iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 **Issue:** VIII **Month of publication:** August 2020

DOI: https://doi.org/10.22214/ijraset.2020.30819

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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 VIII Aug 2020- Available at www.ijraset.com

Driver Understanding of the Flashing Yellow Arrow and Dynamic No Turn on Red Sign for Right Turn

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***Abstract:** This examination investigates the current driver appreciation of lenient right turns during both green and red stages through static assessment and small scale reenactment. Proposed traffic gadgets including the FYA and the Dynamic No Turn on Red sign were assessed corresponding to the current sign and sign conditions executed in the field. Through utilization of the VIS program, it was resolved that correct turning speeds with the FYA present were altogether lower than while associating with exclusively the round green. Both the static assessment and small scale recreation decided a solid comparability between the current round red and the proposed dynamic no turn on red sign which confirms the solid understanding drivers have of the message and the sign itself.*

I. INTRODUCTION

A large number of drivers rely upon Transportation Engineers to execute and structure protected and capable street frameworks to get customers beginning with one spot then onto the following. The Indian Branch of Transportation recorded a nation total of 5.22 million vehicle crashes in 2018 which is a 3.5% extension from 2017. As per the recorded mishaps, the Institute of Transportation Engineers has evaluated that half of all mishaps occurred at combinations and besides 35% of those mishaps occurred at signalized crossing focuses. Exploration performed by the National Highway Traffic Safety Administration accumulates how crashes at controlled combinations were added to lack of consideration, unlawful move, or sham doubt of other customers' exercises. Due to the collection of turning improvements that can be performed at signalized combinations, the shortcoming of walkers ends up being continuously clear in the wake of entering a crosswalk. The Manual on Uniform Traffic Control Devices expresses that when a bystander is permitted to walk the bordering sign to the crosswalk must give a red indication . These conflicts, which do consent to the MUTCD, join; vehicles making a left or right on green while the equivalent crosswalk in like manner has the individual by walking walk signal and a vehicle proceeding to cause a right turn on red while individuals by walking to have the walk signal.

II. LITERATURE SURVEY

Rui Guo et.al [2016] Florida experienced genuine walker security issues and had the most noteworthy person on foot casualty rate in the U.S. from 2008–2011. Person on foot wellbeing at signalized convergences is the most genuine worry because of incessant and extreme clashes among vehicles and walkers. Person on foot includes straightforwardly identified with walker security are utilized to expand driver consistence practices and lessen vehicle-passerby clashes.

Pei Sung Lin et.al [2015] in this paper, we expected to investigate driver practices at signalized crossing points with four recognized person on foot highlights—"Stop Here On Red," "No Turn On Red," "Turning Vehicles Yield To Pedestrians," And "Right On Red Arrow After Stop" signs—by utilizing a creative wellbeing information source, the Strategic Highway Research Program 2 (SHRP 2) Naturalistic Driving Study (NDS) information.

Zhenyu Wang et.al [2015] to improve information preparing productivity, two programming apparatuses were created to help analysts in information decrease in a programmed as well as self-loader way: (1) the NDS Automatic Video Processing Tool, which naturally identifies and tracks people on foot and traffic signal signs in NDS recordings, and (2) the NDS Data Reduction and Analysis Tool, which helps scientists in evaluating and dissecting NDS recordings and sensor information.

Junyi Zhang et.al [2015] this examination investigated the conceivably perilous driving practices of business truck drivers from both large scale and small scales points of view. The investigation depended on computerized tacho graph information gathered over 11 month time span and involving 4373 outings made by 70 truck drivers. At that point, a staggered model was worked to separate the variety properties of speeding conduct at the miniaturized scale level.

Tuqiang Zhou et.al [2011] This paper presents a methodical way to deal with extricating and looking at data from a major information wellspring of computerized tachograph information. The inferred discoveries make important commitments to the advancement of security instruction projects, guidelines, and proactive street wellbeing countermeasures and the board.

Ramin Arvin et.al [2012] this investigation exploits the SHRP2 Naturalistic Driving Study which is a one of a kind dataset that permits new bits of knowledge because of definite data on driver conduct in ordinary, pre-crash, and close accident circumstances, notwithstanding excursion and vehicle execution qualities.

