Implementation of Advanced Skin Detection Based on Image Color Segmentation with Histogram and Skin Segmented Clustering Method

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Abstract- Image Enhancement is one of the important requirements in Digital Image Processing which is important in making an image useful for various applications which can be seen in the areas of Digital photography, Medicine, Geographic Information System, Industrial Inspection, Law Enforcement and number of more Digital Image Applications. Image Enhancement is employed to enhance the standard of poor images. The focus of this paper is an attempt to improve the quality of digital images using Adaptive Histogram Equalization and enhancement of image segmentation using advanced clustering method.

Keywords –Segmentation, Adaptive Histogram, K-means Clustering, PSNR.

I. INTRODUCTION

IMAGE

An image [1] is an array, or a matrix, of square pixels (picture elements) arranged in columns and rows. An Image is a 2 dimentional capacity f(a, b), where a and b are spatial directions and amplitude of f at any pair of coordinates (a, b) is called the power or gray level of the image.

IMAGE PROCESSING

Image Processing includes methods to convert a real time object/ image into digital image form and perform some operations on it, in order that we can obtain an enhanced image or to obtain some useful information from it [2].
Various Image Processing Techniques are given below:

- Image Representation
- Image Processing
- Image Enhancement
- Image Restoration
- Image Analysis
- Image Segmentation
- Image Data Compression

IMAGE ENHANCEMENT

The main objective of image enhancement is to procedure the image in order that the output image will be better than data image. Histogram equalization is one of the techniques utilized for image enhancement. In Histogram Equalization a data image is represented in a predetermined number of gray levels. While ascertaining the probability density function of the dark levels of the data image, for use in histogram equalization, the number of occurrences of every gray level is constrained not to exceed a predetermined value. Then histogram equalization is performed on the data image based on the determined probability density function. As a result, the mean brightness of the data image does not change altogether by the histogram equalization. Additionally, noise is prevented from being greatly intensified.

Adaptive histogram equalization (AHE) [3] is a computer Image Processing technique utilized to improve contrast in images. It differs from ordinary histogram equalization in the respect that the adaptive method computes several histograms, every corresponding to a distinct section of the image, and uses them to redistribute the lightness values of the image. It is along these lines reasonable for improving the local contrast.

IMAGE SEGMENTATION

Image segmentation [4] is the one of the first step in image analysis and pattern recognition in the field of image processing and it is important and its necessary part of investigation framework, and which is one of the most troublesome assignments in picture preparing that, decides the nature of the last consequence of examination.

It ought to be noticed that picture division technique is the procedure which it partitions a picture into various areas and where every district is homogeneous. For more understanding we categorized Image segmentation methods as follows:

1. First type is histogram thresholding and in this kind of segmentation we assumes that the images are compounded of regions with different gray ranges, and detaches it into a number of peaks, each corresponding to one region.
2. The second type is edge-based approaches where these kinds of segmentation normally use edge detection operators such as sobel, prewitt, laplacian for example and resulting regions may not be connected so edges need to be joined.
3. The third one is region based approaches which it based on likeness of regional image data and some of the most common and widely used approaches in this category include thresholding, region growing, clustering, merging and splitting.

CLUSTERING BASED SEGMENTATION

Clustering in image processing is the grouping together of pixels from an image, depending on calculated similarity between them. Clustering can be often defined as a non-coherent design of pixels. The shading picture information is normally bunched in three dimensional color space (RGB). All dominant colors in the image create dense clusters in the color space.

1. Skin detection

RGB color space [5] is considered as the default color space for the most image formats, since it is more sensitive to different light conditions. However, better results for skin color classification might be achieved with other types of color spaces, for instance HSV and YCrCb color spaces. These color spaces are less sensitive to light conditions. Hue-saturation based color spaces portray shading with instinctive qualities based on craftsman's concept of tint, immersion and tone. Tone has a fascinating property: it is invariant to features at white light sources. YCrCb shading space speaks to shading with luma (luminance, nonlinear RGB change) and two shading contrast esteems Cr and Cb framed by subtracting luma from RGB red and blue segments.

2. K-Means Clustering Algorithm

Clustering [6] is a method to divide a set of data into a specific number of groups. It's one of the popular method is k-means clustering. In k-means clustering, it segments an accumulation of information into a k number gathering of information. It classifies a given set of data into k number of disjoint cluster. K-means algorithm consists of two separate phases.

