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A Robust and Secure Video Steganography Method in DWT-DCT Domains Based on Multiple Object Tracking and ECC

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Abstract: ***Over the past few decades, the art of secretly embedding and communicating digital data has gained enormous attention because of the technological development in both digital contents and communication.***
The imperceptibility, hiding capacity, and robustness against attacks are three main requirements that any video steganography method should take into consideration. The secret message is preprocessed by applying both Hamming and Bose, Chaudhuria and Hocquenghem (BCH) codes for encoding the secret data.
First, motion-based MOT algorithm is implemented on host videos to distinguish the regions of interest in the moving objects. Then, the data hiding process is performed by concealing the secret message into the DWT and DCT coefficients of all motion regions in the video depending on foreground masks. Our experimental results illustrate that the suggested algorithm not only improves the embedding capacity and imperceptibility but also it enhances its security and robustness by encoding the secret message and withstanding against various attacks.
Keywords: Imperceptibility, hiding capacity, robustness, hamming and bose, chaudhuri and Hocquenghem

I. INTRODUCTION

1) General

The term digital image refers to processing of a two dimensional picture by a digital computer. In a broader context, it implies digital processing of any two dimensional data. A digital image is an array of real or complex numbers represented by a finite number of bits. An image given in the form of a transparency, slide, photograph or an X-ray is first digitized and stored as a matrix of binary digits in computer memory. This digitized image can then be processed and/or displayed on a high-resolution television monitor. For display, the image is stored in a rapid-access buffer memory, which refreshes the monitor at a rate of 25 frames per second to produce a visually continuous display.

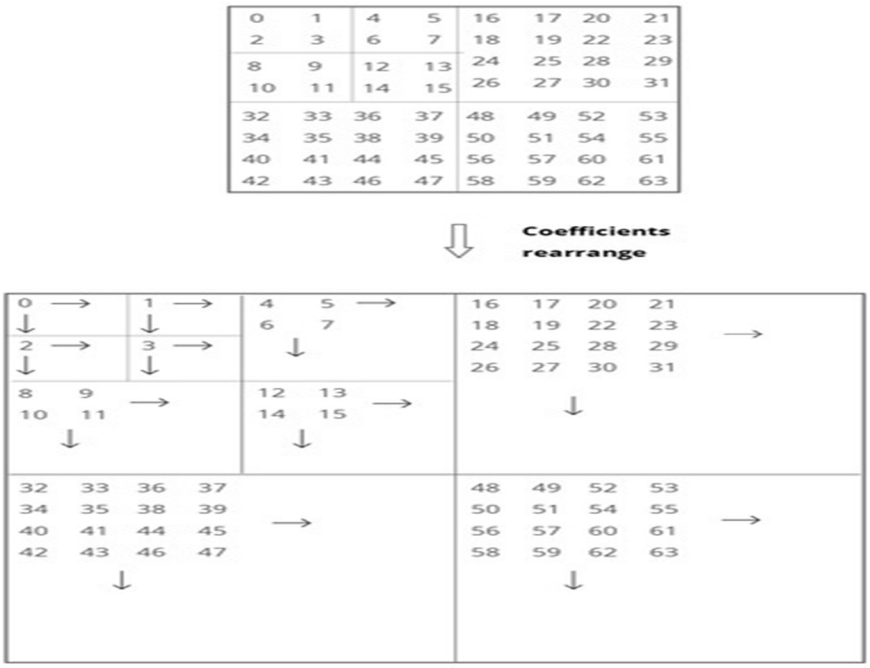
A. Existing System

B. Dct/Dst-Based Data Hiding For Hevc Intra-Coded Frames

DCT/DST-based data hiding algorithm for HEVC intra-coded frames where the block DCT and DST coefficient characteristics are investigated to locate the transformed coefficients that can be perturbed without

A. Exisiting system disadvantages

1) By utilizing the preprocessing stages to include the manipulation on both secret messages and cover videos earlier to the embedding stage in order to enhance the security and robustness of the steganographic method. propagating errors to neighboring blocks.



