iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** VI **Month of publication:** June 2021

DOI: https://doi.org/10.22214/ijraset.2021.34909

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue VI Jun 2021- Available at www.ijraset.com

Tracking and Detecting Moving Object in Real Time Video Surveillance

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Abstract: ***Analysis or monitoring crowd is very important in behavior of human nature, purpose in security system, application like computer vision. Video surveillance is very important application to monitor crowd and its play crucial role for detection and tracking human in crowded area. System development use real time data. Extract input video for preprocessing stage. Optical flow algorithm is used for the motion estimation. Background subtraction algorithm is used for detecting foreground moving object. Kalman filter used for tracking moving object in frame sequence.***
Keywords: Image processing, motion estimation, background subtraction, Tracking

I. INTRODUCTION

Video surveillance technology applied to advance in intelligence surveillance system it can be manually operator in real time risk detection. Multi object tracking technique is applied to automatic video analyze in system. Surveillance insert monitoring about car, pedestrian traffic, people action in crowd for abnormal action detection, counting object etc.

Main aim to build the system first is step is moving detection, second step is tracking the object and last step is huge level of motion analyze. The wide area can provide multimedia system of coverage the observation, for large range object visibility employed the depths to summarize occlusion. In an interesting event moving object can be recognize and human must be coordinates in number of view and specific region can be tracked in the scene.

Surveillance filed detecting the object moving in crowd event is challenging task. Extraction feature and image segmentation it work is not required any training phase. The abnormal behavior is harm public security. The classified method for crowd density first accuracy of detection, to improve algorithm used stream flow based on fluid mechanics. Work on analysis of develop pixel level approach and adaptive algorithm efficient probability density for Gaussian mixture.

II. LITERATURE

Rising the multimedia technique a huge amount of collected video information. Due to limitation in time seen a whole video is not possible for any viewer so to overcome the problem using indexing of video. Some author is define indexing technology with various feature extraction by generation of frames in input data. System model divide into two part training and testing frames important event is recorded. SVM classifier is used for system development. Feature extraction algorithm for video frame used CLBP and LPP [1]. In video indexing work on feature extraction based on human action detection. To improve extraction of feature for people action detection also improve quality. The ground truth data in complicated scene used for detect noisy and irrelevant feature in optical flow algorithm. Information between different frame, direction and velocity in a moving object, Location complexity in coordinates feature to extracting data. Major step to require recognition of human action low level feature extraction. Action detection used extend optical flow algorithm and threshold used for minimize the problem of complication in seen with frame jumping technology. Limitation is useful feature are detect from jumping in frame by the algorithm [2].

In a video surveillance public place is important in a researcher and feature selection in crowd and feature extraction in multi-frame detecting and track based on KLT tracking. Behavior in crowd is compared to separate frame. Behavior in crowd is common model and specially end model and end user plot. Crowd behavior and track algorithm have dependable motion vector in crowd in real database [3]. In crowd survey human behavior is important for science security, simulation in computation and application in computer vision, and also real time investigation detection in crowd used image processing, machine learning, also implementation in physical model. Movement capture, lots of physical allocate in behavior of crowd, motion in direction, velocity, force interactive [4]. To study human action in different technology with trace object is to be moved in frame sequence. Selection of feature by object tracking movement and one feature detect is a system consternation. Tracking path using tracked human in centroid location by combination of color feature. The Kalman filter used to predication of location in human as previous frame and compute with the current frame location of human. The each object are captured by color feature histogram and Bhattacharyya coefficient is matched with color feature. The experiment result are also gives track path of moving object [5].

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In surveillance application walking people count is a big task because obstruction and mess up with a background. Systematically count people based on backward and pathfinder match. To solving the problem walking detect and track method based and regression based feature method. The images and frame sequence collected from regular surveillance scene [6].

Abnormal detection in low level feature on crowd movement is closer boundary. System is to detecting motion of crowd in moving an individual direction and find anomaly in different outline. The data can be generate in velocity based and acceleration based. The crowd tracking based on direction flow grouping. The propose algorithm is detection of the abnormal event in crowd it defend an accuracy and effectiveness. The structure crowd are important attribute that is velocity and direction. Method well pick up image, apply segmentation and find orientation histogram. 'Lucas-Kanade' algorithm used to calculate optical flow with open CV. Next group motion vector into cluster for using the hierarchical clustering also researcher present work is controlled dominant motion flow based on two variable, velocity and direction [7].

