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Content based Image Retrieval using Median Binary Pattern with Structure Element Descriptor on Noisy Images

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Abstract: ***Effective features are essential issue for the representation and recognition of images. In this paper, we present a new feature representation method for image retrieval based on Median Binary Pattern (MBP) and Structure Element Descriptor, named Median Binary Pattern extended structure element descriptor (MBP-SED). Firstly, the gray scale image is converted using the MBP. The elements in the structure can effectively represent the bitmap which is generated by MBP. Global Feature is achieved using the combination of MBP-SED and color Histogram (CH). Proposed system is more reliable on noisy images. Experiments on Corel-1k dataset show that MBP-SED outperforms than other descriptors.***
Keywords: CBIR, LBP, MBP, SED, Corel-1K

I. INTRODUCTION

The popular Research field of the image analysis is content based image retrieval (CBIR). It is also known as Content Based Visual Information Retrieval (CBVIR) and Query based Image retrieval (QBIC) [1]. There are many methods and approaches proposed for Content based Image retrieval till date. The most popular methods yields results on visual contents of the image, such as color, texture and shape [2].The distance measures are used to match the query feature with the dataset feature. The Euclidean distance measure is popular among other and widely used for the similarity measure.

The description of image is depending upon the point of view. So, the description may be differing from one person to another person. To describe the image global and local features are used.

The extraction of the global feature gives the semantic information of the whole image which represents the visual information in compact form. The global features perform better for close similarity images but on other side local features which are more robust due to small patches in the image and perform better for the classification and object recognition [3].

The CBIR has many applications like remote sensing, fingerprint scanning, medical imaging and satellite imaging. In medical imaging it is used for the disease diagnosis and patient health report.

Satellite imaging is used for the monitoring agriculture, aerial survey and to generate weather reports. Fingerprint will consider for the verification of identity which is used in colleges, companies and banking sector. The remote sensing is used for transferring, processing and retrieving the huge amount of data [4].

II. RELATED WORK

A. Local Binary Pattern (LBP)

The "Local binary pattern (LBP)" descriptor was proposed by Ojala et al. [5] as a grayscale

Invariant texture pattern. LBP is a way of explaining the local texture feature. For an image pixel its LBP code is calculated by thresholding its circularly symmetric I_p neighbors with the pixel value of the central point I_0 and arranging the results as a binary string. For clarity, we denote the LBP of pixel which is defined as follows:

$$LBP = \sum_{p=1}^{8} 2^{p-1} \times f_1(I_p - I_o)$$

$$f_1(x) = \begin{cases} 1, & if\ x \geq 0 \\ 0, & otherwise \end{cases}$$

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B. Median Binary Pattern (MBP)

The median binary pattern is suggested to determine the localized binary pattern by thresholding pixels over a 3 x 3 neighborhood a gainst their median value.

$$MBP = \sum_{i=1}^{L} f(a_i) \times 2^i$$

$$f(a_i) = \begin{cases} 1, & if\ a_i \geq m \\ 0, & otherwise \end{cases}$$

Where L is the neighbor number, m is the median value and the intensity value is ai. The MBP is invariant to monotonic modifications in the gray scale because the level of intensity does not rely on the threshold. The pattern identified is the outcome of the spatial interactions in the given locality. If a particular neighborhood has no contrast [6].

C. Structure Element Descriptor (SED)

This article proposed a descriptor known as Structure Element Descriptor (SED).SED can represent image and its local features efficiently. Moreover, SED can extract and describe color and texture features [7].

In [8], the authors suggested a descriptor of the structural Element Descriptor (SED), which represents the texture of the image. The structural element is used in our paper. In a bitmap, the shape and edge of the image are efficiently depicted by defining the structure element's relationship.

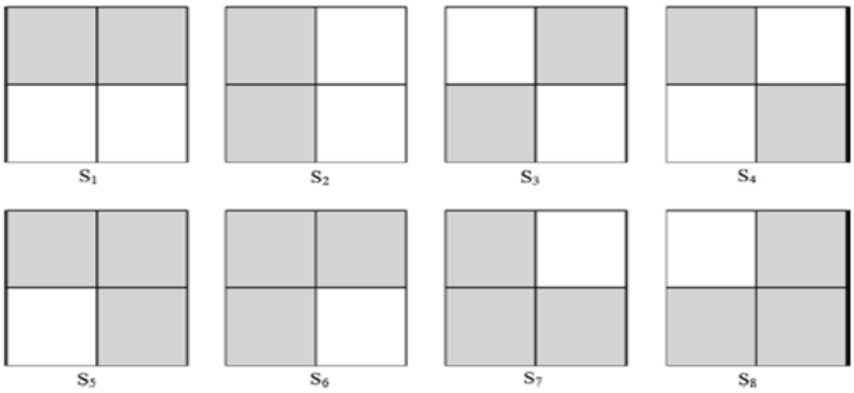

Fig.1. Structure Element Descriptor

D. Effect of Noise

Noise reduction plays vital role in image processing and recognition. There are various methods which is noise resistance in CBIR system to provide fast and reliable results. There are mainly two common type of noise which is as follows.