B. Image Enhancement

Image enhancement operations improve the qualities of an image like improving the image's contrast and brightness characteristics, reducing its noise content, or sharpen the details. This just enhances the image and reveals the same information in more understandable image. It does not add any information to it.

C. Image Restoration

Image restoration like enhancement improves the qualities of image but all the operations are mainly based on known, measured, or degradations of the original image. Image restorations are used to restore images with problems such as geometric distortion, improper focus, repetitive noise, and camera motion. It is used to correct images for known degradations.

D. Image Analysis

Image analysis operations produce numerical or graphical information based on characteristics of the original image. They break into objects and then classify them. They depend on the image statistics. Common operations are extraction and description of scene and image features, automated measurements, and object classification. Image analyze are mainly used in machine vision applications.

E. Image Compression

Image compression and decompression reduce the data content necessary to describe the image. Most of the images contain lot of redundant information, compression removes all the redundancies. Lossless compression preserves the exact data in the original image, but Lossy compression does not represent the original image but provide excellent compression.

F. Image Synthesis

Image synthesis operations create images from other images or non-image data. Image synthesis operations generally create images that are either physically impossible or impractical to acquire.

G. Applications of digital image processing

Digital image processing has a broad spectrum of applications, such as remote sensing via satellites and other spacecrafts, image transmission and storage for business applications, medical processing, radar, sonar and acoustic image processing, robotics and automated inspection of industrial parts.

H. Medical Applications

In medical applications, one is concerned with processing of chest X-rays, cineangiograms, projection images of transaxial tomography and other medical images that occur in radiology, nuclear magnetic resonance (NMR) and ultrasonic scanning. These images may be used for patient screening and monitoring or for detection of tumors' or other disease in patients.

I. Satellite Imaging

Images acquired by satellites are useful in tracking of earth resources; geographical mapping; prediction of agricultural crops, urban growth and weather; flood and fire control; and many other environmental applications. Space image applications include recognition and analysis of objects contained in image obtained from deep space-probe missions.

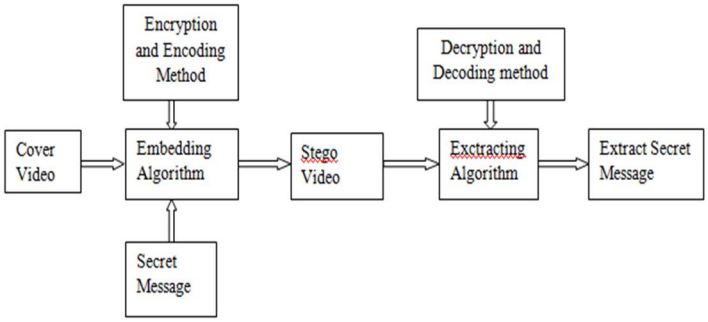
J. Proposed System

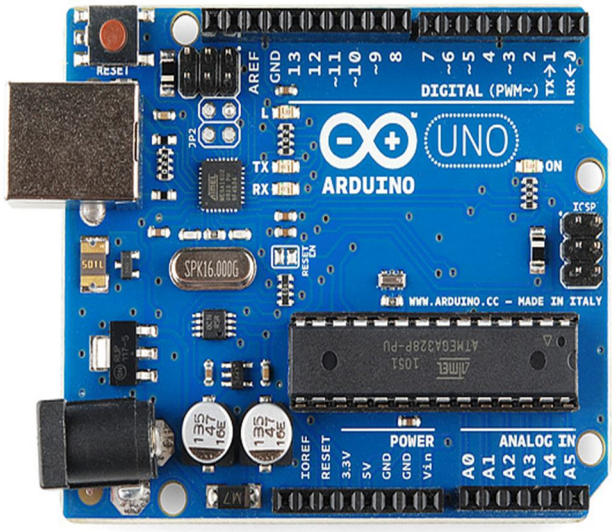
1) Design of an optimal wideband band pass filter (WBBF) for enhancement of bright lesions.

