iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 **Issue:** III **Month of publication:** March 2020

DOI:

www.ijraset.com

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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 8 Issue III Mar 2020- Available at www.ijraset.com

Vehicle Management System

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Abstract: ***These days, due to a continuous increasing number of vehicles on highways and city roads has created tremendous challenge for traffic management to control increasing traffic on the roads and provide proper management. Detecting vehicles with the help of surveillances on traffic signal can give us more efficient and manageable way to control the traffic. The vehicle management system faces a challenging task in identifying the moving objects segmentation in complex environments. The increase in vehicle density on the road and vehicles running on the wrong direction create much disturbance in easy flow of traffic due to which we can see many road accidents, unnecessary traffic jams and increase in travel timing. However, it is very difficult to build a system, which go through hassle due different orientation of vehicles, colour, sizes, similar looking different objects on the roads like trash bins, zebra crossing, and air conditioning unit kept around. Many ideas and methods has been developed to overcome this traffic management issue but this system is based on KNN algorithm, OpenCV and Tensor flow object detection API making it different from others. The system will based on SSD algorithm. It can be observed from the experimental result that how effective and efficient is our proposed system which will produce high precision and recall than other combative methods.***

Keywords: Vehicle, detection and tracking, Direction of vehicle, color, Traffic, approx. Speed.

I. INTRODUCTION

Due to the continuous increasing number of vehicles on highways and city roads has created a tremendous challenge for traffic management to control increasing traffic on roads and provide proper management. This system will be installed on computer has the ability to tackle many problems on the roads, with the help of traffic surveillance it captures the image of vehicles read them and send report to the required authority and accordingly actions can be taken. These types of systems can intelligent transport systems. The increase in vehicle density on the road and vehicles passing from wrong direction create much disturbance in the easy flow of traffic due to which we can see many road accidents, unnecessary traffic jams and an increase in travel timing. This system will help us in finding any kind of violation of traffic system rules like signal jumping, riding vehicles on wrong sides, exceeding the speed limit and many more traffic rules. Traffic. More likely this system requires to be implemented manual which comprise of the human operator reading the traffic changes from different streams and location of the camera. The process becomes more challenging because it is unlikely for any to read so many simultaneous data at a time. If we talk about full integrated system, machine does the whole task like objects detection, recognizes and collects the relevant information. So, these systems becomes easier to install, and can be operated without any disturbance. In complex environment, such types of system can be easily implemented and install. With the help of motion vector and identifying structured elements which comprises trajectory motion of the object we can frame out pixels of the motion video of moving objects and even we can bring in the use of the morphological operator for quality improvement. The given system ignores selective detected objects which does not appear anywhere like vehicle. Hence, we can say that precision in the detection ratio is increased increasing the foreground mask. Rest the proposed method is discussed as: part - II prominent methods are discussed giving descriptive analysis of the work. Section-III briefing of proposed method has explained. Section-IV Discussion of experimental result has done. Section-V Conclusion of the proposed system have discussed here.

II. RELATED WORK

Detailed briefing of the older existing literature work has discussed in this section. There are many more available methods present for the discussion related to vehicle management system and still many research works are being done to improve the quality, efficiency of object detection to improve the quality the system to get more relevant and accurate results.

In her system she proposed a blackboard model for the integration of different object detection modules. In that model we can see different systems components specialized for the detection of any unique object in the marked or required area. Decentralizing the various detected objects nearby like the air conditioning unit, marks on roads, trash bins, and containers tells how much the improvement in the efficiency of the system is. The inconsistent data, which result generating ability, can be major disadvantage.

Leif E. Peterson (2009) Supervised machine learning can be easily implement with the help of K-Nearest Neighbors (KNN) algorithms which used for solving classification and regression issues. This algorithm uses non parametric method for classifications and regression in recognition pattern. The feature space is examples of k closest training input which works for both cases. Classification or regression depends upon output of KNN:

1) The output can be class membership in case of classification. With the help of plurality, votes of neighbor's classification of objects has achieved. Most commonly in KNN the objects can be assigned to its class.

2) The output can be more like property value in regression. The average of currently used algorithm value is the value for property.

K-NN can be defined as the learning which could be either lazy learning or instance based, in which the functions are only approximate locally in which all the calculation is changed till classification.

Classifications and regressions are useful techniques which weights are assigned for the contribution of neighbours. The average of the nearest neighbor exceeds than the average of one present at distance. For example, some commonly used weighing schemes consist in throwing each neighbors weight of 1/d, in which d is the distance to neighbor.