1) In salt and pepper noise it takes either minimum or maximum values in dynamic range due to this reason it is also called as “Impulsive ” noise. For efficient retrieval of images are on the noisy images [9].
2) Gaussian noise is statistical noise which has its probability density function equals to normal distribution also known as the Gaussian distribution. The special case of Gaussian noise is white noise in which values at any pair are statistically independent and identically distributed [10].

III.PROPOSED METHODOLOGY

The median binary pattern with structure element descriptor .This method is proposed for texture features. The Bitmap is created using this median binary pattern. There are following steps to create the bitmap form the MBP method.

1) *Step1:* The non-overlapping block is created by dividing images into block of size 3*3.
2) *Step2:* Calculate the median of the particular block which is used as threshold for making the bitmap for that block.
3) *Step3:* The bitmap is calculated using the following method

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$$bitmap(i,j) = \begin{cases} 1, & if\ a_i \geq m \\ 0, & otherwise \end{cases}$$

4) *Step4:* Match structure element with the bitmap and after this the bitmap is converted to the structure element correlation map. The dimension of map gets reduce by the half of bitmap matrix dimension.
5) *Step5:* Create the histogram using the map then concatenate this histogram with the color histogram to get the final feature vector.

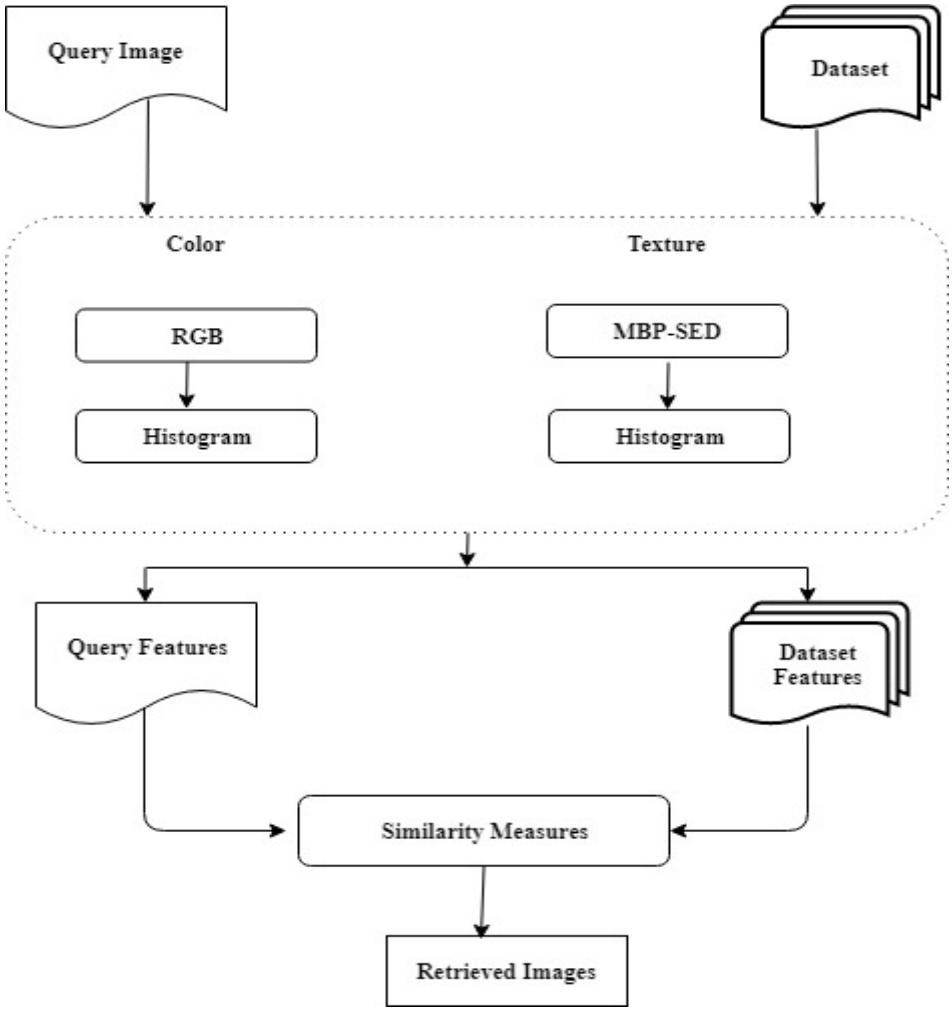

Fig.2 Flow chart of proposed method

IV. SIMILARITY MEASURES

Distance Metric plays an important role for similarity matching in CBIR. Content Based Image Retrieval calculates the visual difference between the query and dataset images. Therefore retrieved result is no single image it is images ranked according to the similarity. The two methods which are popular are Euclidean and Manhattan distance [11].

Euclidean Distance $d(x,y) = \left(\sum_{i=1}^{d}(x_i - y_i)^2\right)^{1/2}$

V. EXPERIMENTAL RESULTS

For computing the results the experiment done on corel-1k dataset [12]. Corel-1k contains 1000 images form 10 different categories including Africa, Beaches, Horses, food, Mountains, Buses, Flowers, Dinosaurs, Elephants and Building there are 100 images for each categories. The Precision of the proposed method is high as compared to existing method

