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Intelligent Traffic Light Control System using ATMGA328 Microcontroller

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Abstract: ***In this proposed paper, the main aim is to make an intelligent traffic light control system. Present Traffic Light Controllers (TLC) are based on microcontroller and microprocessor. These TLC have limitations because it uses the pre-defined hardware, which is functioning according to the program that does not have the flexibility of modification on real time basis. Due to the fixed time intervals of green, orange and red signals the waiting time is more and car uses more fuel. To make traffic light controlling more efficient, we exploit the emergence of new technique called as "Intelligent traffic light controller".***
Keywords: Atmega328 & Atmega8 Microcontroller section, Ultrasonic sensors, regulated power supply.

I. INTRODUCTION

The First traffic signal was discovered by Detroit policeman named Lester Wire like two colour,
red-and-green light with a buzzer in 1912. After that, in 1920, William Potts update the previous design of traffic light .William include the tri-coloured red, yellow, and green lights widely used today. Traffic signal mainly used for controlling the vehicles and help to reduce the accidents between vehicles. The traffic congestion problems are increasing day by day because of the increasing number of vehicles with limited infrastructure. Under this situation, the existing traffic light systems which are timer based are not able to control traffic. To solve this problem, a real time traffic control system is needed which will control the traffic signal according to traffic density. The existing traffic signal system is implemented with delays where the signal transition time slots are fixed and do not depend on current traffic flow. The existing traffic system needs to be upgraded to solve the severe traffic congestion problems. So here we propose a simple, low-cost, and real time traffic signal system that aims to overcome many problems and improves the traffic system. The system is based on ATMEGA 328 & ATMEGA8 Microcontroller that calculates the traffic density using Ultrasonic sensors mounted on either sides of each road and dynamic timing slots with different levels. Our system will be very useful for solving most of the traffic congestion problems occurs today.

II. COMPONENT DESCRIPTION

A. Regulated power supply

To drive Microcontroller & discrete component circuit a regulated power source required. Here we have design 5V regulated power supply using LM7805 Regulator. Which can step down 12V AC/DC source to constant 5V by using rectifiers & filters? For rectification we have use 1N4007 diode as bridge rectifier & after that we have connected 1000uf/16V electrolytic capacitor as charge storage capacitor to fed constant voltage to regulator. After that regulator is connected with 100nf capacitor, which work as filter means it pass block DC & pass AC. So, if any AC component reaches their than it will ground that signal & protect regulator from being damage. After regulator Same electrolytic capacitor is used to store charge.

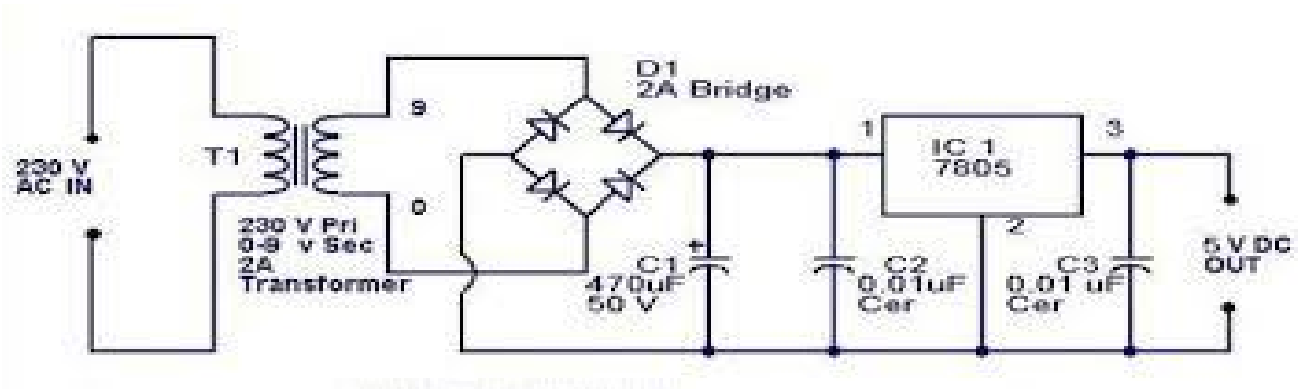

Fig.1 Power supply

B. Traffic Light

The Traffic lights consist of three universal coloured lights: the green light allows traffic to proceed in the indicated direction, the yellow light warns vehicles to prepare for short stop, and the red signal prohibits any traffic from proceeding. Similarly as traffic light we have used four light pair of three color lights Red, Green & Yellow. These light timing is control by Atmega8 controller.