Automatically walker trace in video sequence with less and large swarm thickness. Video with less thickness distinguish each individual utilizing location based human detection and worldwide information networks strategy based on generalize graph which tracing individual and every single whole video. Another way for video with high density crowd, tracking using organized drive show and swarm stream modeling. The less swarm thickness system for tracing based on first human detection and data association. Human detection using HOG feature in the image. For data association method using generalize minimum clique problem (GMPC). For high crowd density tracking using floor filed. Floor field are categories first static floor field in that optical flow for location of initial frame. Second, boundary field its capture influence from barrier and boundary of the frame and segmentation using segmentation algorithm. Last, dynamic floor field it capture instantaneous flow around the point. Present framework is currently available for several benchmark [8].

III. METHODOLOGY

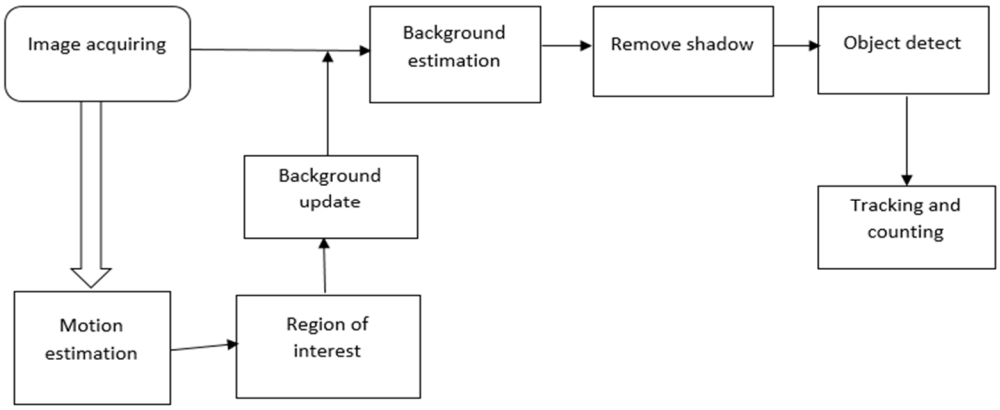

Figure 1: Block diagram of detection and tracking

Figure shows input of the system gives real time database. Input video sequence apply to preprocessing stage also processing stage shows property of input video. After preprocessing the input video apply motion estimation block these block used optical flow algorithm to calculate the motion velocity matrix. Next step to find the foreground object in frame used adaptive Gaussian mixture model for background subtraction method. Filter is used to remove noise in frame sequence. Last step is tracking and counting the detected object using Kalman filter.

A. Input video

Figure show input of the system is given a real time database. Collect the real time database in temple area, bus station, railway station, market area or hotel side areas. Input video apply preprocessing stage.

B. Preprocessing

Input video apply to preprocessing stage. First step read the input video by using imread function also write function to find properties of video like width, height of the video, number of frames. We separate out the frames for working and display the result.

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C. Motion Estimation

Next step of system is motion estimation. Calculate the motion vector use optical flow algorithm to find the velocity and displacement of the moving object. Optical flow algorithm used Lucas-Kanade method.

The strategy of Lucas-Kanade expect that uprooting picture substrate connecting two adjoining moments (outlines) is small and roughly consistent internal neighborhood at point p beneath conception. So condition of optical stream can expected to hold every pixels inside a window centered at point p. To particular, picture in neighborhood a stream velocity vector (v_x, v_y) requirement fulfil.

$$I_x(q_1)v_x + I_y(q_1)v_y = -I_t(q_1)$$

$$I_x(q_2)v_x + I_y(q_2)v_y = -I_t(q_2)$$

$$\vdots$$

$$I_x(q_n)v_x + I_y(q_n)v_y = -I_t(q_n)$$

Place,

$q_1, q_2, \ldots\ldots, q_n$ Pixels in window, $I_x(q_i), I_y(q_i), I_t(q_i)$ is fragmentary subordinates picture I w.r.t location x, y or hour t, evaluate movement q_i at present time.