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Fig.3 Corel 1k dataset

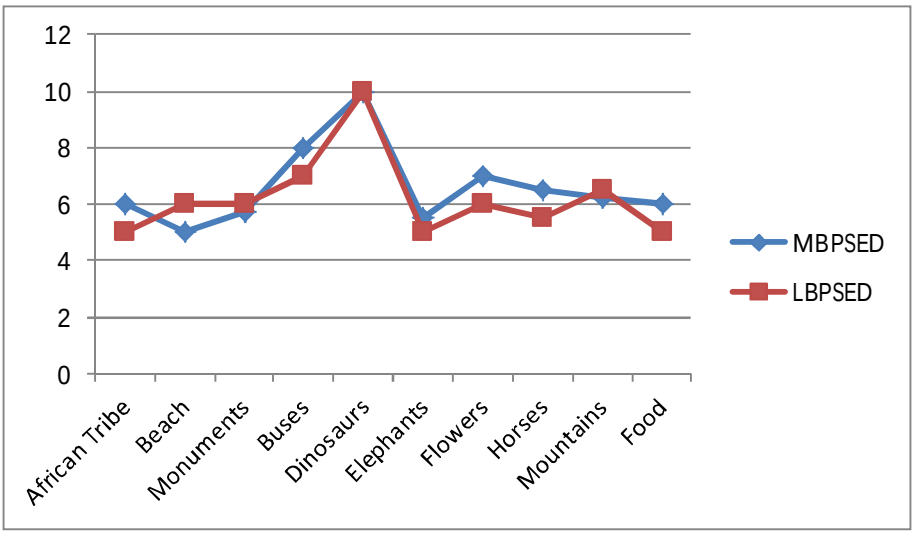

Fig.4 Average Precision of 10 retrieval image with 5% salt and pepper noise

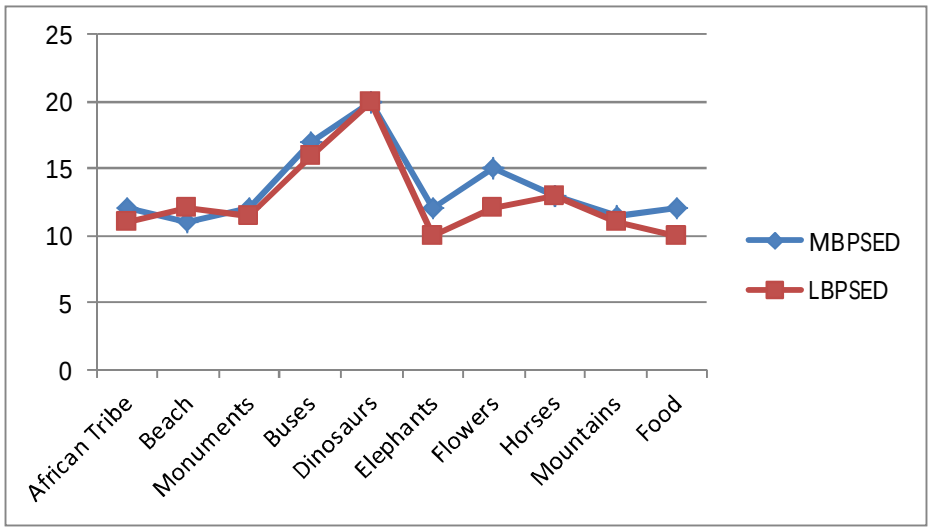

Fig.5 Average Precision of 20 retrieval image with 5% salt and pepper noise

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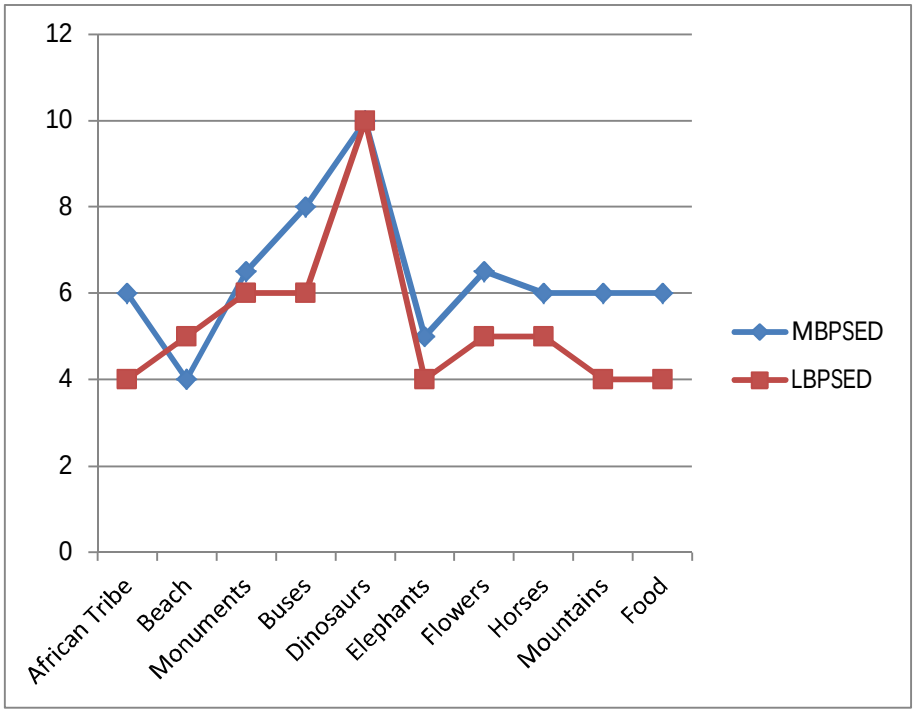

Fig.6 Average Precision of 10 retrieval image with 10% salt and pepper noise