2) Differential Evolution (DE) based contrast enhancement to automatically set the gain and the bandwidth of the WBBF to make the system adaptive for different types of images based on their characteristics.

a) Block Diagram

Fig: Block Diagram of the proposed system





b) Advantages

i. Applying encryption methods and ECC such as Hamming codes and BCH codes to encode the hidden message earlier to the concealing stage will produce a secure and robust steganographic algorithm.

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II. ALGORITHM

In spite of the fact that the Internet is utilized as a medium to access desired information, it has also opened a new door for attackers to obtain precious information of other users with little effort . Steganography has functioned in a complementary capacity to offer a protection mechanism that hide communication between an authorized transmitter and its recipient. Steganography is defined as the art of concealing secret information in specific carrier data, establishing covert communication channels between official parties [2, 3]. Subsequently, a stego object (steganogram) should appear the same as an original data that has a

A. MODULE 1: *Motion-Based Mot Stage*

The motion-based MOT algorithm has been previously explained in Section 4. The process of identifying the moving objects in the video frames must be carried .

B. Module 2: Data Embedding Stage

By using the motion-based MOT algorithm, the process of detecting and tracking the motion regions over all video frames are achieved. In every frame 2D-DWT is implemented on RGB channels of each motion region resulting LL, LH, HL, and HH subbands. In addition, 2D-DCT is also applied on the same motion regions generating DC and AC coefficients. Thereafter, the secret messages are concealed into LL, LH, HL, and HH of DWT coefficients, and into DC and AC of DCT coefficients of each motion object separately based on its foreground mask.

C. Module 3: Data Extraction Stage

video is separated into a number of frames through the receiver side, and then two secret keys are obtained from the non-motion region of the first video frame. To predict trajectories of motion objects, the motion-based MOT algorithm is applied again by the receiver

1) Applications

a) Computer vision is one of the fastest emerging fields in computer science. The detection and tracking of moving objects within the computer vision field has recently gained significant attention.

b) The modification of high frequency coefficients does not have an impact on the video quality.

2) Software Requirements

a) MATLAB 7.14 Version

3) Matlab: MATLAB is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation.

Typical uses include:

a) Math and computation

b) Algorithm development

c) Modeling, simulation, and prototyping

4) Development Tools: MATLAB includes development tools that help you implement your algorithm efficiently. These include the following:

5) MATLAB Editor : Provides standard editing and debugging features, such as setting breakpoints and single stepping

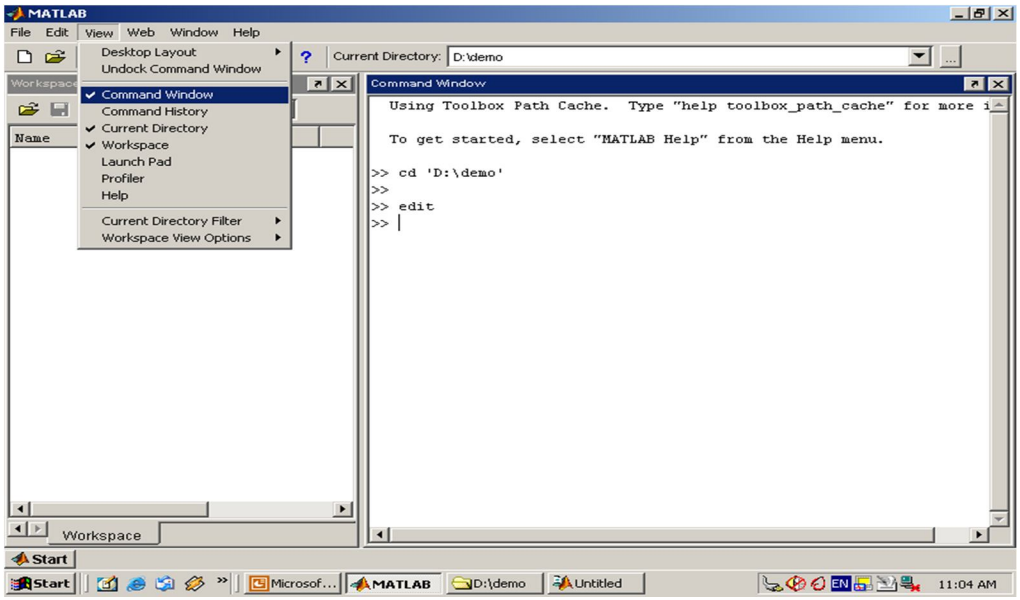
6) Code Analyzer *:* Checks your code for problems and recommends modifications to maximize performance and maintainability