From sets of objects neighbors are been taken in the class or object properties values are considered. For the algorithm it can also be thought as training sets despite requirement of another training sets.

Tensor Flow is open source library, which used for computing flow of numerical data with help of DFG. Mathematical operations are represented by nodes in the graph and multidimensional array data are represented by graph edges. Succeeding input frames from the frame of videos is known as current frame generating foreground from the reference image by subtracting it from the available current image. Despite, using non adaptive background subtraction algorithm sometimes it fails to recognize elements in the background hence not able to identify vehicles moving at a distance. Further to increase the efficiency Daigavane and Bajaj worked together on this method by considering some factors that could make noise in forefront limiting some behaviors like temporal and spatial of the vehicle which algorithm will generate. The problem of sparse pixel and sporadic noise in the forefront have been addressed by them. In spite, it was very difficult to identify or recognize the vehicle which are of similar color intensity with the reference frame background.

Recently these years, for moving vehicles few new extractions features, and different techniques of machine have been developed. Some features algorithm are developed like methods of abstraction which is relevant to Haar wavelet feature and the histograms of oriented gradients (HOG) technique for detection of movement of object was proposed by Deng and Zhu. Few intangible features with regard to some particular object is identified even extraction is also done but failed, not generating real time results. Shukla and Sani proposes differencing in frame and trajectorial motions established method which tracks objects which are moving. Some disadvantage was found in this method like increase in the false negative in the forefront.

The Camera calibration techniques was proposed by Iwasaki and Itoyama where the camera orientation for detecting vehicle is use for finding the efficiency. Camera is assembled on roadside and sidewalks with low position for the detection of presence of vehicle. The major drawback for the proposed system is that the installation of system can be very costly and even there will always be a fear of theft. After vehicle detection task is performed in this system also recognize color, speed, count of vehicle passed etc. The color recognition API does not carry information about the absolute color space that should be used to interpret the RGB value. By default, applications should assume the RGB color space. However, there is some disadvanges about recognizing exact color at night.

III. PROPOSED METHOD

Main aim of making papers on vehicle management system is enhance the traffic control system by designing and developing real time traffic management, which is used to minimize the resolutions of achieved passed video, attainment heights, noise from environment and so on to achieve satisfactory performance.

For detection of vehicles using input such as low resolution video and high resolution video achieved from surveillance camera present on road side. Afterwards, count of vehicles is detected by the help of video which track the vehicles and direction moving vehicle such as up, down, right, left until it detected vehicle.

The objective of paper is improving the qualities of nearby mask which is generated after reduction of unwanted noises and ignoring the object in casted forefront. Input in these systems used are low and high resolution video. The task of detecting iteratively on each frames till achievement of last frame is done by the system. In Fig1 the flow diagram of the proposed system is present.

Following steps gives the brief description of proposed model:

1) *Step 1:* It will take input video from surveillance camera like we can Parking camera and Roadside camera as a input argument to the system. The input video, which are taking as input, will be in .MP4 format. The input video is decomposed into frames with small pixel and where the video frames will be vary from 1 to at the end of video and then system is initialized after that it continuously accepts the video input till the last frame (or video) is not reached.

Mathematical formula used in this system is

$$V = \{F_i\}, \quad i = 1,...n \qquad (1)$$

Where, '*V*' represents input video and '*n*' represents the total number of frames forms in the video and 'F' represent frames.