Mohsen Kamrani et.al [2012] Demonstrating after effects of the fixed and irregular parameter probity models uncovered that unpredictability is one of the main components expanding the likelihood of an extreme accident. With unstable driving filling in as a main marker of crash power, given the accidents investigated in this examination, early admonitions and cautions for the subject vehicle driver and proximate vehicles can be useful when unpredictable conduct is watched.

III. STUDY AREA AND RESEARCH METHODOLOGY

A. Study Area

Rohtak is a city and the managerial central command of the Rohtak region in the Indian province of Haryana. It lies 70 kilometers (43 mi) north-west of New Delhi and 250 kilometers (160 mi) south of the state capital Chandigarh on NH 9(old NH 10). Rohtak structures a piece of the National Capital Region (NCR), so it can get modest credits for framework advancement from the NCR Planning Board. Rohtak is the 6th most crowded city in Haryana according to the 2011 statistics with populace of 374,292 and Dirt hills of coins found at Khokhrakot have illuminated the way toward throwing coins in old India. The coin molds of the later Yaudheyas of the third or fourth century AD have been found in enormous number here, alongside a few earth seals of the equivalent and ensuing dates. A Gupta earthenware plaque and a head of later date have additionally been found. The town kept on prospering till the tenth century AD, as coins of King Samanta Deva of the Hindu Shahi line of Kabul have been found here.

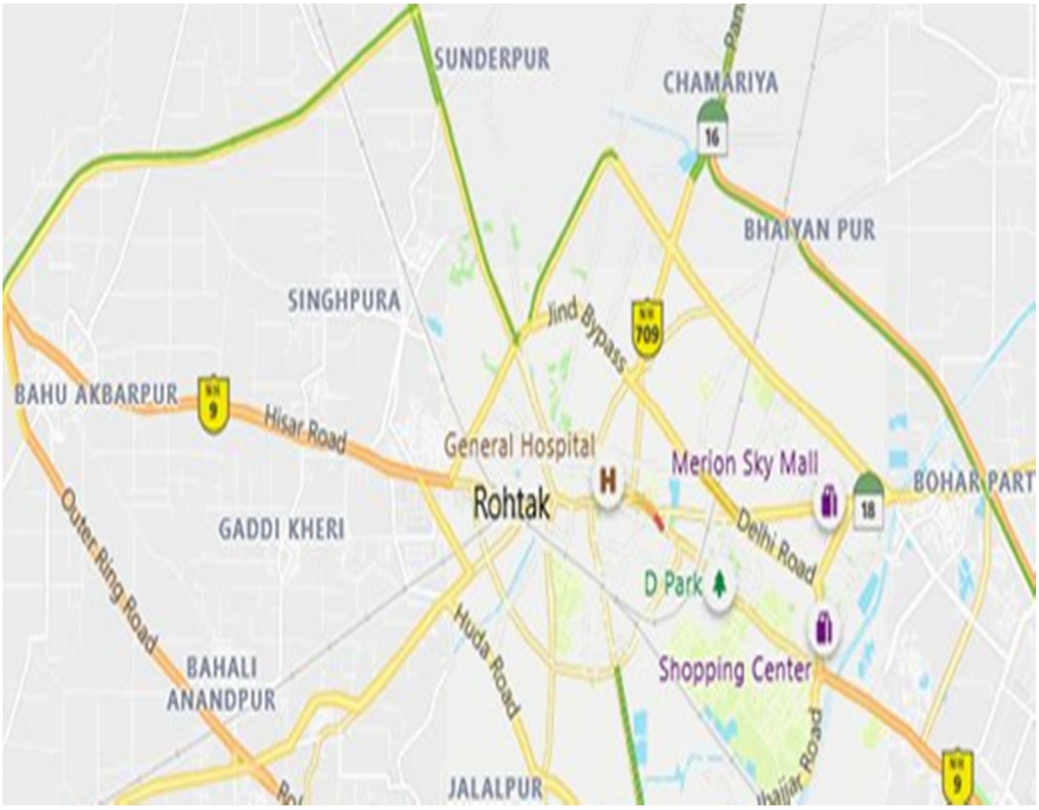

Fig.1 : Rohtak map.