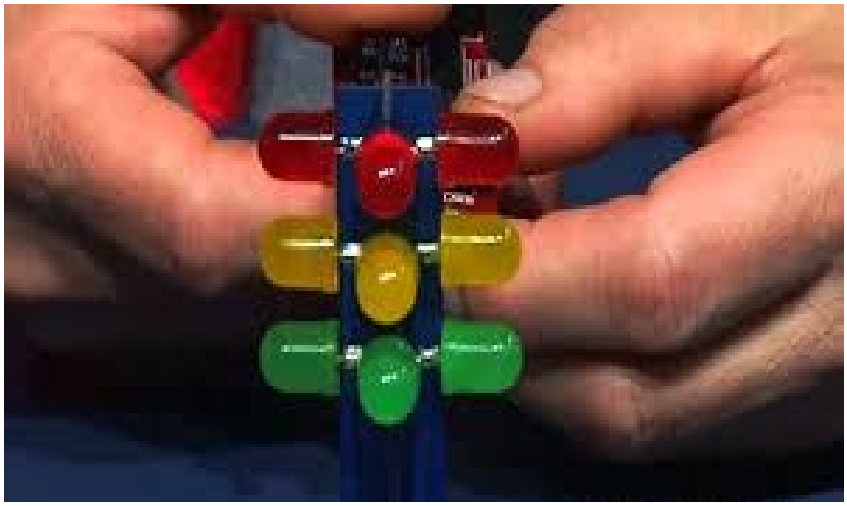

Fig.2 Traffic Light

C. Atmega328 & Atmega8 Microcontroller

He ATMEGA328 is a single chipmicro controller created by atmel in the magaAVR family. Both microcontroller has a 28 pin. Atmega328 is a 8-bit microcontroller. Atmega8 microcontroller has 1Kbyte Internal SRAM, 8 Kb of Flash program memory and 512 Bytes of EEPROM. It has three ports, namely port-B, port-C and port-D and 23 I/O line can be attained from these ports. The main feature of Atmega8 Microcontroller is that, all the pins of the Microcontroller support two signals except 5-pins. The Atmega8 microcontroller consists of 28 pins where pins 9,10,14,15,16,17,18,19 are used for port B, Pins 23,24,25,26,27,28 and 1 are used for por C and pins 2,3,4,5,6,11,12 are used for port D. Here we have used two Microcontrollers. Atmega8 Microcontroller control timing function of lights connected through it with respect to traffic information shared by ATmega328 controller. Means Atmega328 controller check density of traffic with the help of Ultrasonic & if level of traffic crosses than this controller send command to Atmega8 Microcontroller through serial communication & with respect to command Atemag8 controller change traffic ON/Off time.