Equation is written matrix from

$$A_v = b,$$

Place,

$$A = \begin{bmatrix} I_x(q_1) & I_y(q_1) \\ I_x(q_2) & I_y(q_2) \\ \vdots & \vdots \\ I_x(q_n) & I_y(q_n) \end{bmatrix} \qquad v = \begin{bmatrix} V_x \\ V_y \end{bmatrix} \qquad b = \begin{bmatrix} -I_t(q_1) \\ -I_t(q_2) \\ \vdots \\ -I_t(q_n) \end{bmatrix}$$

framework is additional condition of object in this way its more often than not over- purposeful. Strategy of Lucas-Kanade gets compromising arrengement of slightest square rule. To be specific, it tackles the 2x2 framework.

$$A^T A_v = A^T b \quad or$$
$$V = (A^T A)^{-1} A^T b$$

Here,

A^T is transform of matrix A that is,

$$\begin{bmatrix} V_x \\ V_y \end{bmatrix} = \begin{bmatrix} \sum_i I_x(q_i)^2 & \sum_i I_x(q_i)I_y(q_i) \\ \sum_i I_y(q_i)I_x(q_i) & \sum_i I_y(q_i)^2 \end{bmatrix}^{-1} \begin{bmatrix} -\sum_i I_x(q_i)I_t(q_i) \\ -\sum_i I_y(q_i)I_t(q_i) \end{bmatrix}$$

Where,

equation of central matrix is invesre matrix in sum running from of I = 1 to n.

Matrix $A^T A$ is also called structure tensor of picture at point p.

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D. Weighted Window

Plain slightest arrangement of square over gives similar significance of every n pixel q_i within a window. Hone, it better rule way to deliver additional weight of pixels are closer to central pixel p. this employments weight from slightest square equation

$$A^T W A v = A^T W b$$

or

$$v = (A^T W A)^{-1} A^T W b$$

Where W is n x n diagonal matrixs containging weight $w_{ii} = w_i$ is assign the equation of pixels q_i that is

$$\begin{bmatrix} V_x \\ V_y \end{bmatrix} = \begin{bmatrix} \sum_i w_i I_x(q_i)^2 & \sum_i w_i I_x(q_i) I_y(q_i) \\ \sum_i w_i I_x(q_i) I_y(q_i) & \sum_i w_i I_y(q_i)^2 \end{bmatrix}^{-1} \begin{bmatrix} -\sum_i w_i I_x(q_i) I_t(q_i) \\ -\sum_i w_i I_y(q_i) I_t(q_i) \end{bmatrix}$$

The weight w_i is set the gaussian function in distance between q_i and p

E. Background Subtraction

Next step of motion estimation is nothing but the background subtraction algorithm here for the system development used simple method for eliminate background so the method is nothing but frame differencing. In these method simply the current frame subtracted from the past frame and cut off chance that contras of the pixels for a given pixel is greater than edge of threshold then pixels consider portion of frontal area.

$$|frame_i - frame_{i-1}| > T_h$$

The evaluated background is fair the past frame and it's exceptionally touch to the threshold TH.
Advantages of this strategy are it may be a least computation speed of all the strategies.

F. Blob Analysis

Background subtraction algorithm after next step to detect the object by using the blob analysis method in that used frame differencing and threshold. A blob could be a gather of associated in picture that offers a few common property that is grayscale esteem.

The objective of blob location is to recognize and stamp these districts.

1) *Extraction:* The RGB picture is gotten as appeared and it is changed over into a grayscale picture within edge esteem. The edge (0 to 1) connected to get a local comparing to the object being assessed as appeared. In this case, ruddy colored objects are progressing to be identified
2) *Refinement:* The extricated locale is regularly imperfect by the commotion of different kind because of conflicting lighting or destitute picture quality. Within the refinement step the picture is upgrade by applying a commotion channel that is middle filter
3) *Investigation:* The last step, the refined picture is changed over into a binary picture and ultimate comes about are computed. In the event picture contains numerous objects, it is part into personal blobs each of which is reviewed separately which contains the blob as appeared
4) *Centroid:* Once the blob are identify and the bounding box is drawn over it, the middle of the blob must be calculated because it speaks to the location of the object within the workspace. The centroid of physical object area on the object where ought to put your finger in arrange to adjust the object.

a) Its normal X-area and Y-area twofold object. Its point characterized value of X is calculated by averaging x-coordinate of each pixels within blob and after that separating entire numbers of pixels. Additionally value of Y Numerically, the centroid (x, y) of the blob is calculated as within the underneath equation.

