quality of the given image. The enhancement is done both with respect to resolution and contrast. The proposed technique uses CT(Contourlet Transform) and BicubicInterpolation also we had used Bilateral filter for denoising. To increase the resolution of test image, the proposed method uses Contourlet Transform decompose the given image into multiple sub-bands, out of which one is of low frequency and the rest are of high frequency. The Low freq components and High components are interpolated using Bicubic technique. Then find the difference image using interpolated LF and input image and add that difference image with all modified HF sub bands. We use Inverse ContourletTransform to combine the interpolated high frequency and low frequency components. To increase the contrast, we use adaptive filter. The experimental results show that proposed technique gives good results over conventional methods.

Keywords:Frame separation, Bilateral filter, Contourlet Transform (CT), BicubicInterpolation, Adaptive filter, Reconstruction.

I. INTRODUCTION

According to the available methods, Data mining process is dominated many decision support process on the business application and the prediction approach. Clustering is a concept to determine the pattern through map and analysis of available data set according to the need and demand of the business applications. Clustering is belonging to both machine learning and data analysis major domains.

Many techniques have been introduced in order to manage, to summarize or to simplify a dataset into a set of clusters such that data related to a same cluster are identical and data from different clusters are not similar. Clustering process organize data according to three process: partitioning, hierarchical, and mixture model methods. These frameworks have been adapted by many clustering methods in last few years and permitted large amount of application fields [3], [6].

This condition occurs in important fields of applications such as biological information and Information Retrieval. Most cluster analysis results, a classification of the data into nonoverlapping groups [7],[9],[10]. The clustering process manipulated on supervised and unsupervised as well as automated selection method. These unsupervised approach provided the more weight on data property rather than the occurrence. If the existing data is clustered according to the property of data, its character and the behavior, then cluster impact is valuable. With these discussion, in this research work K-Means and Fuzzy C-Means clustering algorithms are examined based on their clustering quality.

II. PROPOSED METHOD

The proposed system has mainly four modules: Bilateral filter, Contourlet Transform (CT), BicubicInterpolation, Adaptive filter and parameter analysis. Preprocessing is done by Bilateral filter. Contourlet Transform is used to find the low and high frequency components of the image. Then we had used Bicubic interpolation to increase the resolution and Adaptive filter is used to increase the contrast of the image.

A. Bilateral Filter

In MRI, It consist of an brain’s image which is surrounded by black matter, which is results in waste of time and energy to introduce into the examine processes. So, the image of the brain around the affected place need not be examined. The infected place alone can be seen by means of perimeter and area constraints of image processing techniques.
In Preprocessing of the proposed system the following steps namely Gray scale conversion, Noise removal is involved. In computing, a gray scaledigital image has the value of each pixel is a single sample, it carries only intensity information. This sorted images, also known as black-and-white, are composed specially of shades of gray, varying from weakest intensity to strongest i.e. from black to white. Gray scale images are observed from one-bit bi-tonal black and white images with only the two colors i.e. black and Gray scale images have different shades of gray in between. At every pixel in a band of the electromagnetic spectrum, gray scale images are offering the measurement of the intensity of light, and in this situation they are monochromatic in nature when only a given frequency is captured. Figure 1.a shows the output result for gray scale conversion of MRI brain image. The gray scale conversion of MRI image is given by [17].

\[
grey(i, j) = 0.29 * rgb(:,:,1) + 0.59 * rgb(:,:,2) + 0.11 * rgb(:,:,3));
\]

Generally we are using median filter to suppress the noise. The procedures are

(i) Arranging matrix pixel value in the form of ascending order.

(ii) Find the median value of that matrix.

(iii) Replace that value into that noisy pixel location.

B. Contourlet Transform (CT)

In our proposed work we implemented segmentation algorithm using kernel weighted fuzzy clustering. This can be applied to wide range of problems like feature analysis, clustering and classifier design and therefore it is also called as unsupervised clustering algorithm. It follows a set of procedure. Finally, the final clustering result can be obtained by processing the pixels on edges. This method is normally used for pattern recognition. Following objective is based on minimization of below method:

\[
J_m = \sum_{i=1}^{N} \sum_{j=1}^{K} u_{ij}^m \|x_i - c_j\|^2 \quad 1 \leq m < \infty
\]

where \(m\) is real number, \(uij\)-degree of membership the cluster \(j\), \(xi\) is the \(i^{th}\) of \(d\)-dimensional measured data, \(cj\) is the \(d\)-dimensional cluster’s center, and \(||x||\) is a norm showing the similarity between center and measured data. Fuzzy partitioning is the process which is observed through an repetitius optimization of the aim function, with the modified membership \(u_{ij}\) and the cluster centers \(cj\) by:

\[
U_{ij} = \frac{1}{\sum_{k=1}^{K} \left| \frac{x_i - c_j}{d_k} \right|^2 + \epsilon}
\]

\[
C_j = \frac{\sum_{i=1}^{N} u_{ij}^m x_i}{\sum_{i=1}^{N} u_{ij}^m}
\]