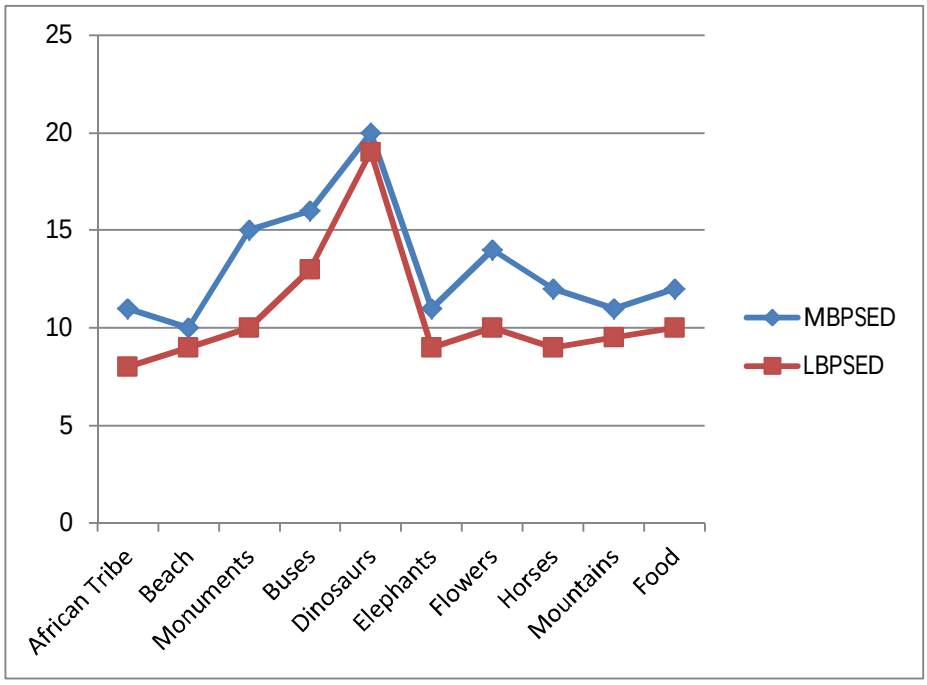

Fig.7 Average Precision of 20 retrieval image with 10% salt and pepper noise

VI. CONCLUSIONS

In this paper we have proposed texture based method which is median binary pattern with structure element descriptor. The proposed method is more robust to the noise as compared to existing method. The result of the proposed method on salt and pepper noise performs well as compare to the existing one.