In the first phase it calculates the k centroid and in the second phase it takes each point to the cluster which has nearest centroid from the respective data point. There are different methods to define the distance of the nearest centroid and one of the most used methods is Euclidean distance. Once the grouping is done it recalculate the new

centroid of each cluster and based on that centroid, a new Euclidean distance is calculated between each center and every datum point and doles out the focuses in the group which have least Euclidean separation. Each bunch in the segment is characterized by its part questions and by its centroid. The centroid for each cluster is the point to which the sum of distances from all the objects in that cluster is minimized. So K-means is an iterative algorithm in which it minimizes the sum of distances from each object to its cluster centroid, over all clusters.

II.RELATED WORK

Kseniia Nikolskaia [7] et al. devoted this paper to new skin detection technique based on the HSV color model and SLIC segmentation method. The algorithm of skin detection is described. Experiments results are presented. The influence of training images on the skin detection is shown. New skin detection algorithm implemented in Python language using OpenCV library is described.

Agaian et al. [8] introduced a new kind of "frequency domain" based signal/image enhancement algorithms (magnitude enrichment, log-magnitude reduction, iterative amplitude, and log-reduction zonal magnitude techniques) have been described and applied for detection and visualization on objects within an image. The new techniques are based on the so called "sequency" ordered orthogonal transforms, which include the well-known fast orthogonal Fourier, Hartley, cosine, and Hadamard transforms, as well as new enhancement techniques. We have improved upon the current magnitude reduction techniques and developed an entirely novel method. The wide range of characteristics can be obtained from a single transform by varying enhancement parameters. A quantitative measure of signal/image enhancement was presented, which demonstrated the optimal method to automatically choose the best parameters and transform. The proposed technique is simple to design and implement, which makes them practical. A number of experimental results were given which illustrate the performance of these algorithms. The comparative analysis of transforms based image enhancement algorithms has been described, too. Lastly, the comparison of the Fourier transform and Walsh, cosine and Hartley transforms was given. They find that for a negligible trade off of accuracy, one can use the Walsh transform to achieve altogether higher performance enhancement. For our purposes, where speed is a major concern, the proposed method turns out to be a dramatic improvement over existing methods. They have also proposed the zonal transform based image enhancement algorithms.

Albiol et al. [9] proved that the optimum performance of the skin classifiers is independent of the color space, despite the performance of most skin detectors is directly related to the choice of color space.

Cao et al. [10] proposed two novel algorithm detect the contrast enhancement involved manipulations in digital images. First, they dedicated to the detection of global contrast enhancement placed to the previously JPEG-compressed images, which are widespread in real applications. The positions of detected blockwise peak/gap bins are clustered for recognizing the contrast enhancement mappings placed on different source regions. The consistency between regional artifacts is checked for discovering the image forgeries and locating the composition boundary. Extensive experiments have verified the effectiveness and efficacy of the proposed techniques.

Celik et al. [11] proposed a work of fiction algorithm which enhanced the contrast of an insight image using spatial information of pixels. The algorithm introduced a brand new method of compute the spatial entropy of pixels using spatial distribution of pixel gray levels. Different set alongside the conventional methods, this algorithm considered the distribution of spatial locations of gray degree of a picture in the place of gray level distribution or joint statistics computed from the gray degrees of an image. For every gray level, the corresponding spatial distribution is computed employing a histogram of spatial locations of most pixels with the exact same gray level. Furthermore, this technique is alongside with transform domain coefficient weighting to attain both local and global contrast enhancement at the exact same time. Experimental results prove that the proposed algorithms produce better or comparable enhanced images than several state of the art algorithms.

Chen et al. [12] proposed a competitive contrast enhancement algorithm which combines histogram equalization based methods (HEBM) and a multi scales unsharp masking based methods (UMBM). This proposed algorithm uses HEBM to attain global contrast enhancement and UMBM to attain local multi scales contrast enhancement. First, they reviewed the techniques developed in the literature for contrast enhancement. After then, they introduced the modern algorithm in details. The performance of the proposed method is studied on experimental IR data and equate

to those yielded by two well established algorithms. The developed algorithm has good performance in global contrast and local contrast enhancement with noise and artifact suppression.