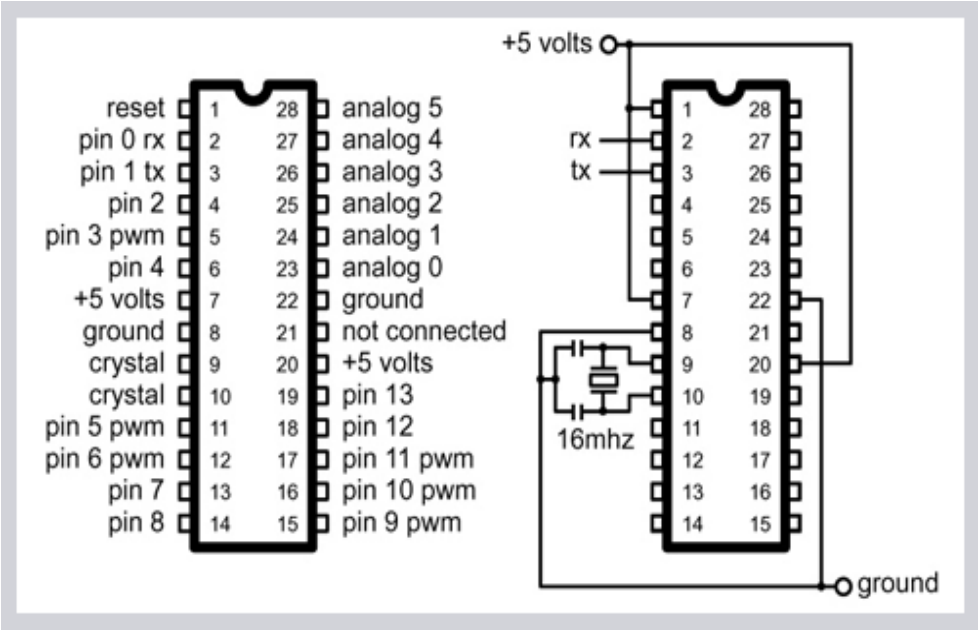

Fig.3 Pin Description of Atmega328 and Atmega8 Microcontroller

D. Ultrasonic Sensor

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. Here we have used our ultrasonic sensor to measure density of traffic. This ultrasonic sensor work on reflection of sound principle. Sensor has one transmitter module with amplifier circuit & Receiver with discrete component. This ultrasonic sensor work on 40KHz frequency so no impact of other sound over which is not of 40Khz.