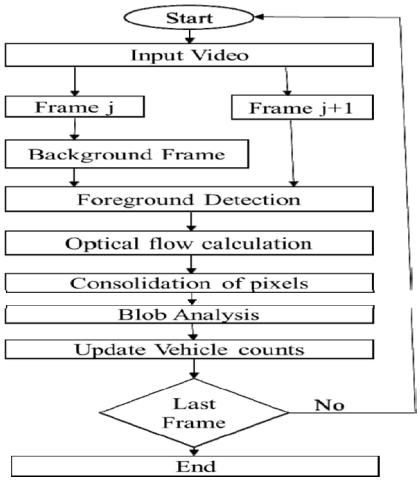


Fig 1 Flow Chart of Proposed Method

2) *Step 2:* Those vehicle will pass through surveillance camera will detected and inform in the system and saved in the file, file like DataFrame (.py) with will carries information like color of vehicle, vehicle type(like bus, car), speed of vehicle, direction of vehicle(in which direction vehicle is passed such as UP or DOWN) etc.
3) *Step 3:* Video frames differentiating operation is used to set part of moving vehicle from video in the sequence of frames and these frames will get converted in Data Frames or on the basis of these Data frames train and test will apply. In the Data frames relative position of the vehicle will predict or data will count.
4) *Step 4:* Optical flow determine the direction of motion of vehicle using pixels. And it will check in which direction vehicle is moving through displacement of pixels which is capture in the pixels. It use flow vector for moving object We have used median filter for predicting in Step no 2 as the optical flow is highly sensitive to noise. Video detection also allow us to detect congestion and can alert the officer of authorized person through sms or email. This makes the authority to approach at the traffic congestion spot and clear all the traffic. This will create problem if there are more vehicles along with various moving objects like animals, bins, people, etc.
5) *Step 5:* The elements in Optical Flow Calculation contain random density of pixels distributed in groups that could affect efficiency by increasing errors and defects. To reduce differences and structural operations, it is necessary to combining the pixels and using the element to examine images, which is near to that element. The element placed in all the possible region of image and then compared with the nearest pixels. This results will tell us that the element will be able to adjust within that neighborhood or hits the neighborhood. Morphological operation is a related to set of image processing based on shapes where all the pixels in the snapshot is adjusted based on value of other pixels in its neighbour. This operation is used to eliminate sound in the surroundings due to sign post on the road edges, lane marking, etc. This morphological operation can determine only those pixel where differentiating elements fits in the given snapshot. The erosion operation determines only those pixels where the structuring element fits in the given images. The output, which we get after modifying the foreground mask, is good in term of standard and the sound from the environment is suppressed. If we need to combine pixels for a newly image which gets from the video we need to use morphological close operation. Morphological close operation fill the vacant space in pixels and removes haphazardness in the pixel. This helps pixels become denser and them it can easily objectify two closely moving object. This increases the overall efficiency of the system and at next step it will form blob analysis for tracking.

6) *Step 6:* For the detection of two dimensional shapes of images of any type we consider Blob analysis that can be used to wipe out those elements which are different from vehicle images like it could be bird, trash bin, air conditioning, man and so on. So, to identify the vehicle we have to set a threshold that will catch vehicle image on basis of area of blob to the area of enclosing box which surrounds the blob.
7) *Step 7:* Output is generated after the completion of Blob analysis. For counting the strength of vehicles we have to maintain two variables. If system catches new Blob as vehicle it has to verify from the database that whether the detected blob is new or registered already in the buffer, suppose if the detected blob is new then count has to be incremented by one considering it as a new one or else assume it as old blob that is already registered and ignore it. With the help of bounding box output is being presented surrounded by detected vehicles and track it until vehicle is visible.

IV. EXPERIMENTAL RESULT

The performance of this system is evaluated approximatelyand then it is compared with the existing system. We have performed this project in the software Spyder (3.3.0) Performance of machine required to run this project is on Intel i5 2.40GHz with 8 GB RAM or more. The video, which we have taken from the traffic surveillance system, have tested on real life situation. The videos capture from the traffic camera were used to test the cases/algorithm, are differentiated into following types.

1) Input high definition(720p) video from traffic surveillance camera of single lane
2) Input high definition(720p) video from traffic surveillance camera of two lane
3) Low-resolution traffic(480p) video with curved surface highway.

We have tested the proposed system in various environmental condition such as at daylight, at night and during different seasons. From these experiments, the accurate efficiency was achieved in (i)Input video of single-Lane traffic, Input high definition video from traffic surveillance camera of two lane and on curve, surface highway the lowest efficiency was observed.

The screenshots of the proposed system given below in the Figure 2-4, which contains input video from real time traffic surveillance video and the output from the machine which gives information about vehicles and its parameters.