Cheng et al. [13] proposed a work of fiction approach for the detection of over enhancement. The main element contributions of the paper are as follows. The causes for generating over enhancement are investigated and analysed deeply. The experimental results demonstrate that the proposed approach can locate the over enhanced areas accurately and effectively, and offer a quantitative criterion to gauge the over enhancement levels well. The proposed approach is probably be great for dynamically monitoring the grade of the enhanced image, and optimizing the parameter settings of the contrast enhancement algorithms.

Garg et al. [14] discussed that various enhancement schemes are utilized for enhancing an image which includes gray scale manipulation, filtering and Histogram Equalization (HE). In the latter case, preserving the data brightness of the image is required to avoid the generation of non-existing artifacts in the output image. In spite of the fact that these techniques safeguard the information splendor on the yield picture with a critical complexity upgrade, they may create pictures with don't look as common as the information ones. The fundamental thought of HE strategy is to re-map the gray levels of a picture. HE will in general present some irritating antiques and unnatural upgrade. To overcome these drawbacks different brightness preserving techniques are utilized which are covered in the literature survey. Relative examination of various upgrade systems will be completed. This examination will be done on the premise of subjective and objective parameters.

III. RESULTS

To see the qualitatively as well as quantitatively performance of the proposed algorithm, some experiments are conducted on several images. The effectiveness of the approach has been even exploitation completely different images. The results are computed qualitatively (visually) as well as quantitatively using quality measures [15].
Figure 1 shows the original image and Red, Green & Blue three colour channel images.