Fig.4 Ultrasonic Sensor

III. BLOCK DIAGRAM& CIRCUIT DIAGRAM

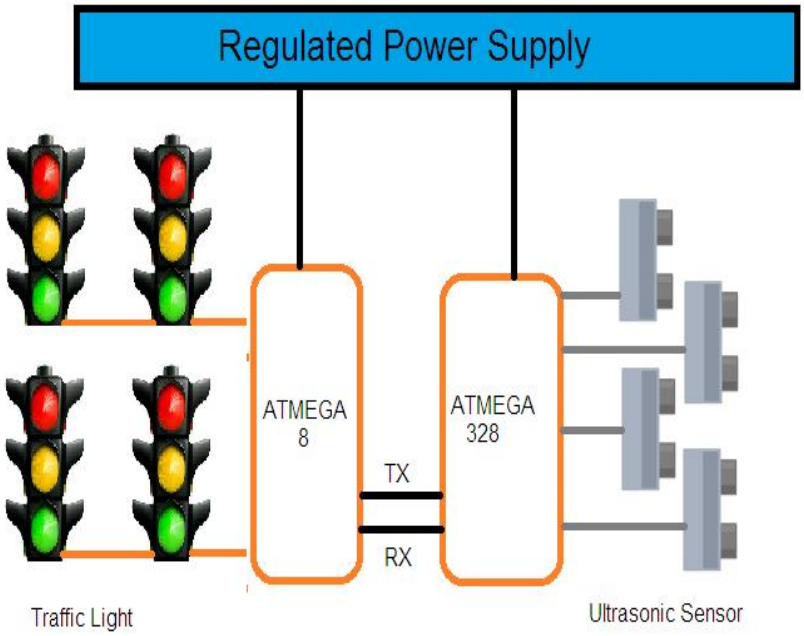

Fig.5.1 Block diagram of Traffic Light Control System

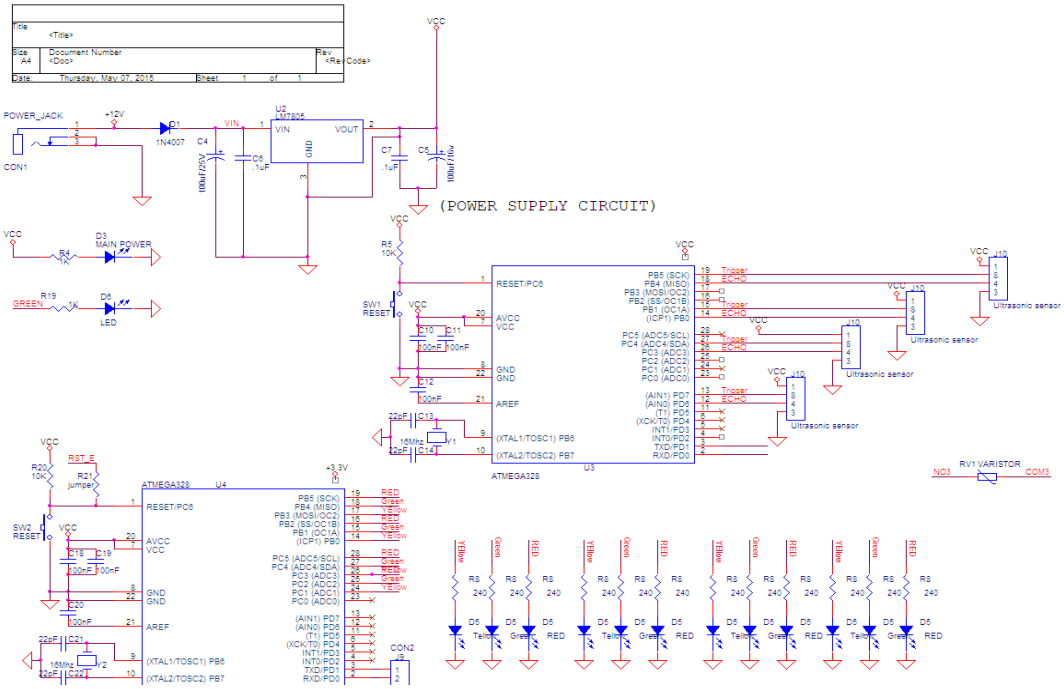

Fig.5.2 Circuit diagram of Traffic Light Control System

IV. WORKING

Here we have used four ultrasonic sensors to measure density of traffic of each road respectively**,** they can be fitted on road with respect to user choice. These four-ultrasonic sensors are connected with ATmega8 controller which will check each ultrasonic sensor and with respect to data collected from ultrasonic sensor it sends command to Atmega328 controller to change timing of lights.