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$$x_c = \frac{1}{N}\sum_{i=1}^{N} x_i$$

$$y_c = \frac{1}{N}\sum_{i=1}^{N} y_i$$

Here,
N is Blob in the number of pixels, and Xi – Yi is pixels in x and y coordinates respectively.

G. Filtering

The filtering purpose we used sobel operator so filtered the output of the blob result in that can first sobel masking then find the gradient of the image in x and y direction.

Sobel operator could be discrete separation gradient-based administrator. It computes the angle guess of picture concentrated work for picture edge location. At the pixels of picture, the sobel administrator produces either typical to a vector or the comparing angle vector. It employment two 3 x 3 parts or veils which are convolved with the input to calculate the vertical and level subordinates approximations separately.

$$M_x = \begin{bmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{bmatrix} \quad M_y = \begin{bmatrix} -1 & -2 & -1 \\ 0 & 0 & 0 \\ 1 & 2 & 1 \end{bmatrix}$$

After that sobel masking next step computer the gradient approximation or magnitude vector then display the filter image.

H. Object Detection and Tracking

After that next step for our system is to detect the multiple object and also track the object in a video sequence. So for the tacking we used the Kalman filter.

Object movement or numerous object video stream over time. Object detection is different for tracking object. Object location is a method for finding objects of intrigued in every frame. So there are two ways to finding location of object in different frames. Tracking different object requires location, forecast, and information association.

1) *Detection:* In video frame identify object of intrigued.
2) *Prediction:* Location of object predict in next frame.
3) *Affiliation Data:* Utilize anticipated area is relate location over frames is to tracks.

IV. EXPERIMENT AND RESULT

Discussed about each step of the system development. The result of each stage of the system based on real database.

1) *Step 1:* In first step input video sequence given to the system and simple finding the property of the video like width, height, number of frames in that video sequence. Also display input video in a system.
2) *Step 2:* preprocessing input step so read each and every frame also extract the particular frames to applying method for developing system and display result.
3) *Step 3:* Result analysis of the motion between the object in a different frame or corresponding frame in that we also know the velocity of the object, and also position of object in coordinates of x and y directions. Analysis result of the vector matrix in the different frame.
4) *Step 4:* Consider the background subtraction algorithm so used frames differencing method in that consider the parameter is threshold set and subtract frames so eliminate the background on the images and result display only the foreground object.
5) *Step 5:* Blob analysis result step in that only given result of blob in that image which is nothing but an object.
6) *Step 6:* Filtering step in that remove noise used soble masking for the filtering process.
7) *Step 7:* The last step of these project is to track the detecting object and also count detecting object in a particular scene. Moving object tracking method is used a Kalman filter and also find prediction of the object.

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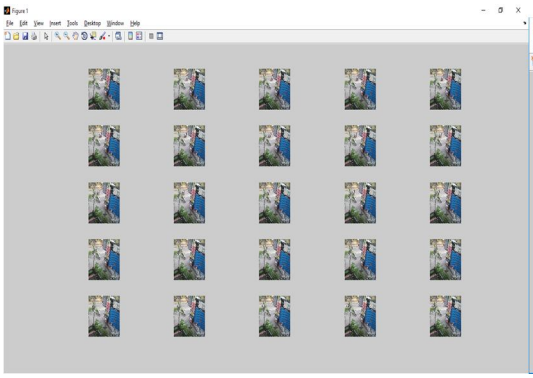