7) Matlab Profiler : Records the time spent executing each line of code

8) Directory Reports : Scan all the files in a directory and report on code efficiency, file differences, file dependencies, and code coverage

9) Designing Graphical User Interfaces: By using the interactive tool GUIDE (Graphical User Interface Development Environment) to layout, design, and edit user interfaces. GUIDE lets you include list boxes, pull-down menus, push buttons, radio buttons, and sliders, as well as MATLAB plots and Microsoft ActiveX® controls. Alternatively, you can create GUIs programmatically using MATLAB functions.

a) Command Window



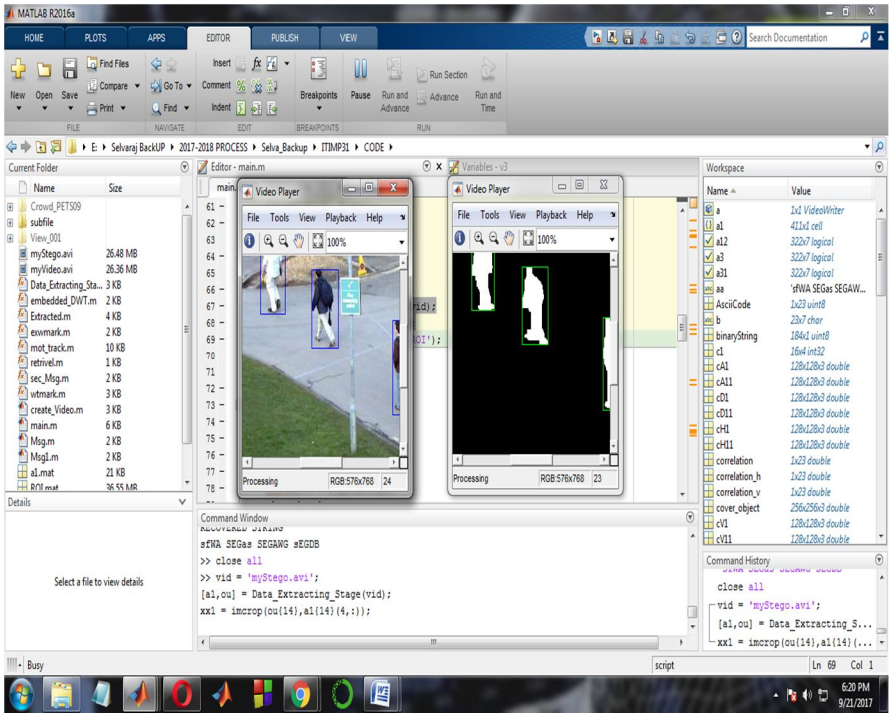
III. PERFORMING NUMERIC COMPUTATION

1) Matrix manipulation and linear algebra.
2) Polynomials and interpolation.
3) Fourier analysis and filtering.
4) Data analysis and statistics.