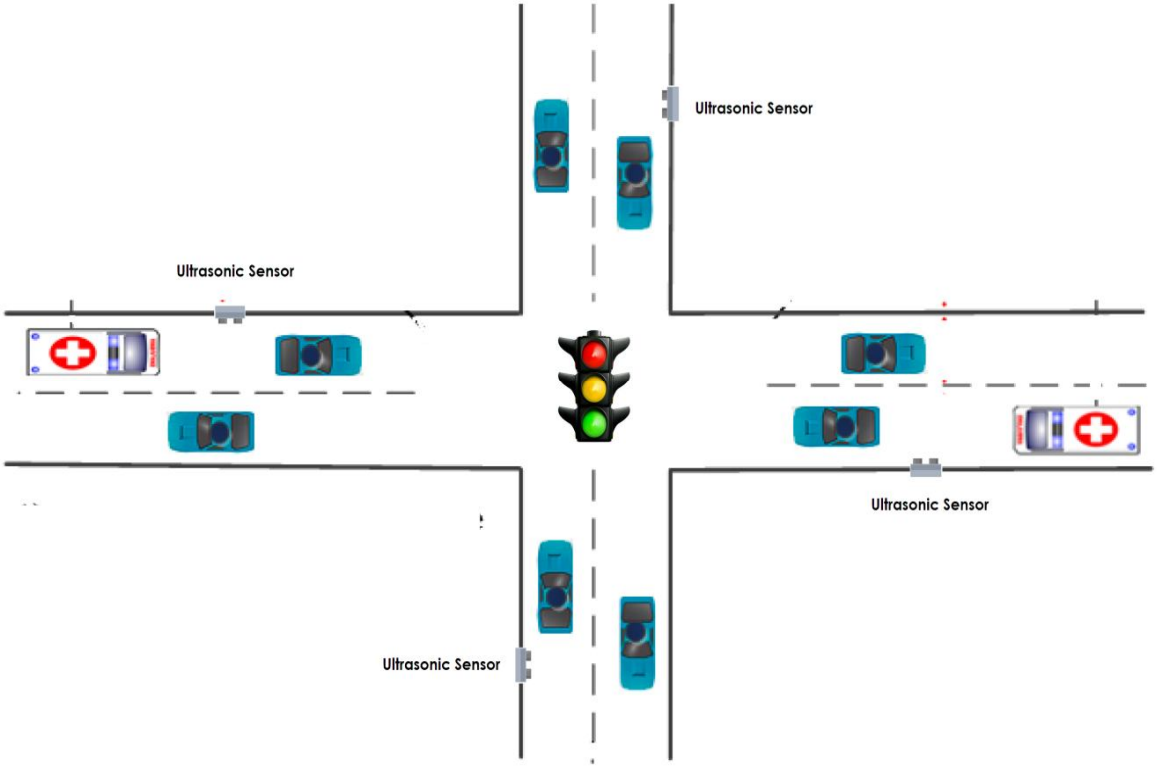

Fig.6 Working of Traffic Light Control System

When traffic reach to ultrasonic sensor than senor sense the presence of vehicle, & if vehicle stay more than 5 second their than controller of ultrasonic send command to controller of light that that there is traffic increase so with respect to ultrasonic sensor Green light time for that road is increase.

V. EXPERIMENTAL RESULT& DISCUSSION

Before using Ultrasonic sensor, we have used IR sensor to measure density of traffic at road but that not work proper due to interference of sun light &light & another light nearby sensor. So, after discussion & design & development of circuit we came to conclusion that we have to choose such type of sensor which have no impact of environmental factors, so we have used ultrasonic sensor which is work on reflection of sound whose frequency is 40Khz so even there is interface of any other sound than sensor will not respond.

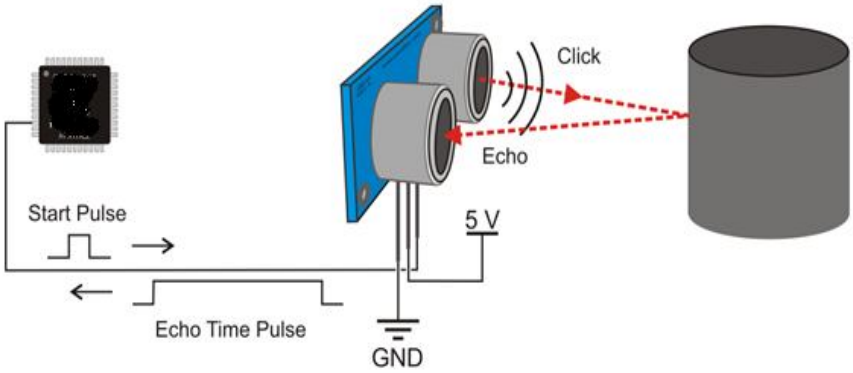

Fig.7

VI. CONCLUSION& FUTURE SCOPE

Nowadays, traffic congestion is a main problem in major cities since the traffic signal lights are programmed for particular time intervals. However, sometimes the demand for longer green light comes in at the one side of the junction due to huge traffic density. Thus, the traffic signal lights system is enhanced to generate traffic-light signals based on the traffic on roads at that particular instant. The advanced technologies and sensors have given the capability to build smart and intelligent embedded systems to solve human problems and facilitate the life style. Our system is capable of estimating traffic density using ultrasonic sensors placed on either side of the roads. Based on it, the time delay for the green light can be increased and we can reduce unnecessary waiting time. The whole system is controlled by Atmega328 & atmega8 microcontroller. The designed system is implemented, tested to ensure its performance and other design factors. future scope of thus system is to control traffic over cross way & also monitor speed of vehicle.