Figure 2: Result of preprocessing

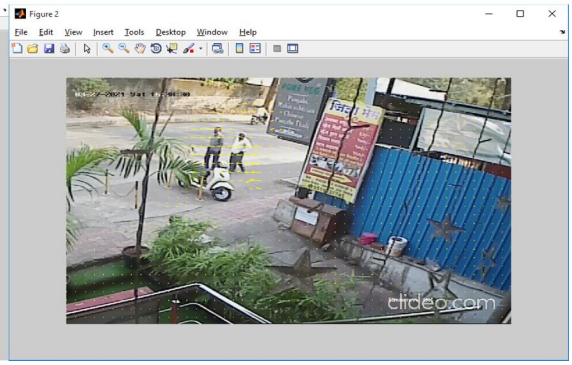

Figure 3: Result of motion estimation

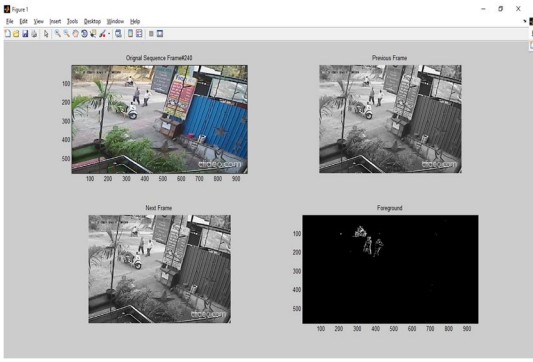

Figure 4: Result of background subtraction

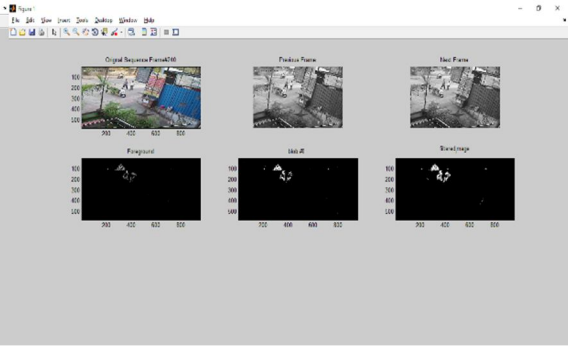

Figure 5: Result of filtering process

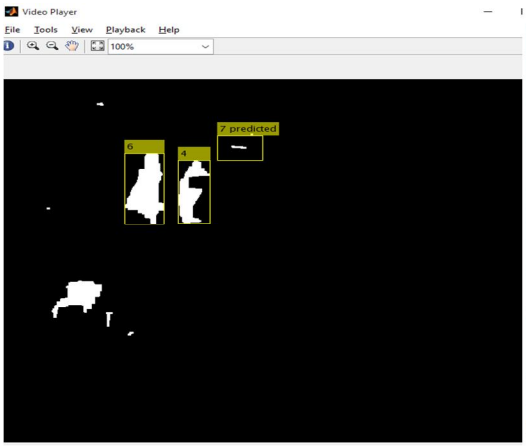

Figure 6: Result of masking

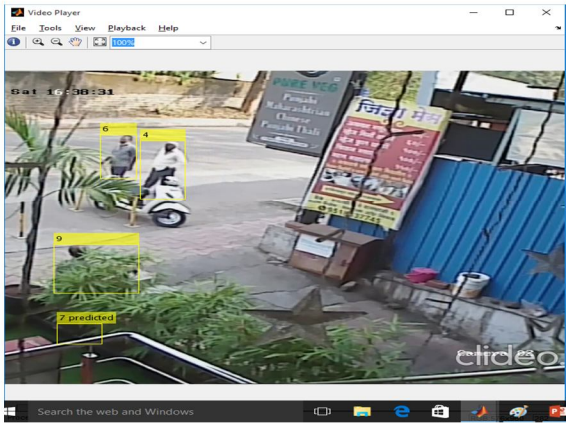

Figure 7: Final result

(Figure 2: The result of preprocessing, Figure 3: The motion estimation result, Figure 4: The result of background subtraction, Figure 5: The result after filtering processes, Figure 6: The result of masking, Figure 7: The final result of tracking detection and counting object)

V. CONCLUSION

System track the moving object in a crowd scene. Technique used for system development first pre-processing input video sequence so separate out the frame. Lucas-Kanade algorithm used for motion estimation in that find the velocity matrix and position of coordinates. Next step of system development using background subtraction algorithm based on the frame differencing method, result of these stage is detect the foreground object. The last step of these system is used Kalman filter for tracking the moving object in the particular scene. But there are some problem occur in object recognition.