B. Micro Simulation

The utilization of micro simulation was executed with the aim to survey the proposed gadgets applied to a specific convergence. This micro simulation was made in the program PTV VISSIM. This program takes into account the perception of free stream re-enactments with the capacity to apply specific structure segments.

IV. RESULT AND ANALYSIS

A. Crash Data

The accidents gathered gave crude information to additionally be dissected. From 2011-2014 in the Commonwealth of Massachusetts there were 486,692 accidents at a crossing point, completely reported with X and Y arranges and other contributing data contribution to ArcGIS. Of these accidents, 16,432 were a consequence of the vehicle making a correct go before crash and 5,854 of those correct turn crashes happened at a signalized crossing points.

Table.1: Details of crash data.

Year	2011-2014		2011		2012		2013		2014	
Total Right Turn Crashes at All Intersections	16432		4111		4014		3974		4333	
	Count	*Percent*	*Count*	*Percent*	*Count*	*Percent*	*Count*	*Percent*	*Count*	*Percent*
Total Right Turn Crashes at Signalized Intersections	5854	35.63%	1443	35.10%	1493	37.19%	1342	33.77%	1576	36.37%
Collision with Pedestrian	215	3.67%	50	3.47%	54	3.62%	55	4.10%	65	4.12%
Collision with Cyclist	248	4.24%	54	3.74%	68	4.55%	50	3.73%	76	4.82%
Collision with Motor Vehicle in Traffic	4485	76.61%	1142	79.14%	1156	77.43%	1003	74.74%	1184	75.13%
Fatality	3	0.05%	1	0.07%	0	0.00%	1	0.07%	1	0.06%
Incapacitating	83	1.42%	18	1.25%	28	1.88%	23	1.71%	14	0.89%
Non-incapacitating	438	7.48%	110	7.62%	118	7.90%	98	7.30%	112	7.11%
Injury possible	520	8.88%	117	8.11%	129	8.64%	118	8.79%	156	9.90%
Property Damage Only	4560	77.90%	1148	79.56%	1133	75.89%	1044	77.79%	1235	78.36%
Daylight	4239	72.41%	1030	71.38%	1079	72.27%	928	69.15%	1148	72.84%
Clear Day	4108	70.17%	990	68.61%	1071	71.73%	949	70.72%	1098	69.67%
Dry Surface	4525	77.30%	1062	73.60%	1193	79.91%	1071	79.81%	1199	76.08%

Survey

Table.2: Breakdown of statistical testing on traffic signal response.

Responses	Circular Green	FYA	p-value	Circular Green+ pedestrian	FYA+ pedestrian	p-value
Pedestrians likely present	103	93	0.793	–	–	–
Right turn permitted	181	162	0.668	169	155	0.428
Driver has the right of way	85	60	0.091	27	27	0.995
Pedestrian has the right of way	94	86	0.870	164	147	0.328
Must complete stop at stop line before proceeding	23	21	0.930	26	20	0.373
Proceed through intersection if clear	160	122	0.085	138	120	0.257
Yield before entering intersection	48	105	**<0.001***	68	120	**<0.001***
Stop and wait for an alternate signal	3	7	0.171	2	7	0.096
None of the above	0	1	0.302	2	1	0.562
Crosswalk A	6	1	0.071	–	–	–
Crosswalk B	59	56	0.947	–	–	–
Both A and B	38	36	0.964	–	–	–