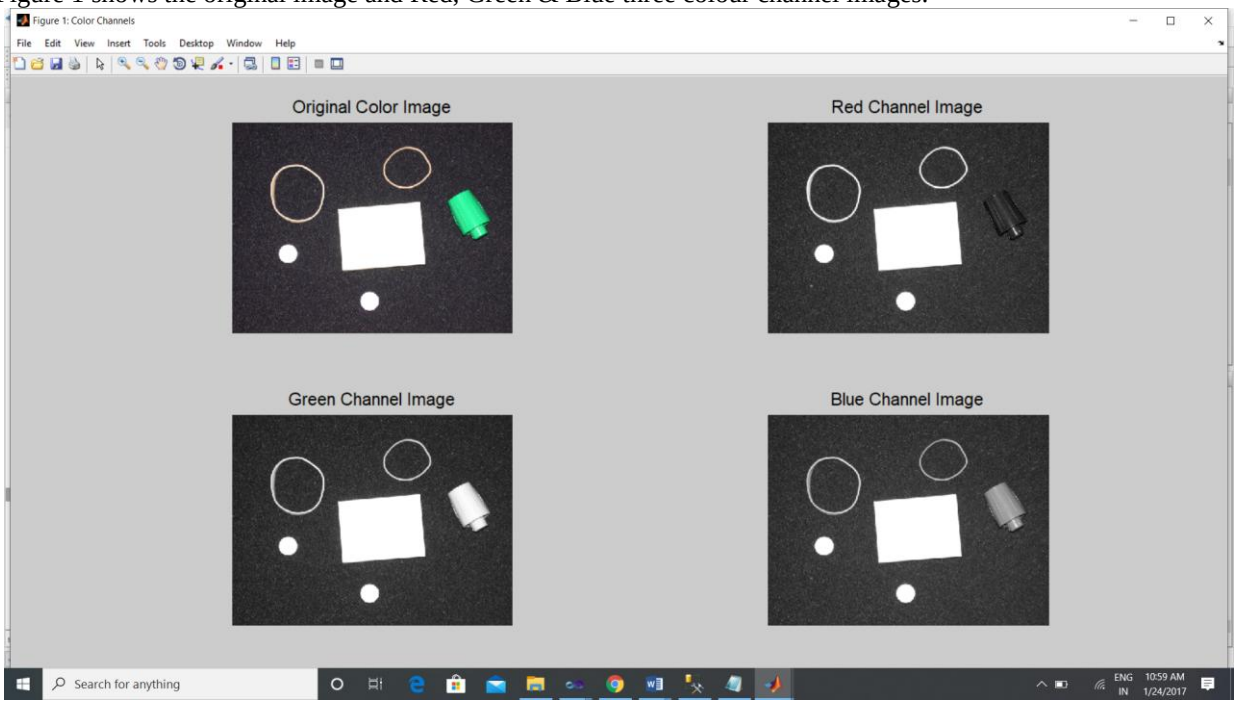

Figure 1. Original Image and Different colour channel image

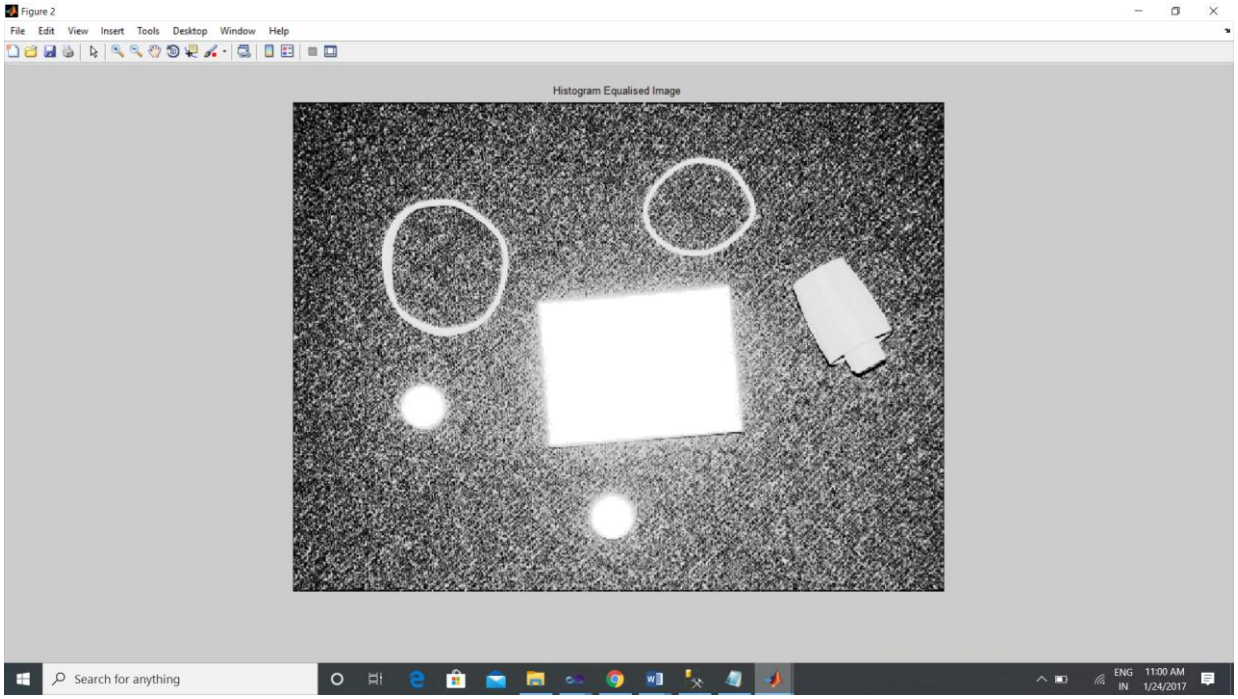

Figure 2. Histogram Equalised Image

Figure 2 shows the image obtained after applying the histogram Equalisation to the original image.