A. *Significant Performance*

1) *Experiment No 1:* Input high definition video from traffic surveillance camera of single lane moving towards the stationary camera In Fig 2, the input and output of the traffic video through image are shown in result. This input video from stationary camera contain various vehicles with different color intensity, and are in motion with each other. The surrounding sound due to divider, vehicle silencer and edges of road in the input frame has been removed. The original input video does not contains any text while the output video from the system contains information such as Count of vehicle, their approx. speed, their color, etc. Here the pixels from traffic video are not combined due to vehicles moving closely with each other and due to this; the efficiency of the system is less. In some of the experiments, the closest part failed to detect the vehicles which are very close to each other[10]. In video footage of the single lane traffic camera of single lane moving towards the stationary camera fails to identify the vehicles, which are vey close to each other. This system will not generate any background noise due to surroundings and vehicles. The density of pixels are combined and the overall output of the system will be execellent. The empty spaces, which is between the blobs and the pixels, are more compact when generated by the proposed system. The noise, which is generated by the surroundings and the vehicles, has been removed by morphological erosion. Moreover, to combine the generated blobs morphological closing operation has been applied which has increased pixels quantity of the similar blobs and drastically reduces the error caused during detection of vehicle. This both the operations has improved the system with less error of detecting closely vehicles. It is evident that this system has successfully detected two vehicles moving closely towards stationary camera.
2) *Experiment No 2:* Input high definition video from traffic surveillance camera of two lane which is moving towards the stationary camera In Fig 3, the input and output of the traffic video through image are shown in result. In the given fig 3, the input video contain various vehicles, which makes it more challenging task for the system to detect the vehicle. Some vehicle also has been from the other lane, which is moving away from the stationary camera. Therefore, it becomes a challenging task for the system to place camera at a larger distance from the road such that both the lanes are visible because of unnecessarily detection of vehicles of other lane. Some vehicles have color intensity, which is similar as background e.g. Grey color car with road color, which makes it hard to differentiate those vehicles.Vehicles on road, which have similar color to, that of the background fails to detect by the algorithm. Vehicles has been detected in the System [10], which has sharp contrast in of the background and similar color and where sound is not present. Hence the execution of the system will not be affected by the

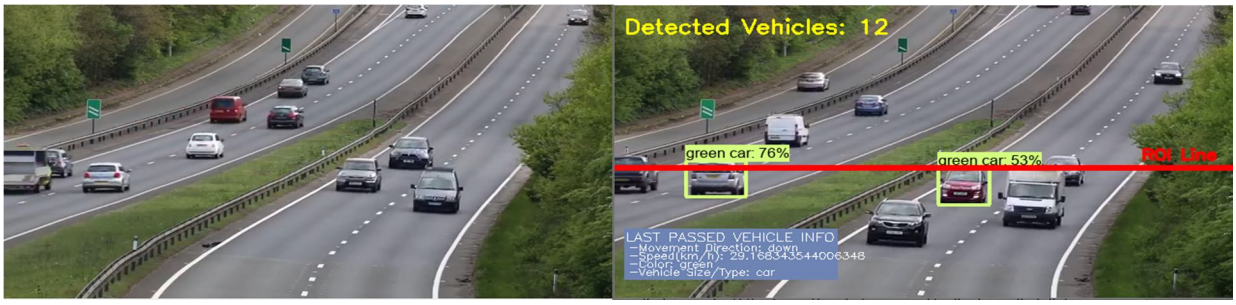
color intensity of vehicles which shows foreground generated by the proposed system. Therefore different types of vehicles such as car, truck, bus, etc. has been clearly identified irrespective of their color intensity.

a) Experiment 1

(a) (b)

Fig. 2: Input high definition video from traffic surveillance camera of single lane

a) Experiment 2



(a) (b)

Fig. 3: Input high definition video from traffic surveillance camera of two lane

b) Experiment 3

(a) (b)

Fig. 4: Low-resolution traffic video with curved surface highway.

3) *Experiment No 3:* Low-resolution traffic video with curved surface highway where camera is been placed at the edge of the curve road. The direction of vehicles on curve road makes an angular curve. The image present below in Fig 4 contains many objects including vehicles such as trees, bin, etc. which can makes it difficult to detect vehicle. It is clearly visible in the image that the lighting condition is not clear. Therefore the proposed system fails to detect some of the vehicles leading to poor performance. The result of this system has more consolidated which fails to recognize many vehicles in the given traffic video. When the camera is placed near the road the vehicles has been detected successfully. Therefore, in this system, vehicles which are compared with other two proposed system can be visibly generated foreground by this method and have been verified successfully. It is necessary to place stationary camera near the curve road so that vehicles can be clearly visible and it can detected by system easily with its all parameters.

V. CONCLUSION

This paper introduce to remove the unwanted noise by presenting an efficient methodology by manipulate the image which will produce more accuracy for detection of vehicles on road by traffic footage. Based on the experimental results, we can say that the accuracy of the output depends on the following factors 1) Sometimes detection of vehicles will not be accurate due to the same background color as that of vehicle. 2) This system can ignore vehicle detection if its size is too small or too large and if there are more obstacles on the road such as bins, poles, etc. other than vehicle the system cannot differentiate it. 3)When it is related to detection of vehicle through traffic surveillance camera then clarity of camera and weather plays a very important role because brightness affect the color of vehicle and if clarity of camera is not good then vehicle will not be detected by the system. From this experiment, we can say that the percentage of correctness, which comes when camera placed near the road, is higher than that which comes when placed far from the road because of resolution of camera. This system has generated accurate quality of foreground image compare to other prominent system. Therefore, this system gives accurate measure of detection of vehicles and all their parameters compared to Standard algorithm. Using the real time traffic footage, this proposed system can detect vehicles, color of vehicles, approx. speed, number of vehicles passed, etc. The result regarding detection of vehicles and their parameters is satisfactory and is helpful in normal traffic condition. However, performance of this system depends upon the resolution of input video from traffic surveillance camera and the position of camera.