* p-value considered statistically significant

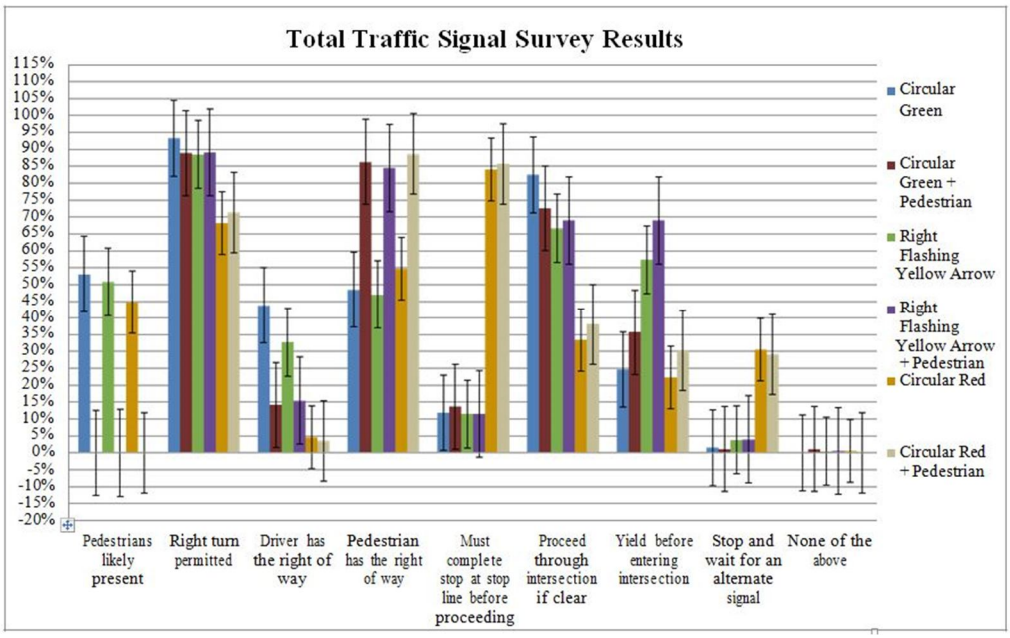

Fig.2: Survey Responses for All Traffic Signal Scenarios and Showing Error Bars

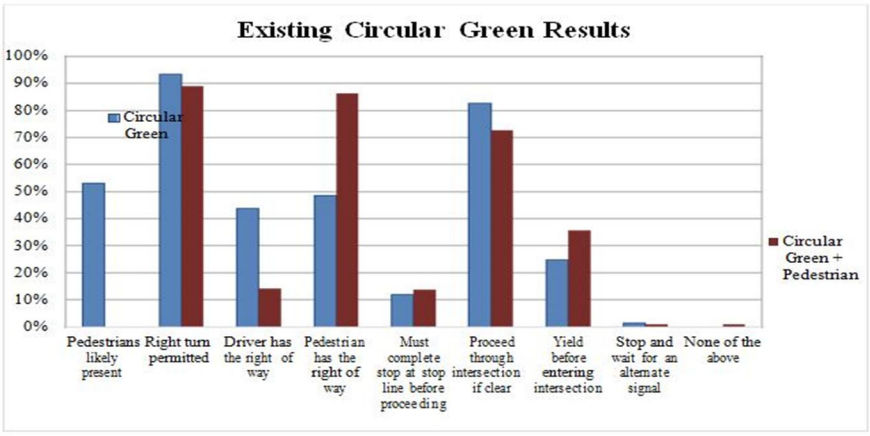

Fig.3: Survey Results for the Existing Circular Green Signal Scenario

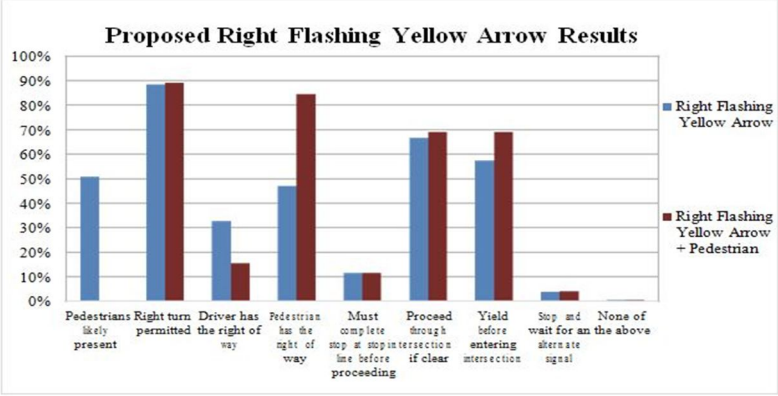

Fig.4 : Survey Results for the Proposed Right Flashing Yellow Arrow Signal Scenarios