VII.ACKNOWLEDGEMENT

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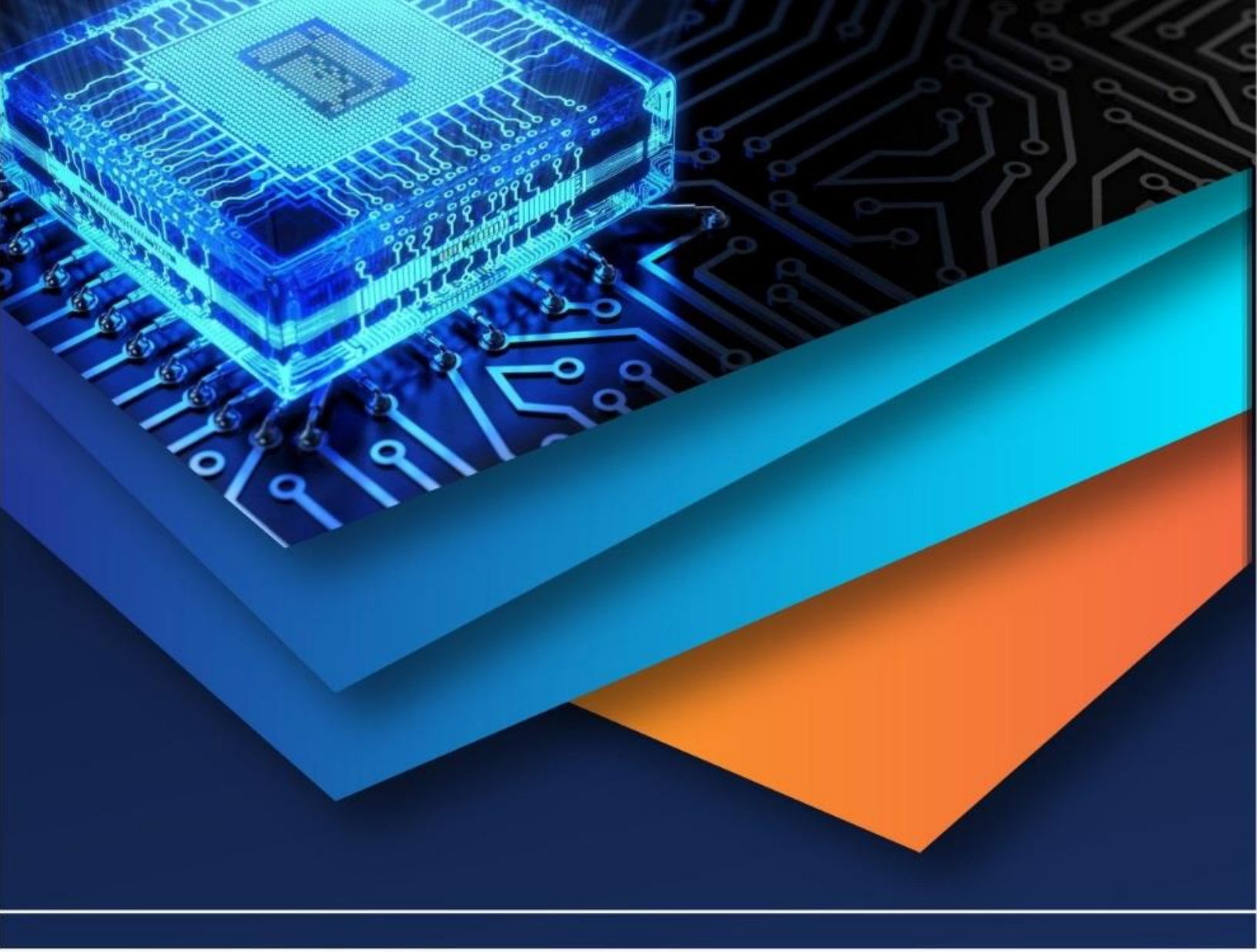

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