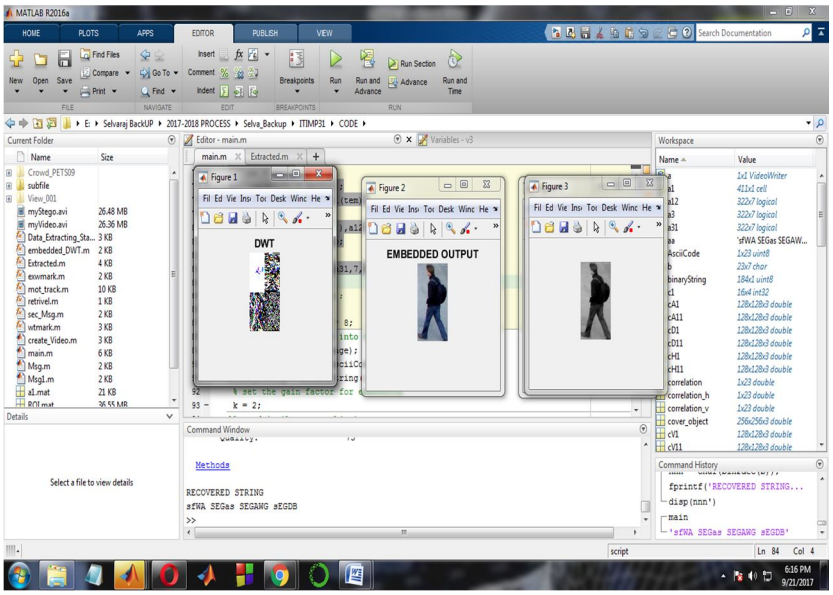
MATLAB can perform arithmetic on a wide range of data types, including doubles, singles, and integers.

A. Snapshots

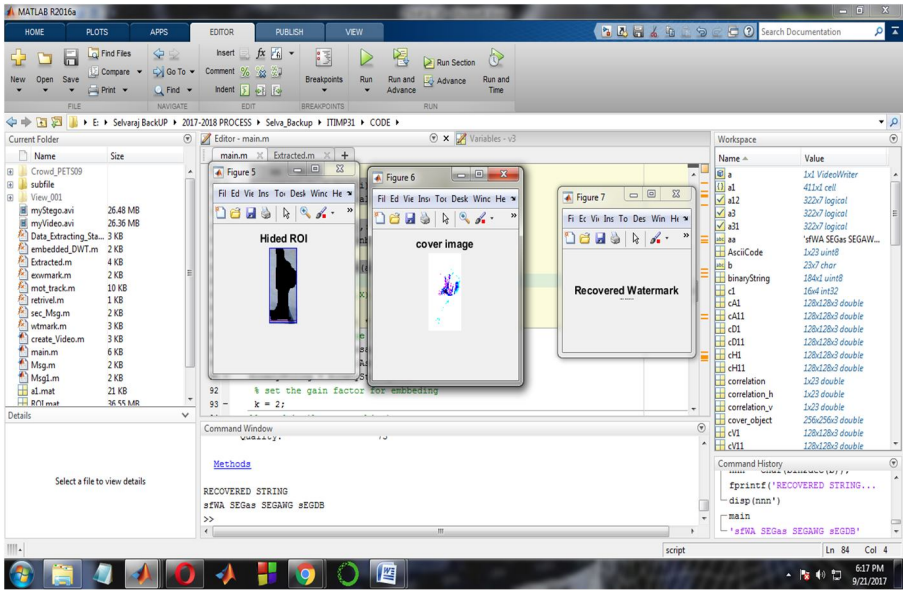
1) Input & Mot



2) Embedded Outputs



3) Recover Watermark image and data



B. Output

Thus an robust and steganography method using dwt and dct using mop and ecc is done and it used to protect secret codes in military purposes or important security places**.**

IV. CONCLUSION

A robust and secure video steganography method in DWT-DCT domains based on MOT and ECC is proposed in this paper. The proposed algorithm is three-fold: 1) the motion-based MOT algorithm, 2) data embedding, and 3) data extraction. The performance of our suggested method is verified via extensive experiments, demonstrating the high embedding capacity with an average HR of 3.40% and 3.46% for DWT and DCT domains, respectively. An average PSNR of 49.01 and 48.67 dBs for DWT and DCT domains are achieved leading to a better visual quality for the proposed algorithm when compared to existing methods of the literature. The proposed algorithm has utilized MOT and ECC as the preprocessing stages which in turn provides a better