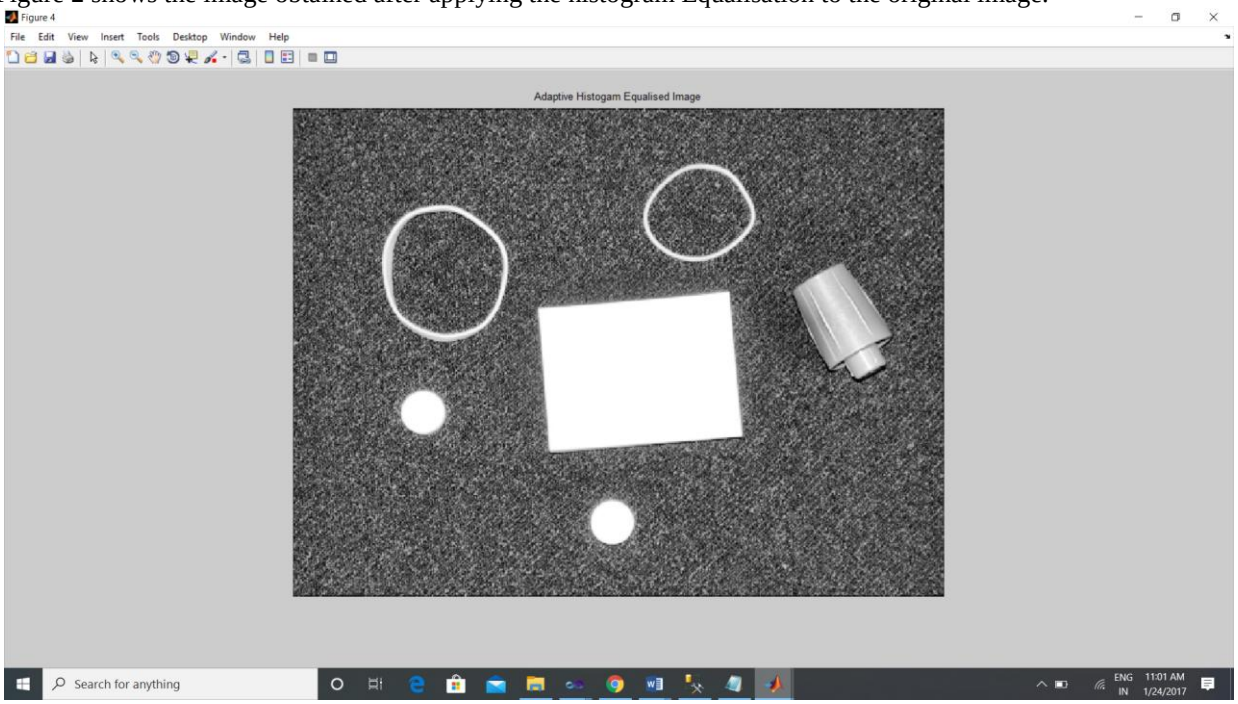

Figure 3. Adaptive Histogram equalised image

Figure 3 shows the image obtained after applying the adaptive histogram equalization.

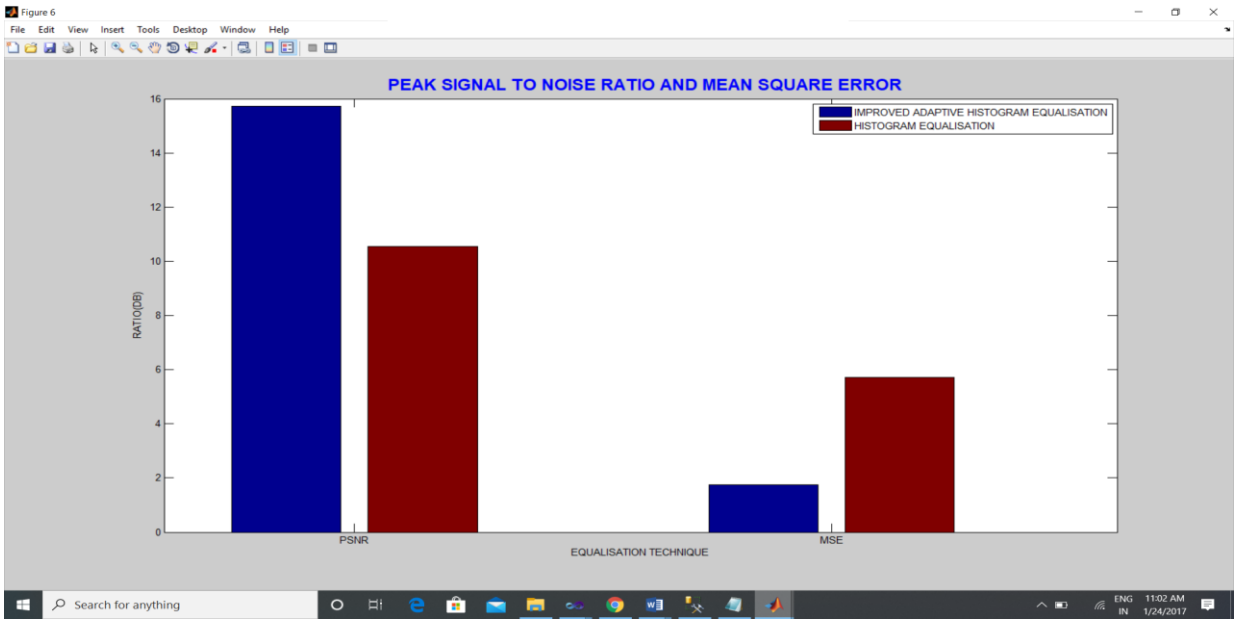

Figure 4. Peak signal to noise ratio and Mean square error of the image after applying the histogram equalization and adaptive histogram equalization technique