Moving object recognizing is a complicating task. Because of some complication of match the speed of the frame sequence and speed of the processor. System required high quality and higher features of the processor for object recognition.

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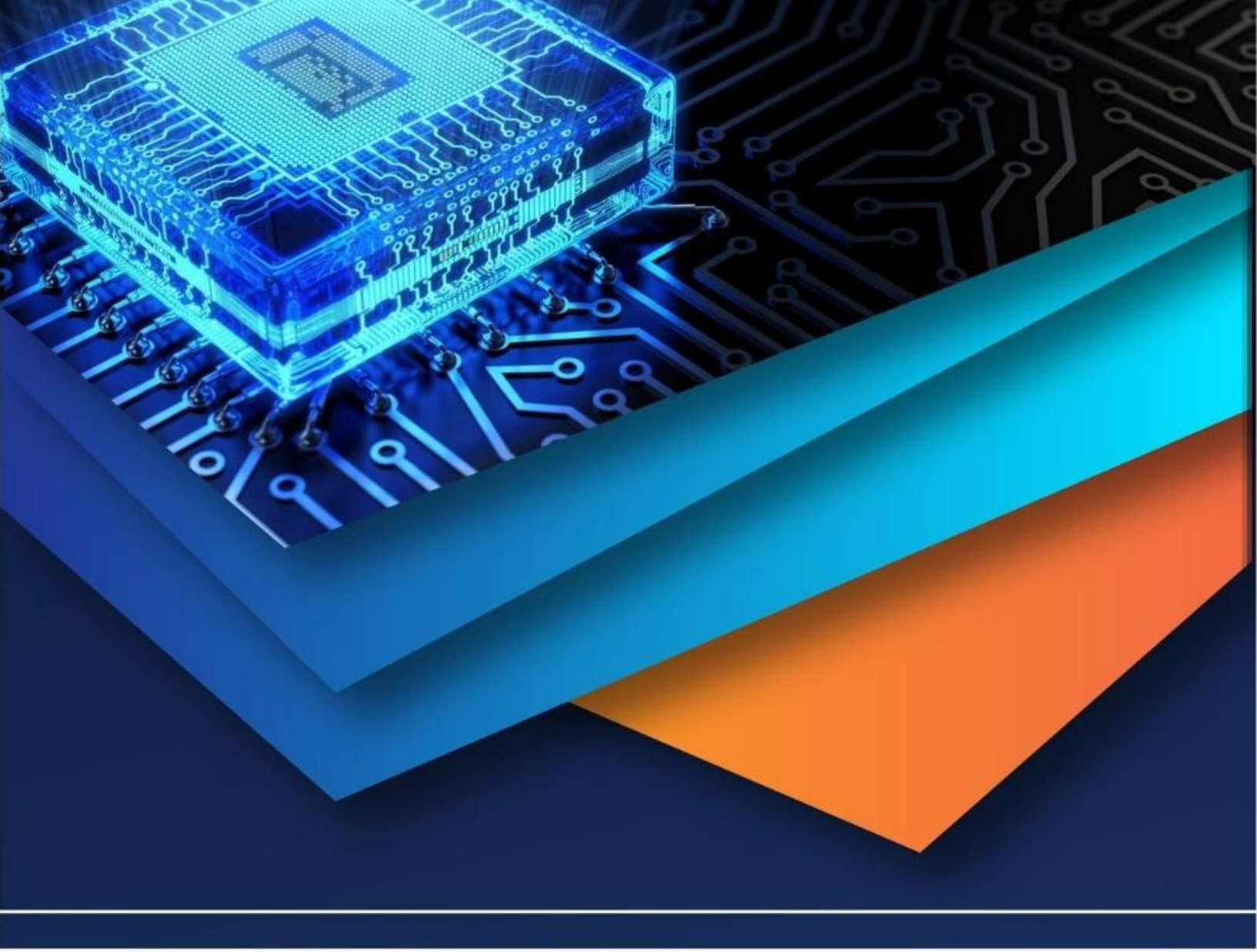

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