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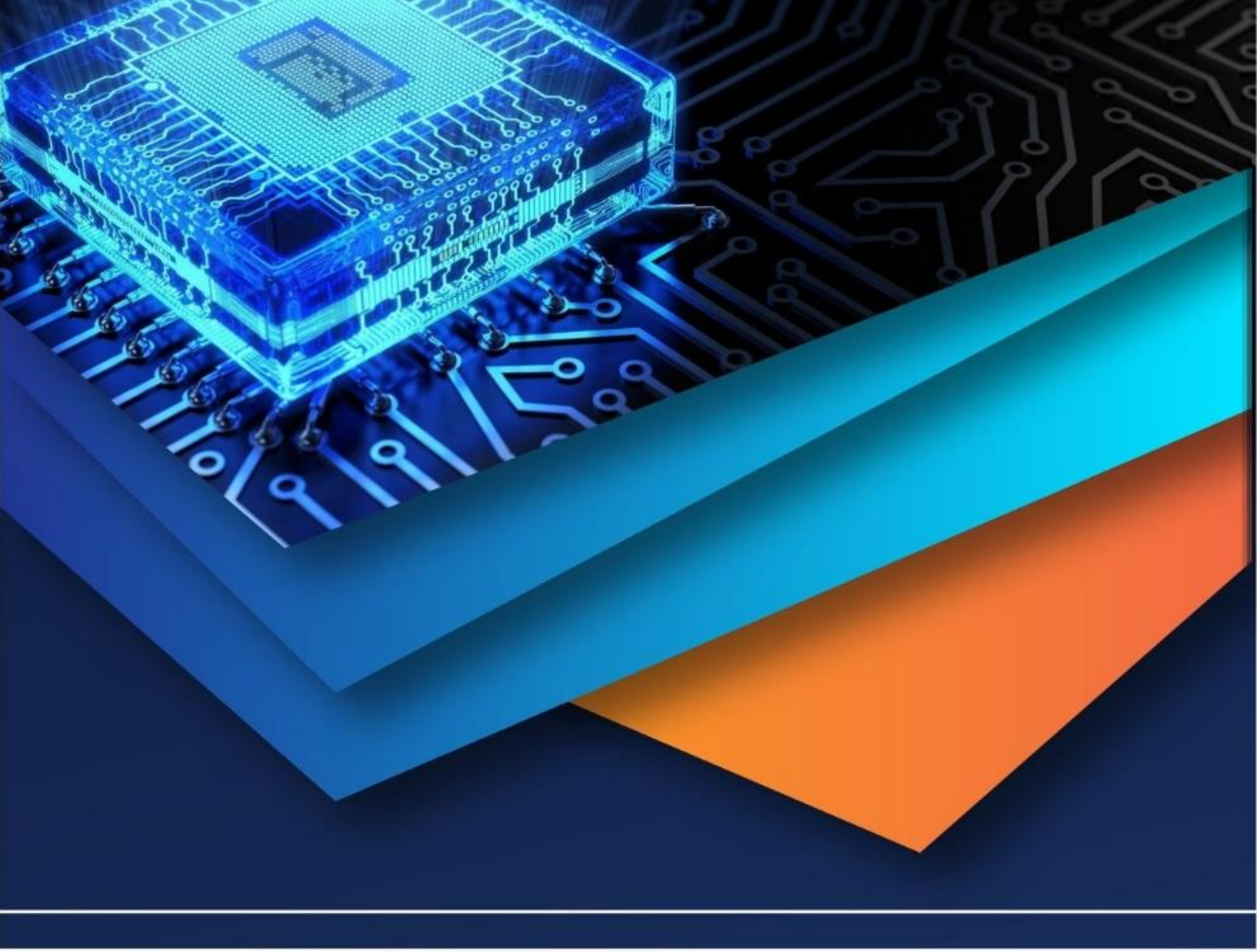

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