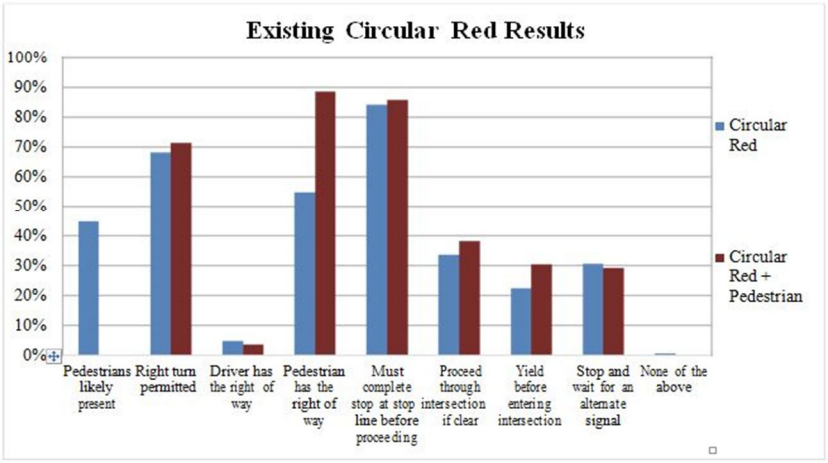

Fig.5: Survey Results for the Existing Circular Red Signal Scenarios

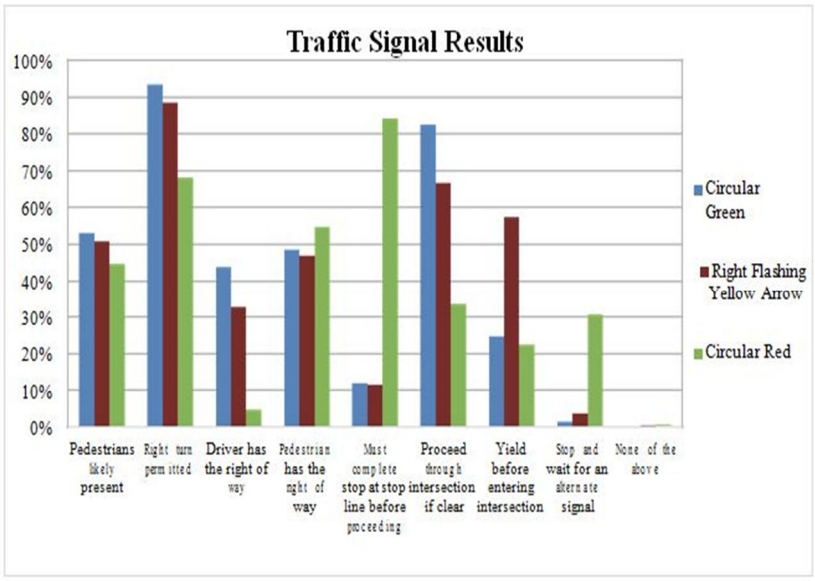

Fig.6: Survey Results Comparing the Observed Signal Scenarios

Because of confinements in the SSAM programming, restricted examination had the option to be finished deciding the variety in clashes between signal conditions. In light of the general number of clashes gathered by SSAM for both the present condition spoke to in VISSIM and the proposed blazing yellow bolt, there was a reduction in clashes in the proposed situation. In looking at the enacted and deactivated dynamic no turn on red situations, the general number of clashes recognized by SSAM diminished when the correct turn on red was disallowed. The aggregate number of contentions being looked at can be found in Table 3.

Table.3: SSAM conflict comparison

	Existing	FYA	Difference
Conflicts	29	22	7
	RTOR	No RTOR	Difference
Conflicts*	1022	1017	3

*includes approaching lane links

V. CONCLUSION

The study divide was performed utilizing a PC based static assessment. The investigation assessed the outcomes from 200 respondents dependent on the current uninvolved green and red stage conditions, the proposed right glimmering yellow bolt, and dynamic no turn on red sign. The outcomes demonstrate that drivers have a solid cognizance of the glimmering yellow bolt and dynamic no turn on red messages. This re-enactment was reproduced to speak to the field conditions, the blazing yellow bolt condition and forbidding a correct turn on red condition where each proposed gadget condition kept all components predictable with the slight difference in exclusively the gadget being referred to. With constrained ease of use of SSAM to dissect passerby clashes, the general clash tally was utilized to think about existing and proposed conditions. There was a diminishing in general clashes from the current condition to the glimmering yellow bolt conditions and a lessening in clashes from right turn on red allowed to right turn on red denied.