Figure 4 shows the Peak signal to noise ratio and Mean square error of the image after applying the histogram equalization and adaptive histogram equalization technique which shows that peak signal to noise ratio increases and Mean square error decreases in the adaptive histogram, equalization technique as compared to Histogram equalization technique.

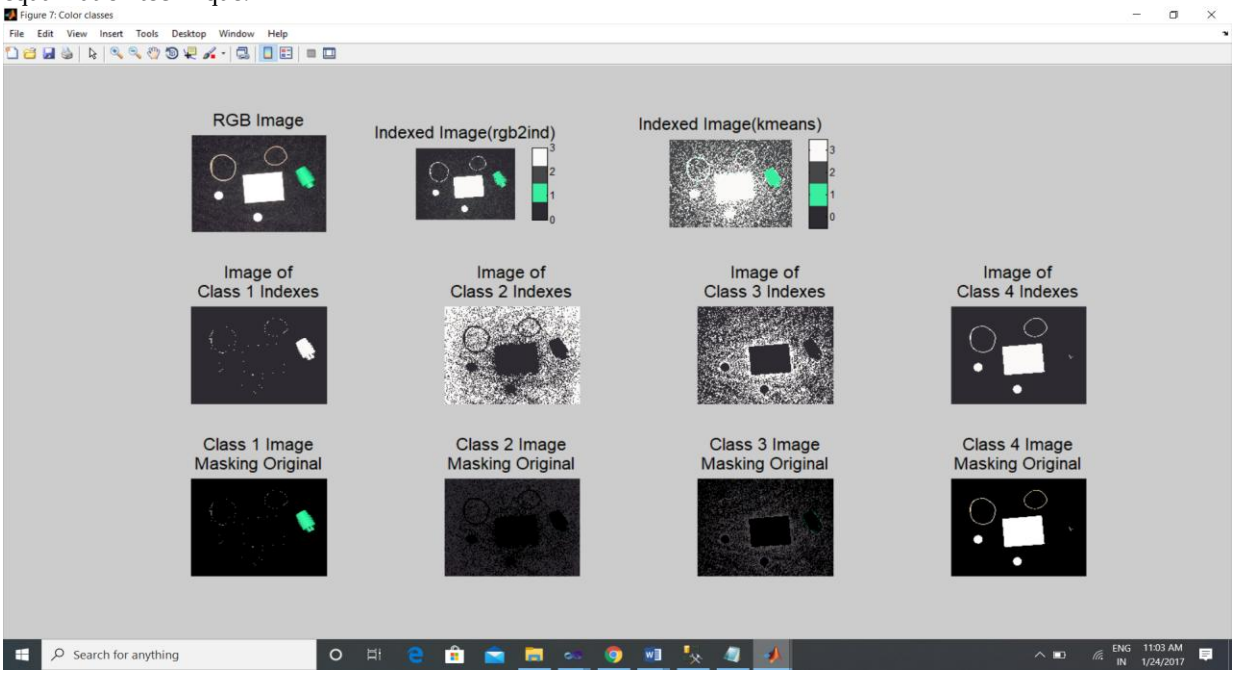

Figure 5. Image after K-means clustering

Figure 5 shows the images after K-means clustering. It shows the RGB image, RGB indexed image, Kmeans Indexed image and its 4 colour classes. We can change the number of colour classes.

IV.CONCLUSION

In this paper, methods that we applied balances the requirements of both appearance enhancement and being faithful to the original appearance of an image has been proposed and applied to the enhancement of full color images. Results have shown the effectiveness of our algorithmic program in rising the distinction and colorfulness of the initial images. We proved it experimentally that proposed method is superior to traditional methods. The proposed algorithm has high value of PSNR than the traditional histogram method. Furthermore, the mean square error decreases as we increase the number of classes.

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