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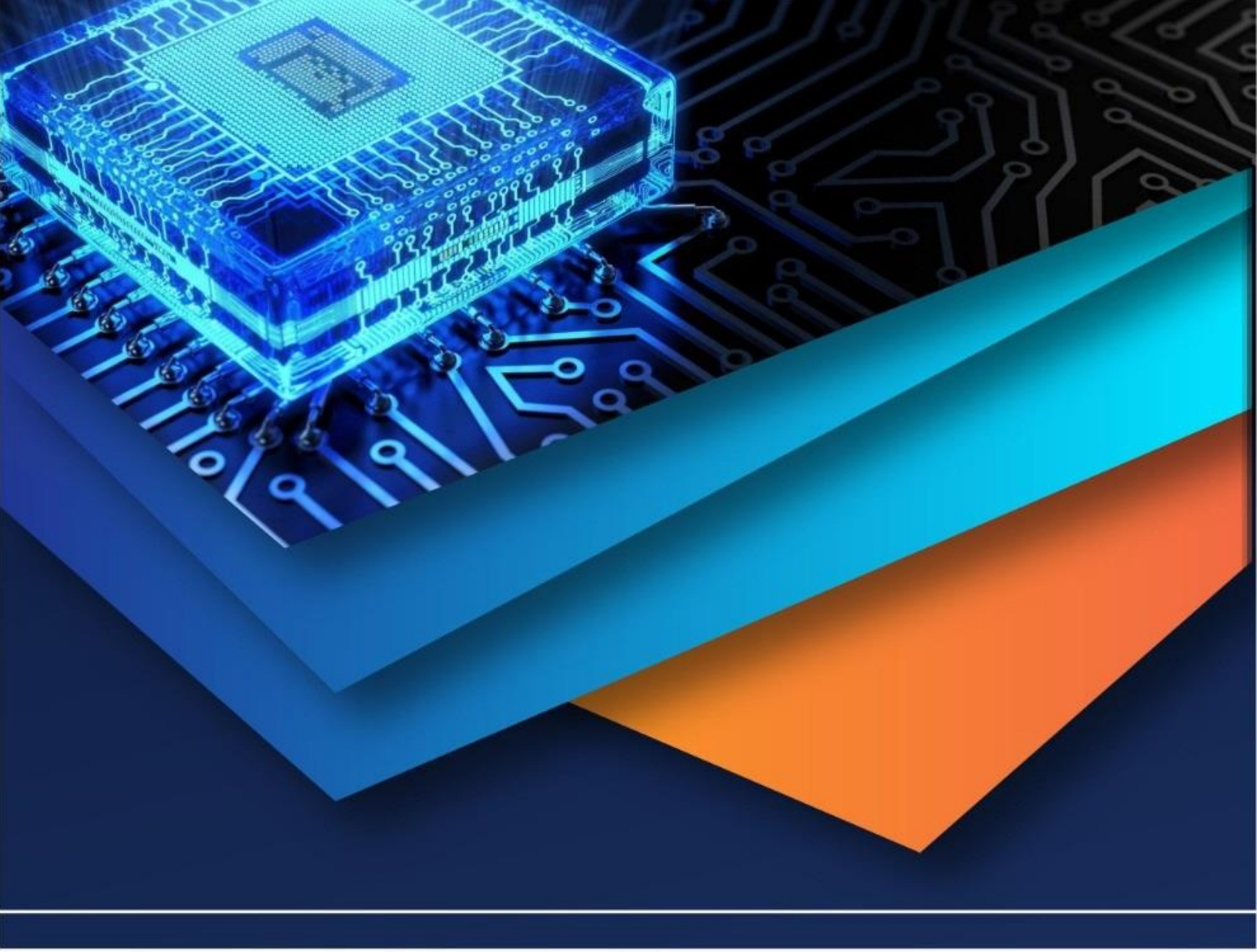

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