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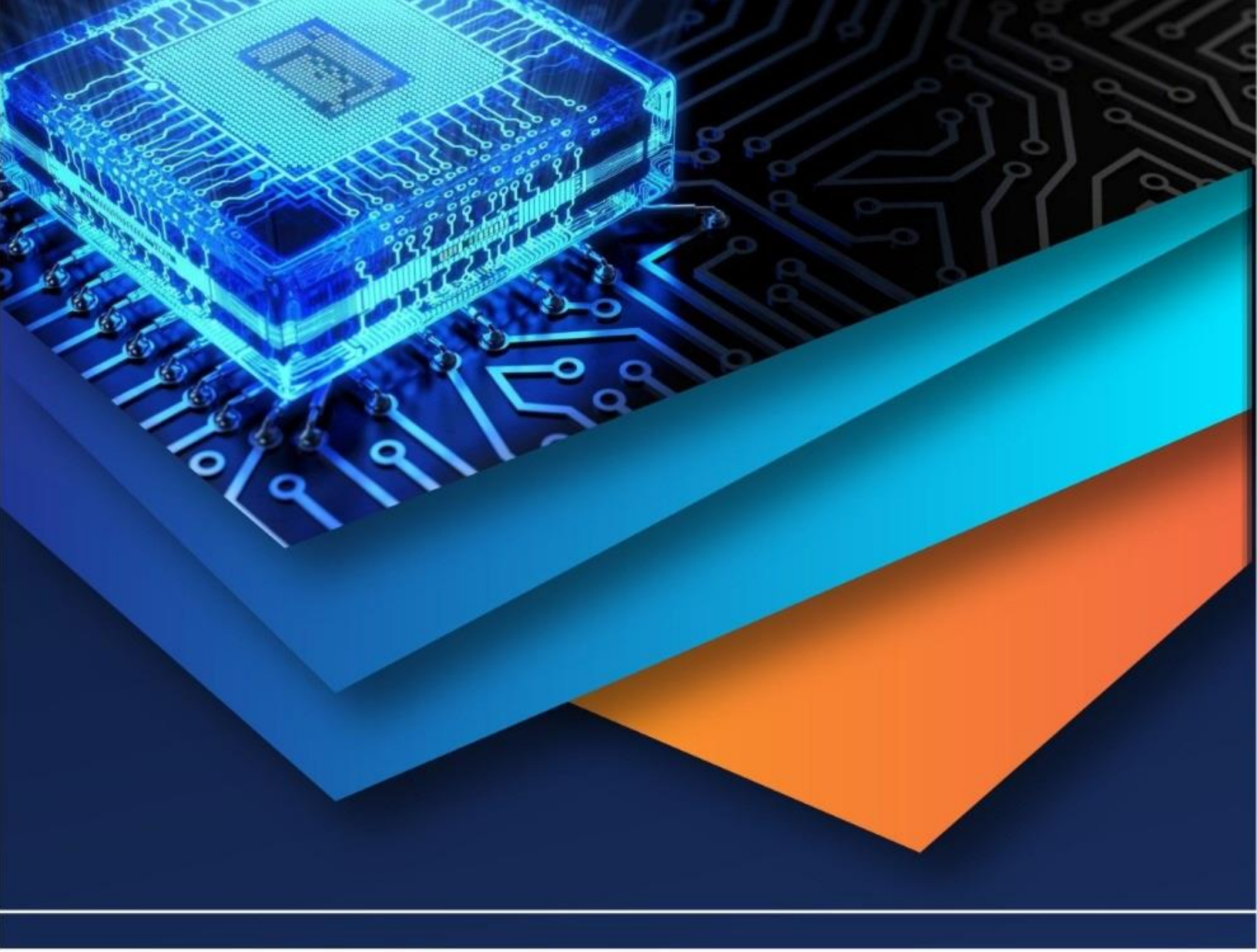

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