This iteration will stop when max \(ij\left\{u_{ij}^{(k+1)} - u_{ij}^{(k)}\right\} < \epsilon\), where \(\epsilon\)-termination criterion between 0 and 1, whereas \(k\)-iteration steps. This procedure converges to, a saddle point or a local minimum of \(J_m\). The algorithm is consist of the following steps:

Step 1: Define \(U= [uij]\) matrix, \(U(0)\)

Step 2: At \(k\)-step: Find the center vectors \(C(k)= [cj]\) with \(U(k)\)

Step 3: Modify \(U(k)\), \(U(k+1)\)

Step 4: If \(||U(k+1) - U(k)|| < \epsilon\) then stop; else return to step 2.

In this, By means of a Membership Function, data are bound to each cluster, which shows the fuzzy attitude of the algorithm [2],[9],[10]. To do that, the algorithm have to make an specific matrix named \(U\) having factors are 0 and 1, and shows the degree of membership between centers of clusters and data [10],[13],[16]. In general introducing the fuzzy logic in K-Means clustering algorithm is the Fuzzy C-Means algorithm. FCM clustering techniques are based on fuzzy behaviour and provide a natural technique for producing a clustering where membership weights

[Diagram of a block diagram of the contourlet transform with two levels of multiscale decomposition. Gray regions represent the ideal passband support of the component filters. Left: The iterated form. Right: The equivalent parallel form.]

C. Bicubic Interpolation

 Morphological image processing is a combination of non-linear operations related to the structure or morphology of features in an image. Morphological Operations are based on relative pixel series inspire on the numerical value hence are suited for biological operation. Morphological operations can also be used in grey scale function so that its light transfer facility should be unknown hence their pixel range are negligible or diminished interested elements. In order to identify possibilities comparison is made between neighbour and compact pixel.
D. Adaptive Filter
The adaptive filter method consists of three important parts: (a) luminance image and background image, (b) adaptive adjustment, (c) color restoration.

Firstly, Using color space conversion we obtain the luminance image and background image, and afterwards adaptively managing the luminance image. The intensity limits can identify at one time is minimum, so the High Dynamic Range image is compressed. Contrast enhancement can modify important visual details so that we can get an image with better visibility. Finally, enhanced color image is obtained. The luminance image of the original color image is

\[ I(x, y) = \frac{\log(y_{x,y})}{\log(255)} \]

We use the formula (2) to get the background image

\[ I_B(x,y) = \frac{\sum G_R G_N N(x,y)}{\sum G_R G_N} \]

Where \( N(x,y) \) represents the pixel of \((x, y)\), \( N G \) is the scale parameter of pixel filtering, and \( R G \) is the distance parameter. But the pixel \((x, y)\) of color image has three values in fact, which are \( Y \), \( U \) and \( V \) values. We usually overlook the color information of color images in filtering. In the paper, when we get the background image, we take all this three values into consideration. It means that \( N(x,y) \) has three components, \( Y \) is luminance value, and \( U \), \( V \) are color values. Therefore, to obtain the background image, we modify the formula (3) according to the \( Y \), \( U \), \( V \) values at pixel \((x, y)\). The image human eye seeing is related to the contrast between the image and its background image [10]. We enhance the image by making use of the relationship between the image and its background image.

\[ \beta(x,y) = (a x + b) \cdot w(x,y) \]

where, \( a \) is intensity coefficient according to the cumulative distribution function (CDF) of the luminance image. \( w(x,y) \) is the ratio value between the background image and the intensity image. \( a \) and \( b \) are constants, we can adjust them to achieve good adjustment results.

Subsequently, we use the color restoration to obtain the enhanced color image, which is based on a linear process of the original color image.

\[ R'(x,y) = R(x,y) \cdot \frac{l'(x,y)}{I(x,y)} \]

\[ G'(x,y) = G(x,y) \cdot \frac{l'(x,y)}{I(x,y)} \]

\[ B'(x,y) = B(x,y) \cdot \frac{l'(x,y)}{I(x,y)} \]

\( R(x,y), G(x,y), B(x,y) \) represent the R, G, B values of the original color image. \( R'(x,y), G'(x,y), B'(x,y) \) are the R, G, B values of enhanced color image.

III. RESULTS

Fig. 4 shows our proposed method results

Above two images the input and output results. Input image is appearing darker and output image quality is enhanced by using contourlet transform and adaptive filter.

CONCLUSION

This paper provides the enhancement approach for the videos. This paper uses the method of contourlet transform and adaptive filters technique based on that video enhancement is carried out. This paper uses the method of kernel metrics based weighted fuzzy factor. And it provides a better segmentation output. The traditional image clustering methods usually regard image pixels as isolated samples, which usually result in isolated regions. Adaptive filter uses local information to guarantee noise insensitivity, but it often produces boundary zones due to the mix pixels near the edges of different regions.

REFERENCE