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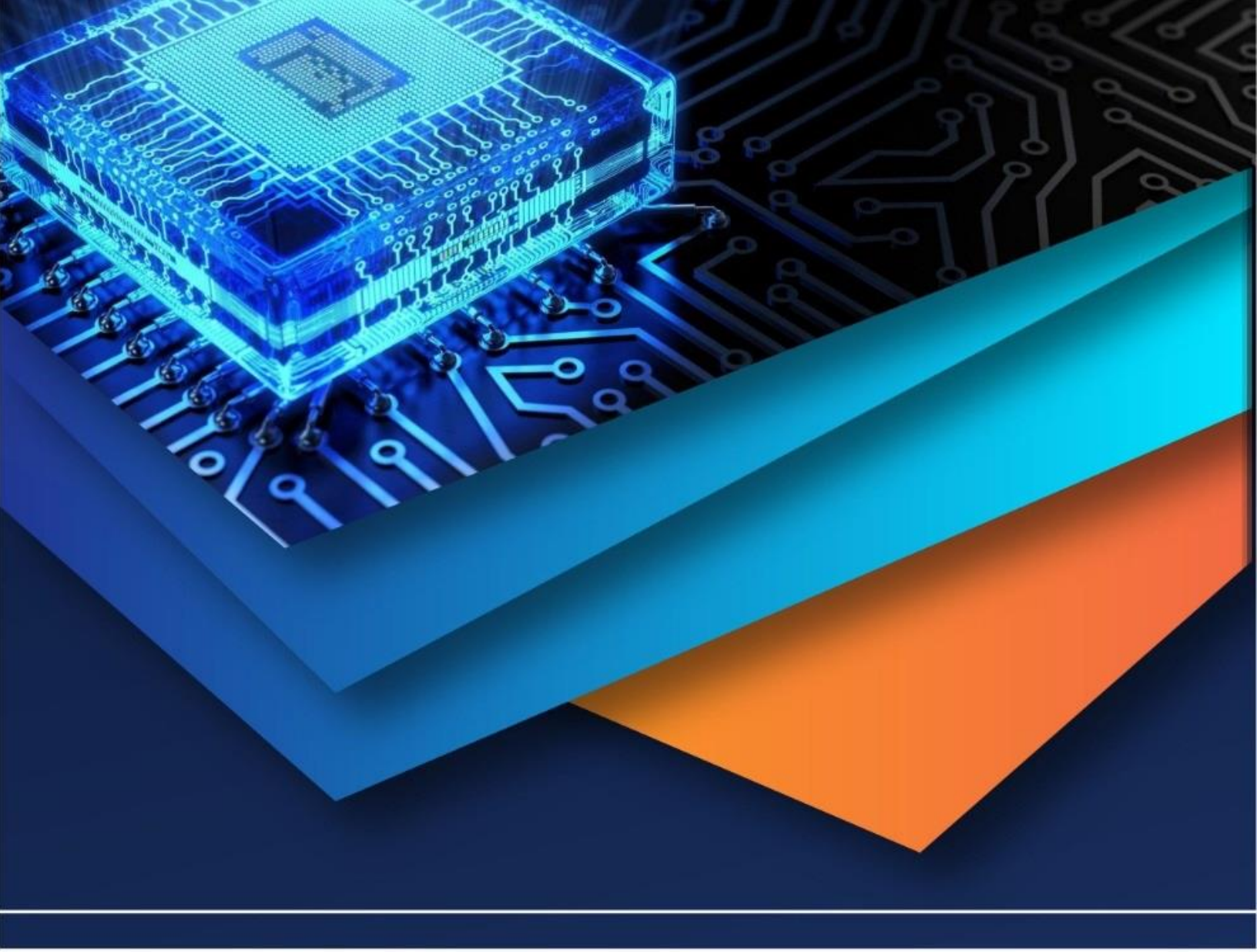

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