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Automatic Door Control System with Body Temperature Sensor

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Abstract: ***Conventional doors usually consist of key housing and a key saddle to open it in the current pandemic situation that has arisen due to covid-19, so every human being is required to take precautions such as wearing a mask , keeping a distance , washing hands , not touching anything if not unnecessary. Research method literature study, collection of supporting materials and tools, program Design and Realization, testing and Analysis of program Results, making final Report. The automatic door control system with a body temperature sensor is a prototype made to prevent spread of covid-19 by reducing direct physical contact this is spread through droplets attached to conventional doorknobs. Technology can be implemented in crowded areas such as shopping centers offices, restaurants that are placed in indoor areas that are not exposed to direct sunlight.***
Keywords: Arduino Uno 3, Infrared sensor, MLX90614 Temperature sensor, 16*2 LCD, Buzzer, L298N Motor driver, DC Motor, 12v Adapter, and LED.

I. INTRODUCTION

In today`s era, the development of science and technology plays and important role in human civilization. With the increase in knowledge, and technology that is mastered or applied, it is hoped that human can improve overall human welfare, although negative impact always appears along with human technological advance. Today`s technological developments can be seen that many tools have been created in order to provide convenience to the community in carrying out work. For example, to open and close a large door if done manually it will take lot of times and energy. In this case, a tool will be made that can be used to that the door can open and close itself automatically. Conventional doors usually consist of key housing and key saddle to open it. Generally, the door can be made more practical in the office. The door will automatically open if there is a stimulus (physical energy) that move it. Fore example, when someone wants to enter the room, the door will automatically open. Doors like this can be designed using automatic control using embedded system equipment such as microcontrollers. This automatic door system can be designed using automatic control combined with sensors and servo motors. In terms of input equipment, a PIR (Passive Infrared Receiver) sensor is used which can detect humans approaching the door, this PIR sensor will send a single to the Arduino process unit in which there is a microcontroller chip the microcontroller will send the processed data to the servo motor so that it can open closed the door automatically. In the current pandemic situation that has arisen due to COVIND 19, so every human being is required to pay precautions such as a wearing mask, keeping a distance, washing hand, not touching any think if not unnecessary. bit something like tables, door, vehicle, etc. we touch so tree is a possibility of spreading diseases. On campuses and offices, people meet so there is a possibility of spreading diseases by touching doors or other things that contain. this project is date on automation, where we will make an automatic door opening and closing mechanism.

II. LITERATURE REVIEWS

After reviewing the various research paper relevant to Coconut Peeling Machine, the conclusions are stipulated below.

1) *Swapnil kumbhar Kirti raj Patil [1]:* In this Research paper author says that the COVID-19 pandemic has pushed us to accept certain changes and has made us more vigilant. With no infection specific and evidence-based remedy available yet with all public places opening, prevention is only option we are left with. Sanitizers have become the most significant commodities right now. By the new rules and regulations given by WHO vigorous sanitization is needed to survive. The paper gave the solution for the problem stated. The paper introduces an automatic hand sanitizer and temperature sensing system, to keep the hand sanitized whenever a person wants to do it, without a contact with the sanitizing machine. The temperature sensor on touching gives the body temperature of the person. If the body temperature is normal, then the door is automatically opened else the door will remain closed.

2) *Apip supriana, Bayi Adi parkosa [2]:* The main objective of this research is to investigate the implementation of the IOT prototype that contributes to the movement to prevent COVID-19 transmission to support COVID-19 free programs among higher education institutions in Bogor with the implementation of the existing system. Several efforts were made, one of which was checking the body temperature when entering the room. for normal temperature will be allowed to enter and if fever is not allowed to enter. Body temperature measurement can also be done with conventional infrared thermometers that have been circulating in the community, but this infrared thermometer requires guards for its operation who will be at risk of contracting COVID-19. Then a body temperature measurement tool was built using the Arduino Mega2560 microcontroller and web assistance to minimize the spread of COVID-19 when entering the room. There are several methods including Analysis, Design, Implementation, Testing. This tool is designed to use the MLX90614-DCI sensor as a temperature sensor which will be displayed on the LCD if the temperature is normal then the relay will cut off electricity on the electromagnetic door so that the door lock will open and vice versa. The temperature that is read will be stored in the database and will appear on the web to monitor the temperature read by the body temperature measuring device. This tool has been tested for comparison with conventional infrared thermometers with a difference of 0.3oC so that it is feasible to use.
3) *Tonny Heng Yew Ling et.al. [3]:* Patient health monitoring is a common thing done by doctors to monitor their patients' health. The most crucial reading monitored by doctors is the patient's read time body temperature. Unfortunately, current system used by doctors required them to see patients face to face, and the doctors will have to walk door to door to check the patient's temperature. "The Non-Intrusive Human Body Temperature Acquisition and Measurement System" is a one-off health system to monitor the patient's temperature by using computer. The aim of developing this system is to provide body temperature measurement without being intrusive and uncomfortable. It also processes less threat to the doctor when testing patient's body temperature because diseases have chance to infect the doctor. This system is also convenient for patient measure body temperature. This is because it can be installed or mounted on the wall. By using this system, infrared temperature sensor plays an important role. The radiation of infrared temperature sensor determines temperature. It can be used at airports, schools and clinics to prevent disease from spreading disease. Another aim of this project is to measure body temperature accurately. When infrared temperature sensor detects the human body temperature, it will transmit the data to microcontroller. Microcontroller plays its roles to send data to the computer by using Zigbee. The user can get the results from the computer.
4) *B V arshini, HR Yogesh et.al. [4]:* COVID 19 pandemic is causing a global health epidemic. The most powerful safety tool is wearing a face mask in public places and everywhere else. The COVID 19 outbreak forced governments around the world to implement lockdowns to deter virus transmission. According to survey reports, wearing a face mask at public places reduces the risk of transmission significantly. In this paper, an IoT-enabled smart door that uses a machine learning model for monitoring body temperature and face mask detection. The proposed model can be used for any shopping mall, hotel, apartment entrance, etc. As an outcome a cost-effective and reliable method of using AI and sensors to build a healthy environment. Evaluation of the proposed framework is done by the Face Mask Detection algorithm using the TensorFlow software library. Besides, the body temperature of the individual is monitored using a non-contact temperature sensor. This proposed system can detect the users from COVID 19 by enabling the Internet of Things (IoT) technology.
5) *Wenhong Yu, et.al. [5]:* At present, COVID-19 is raging in many countries, which poses a great threat to people's life, health, social and economic development. Body temperature screening is very helpful for early detection of potential infected persons and blocking the spread of the epidemic. The paper mainly introduces the body temperature detection and data acquisition system and designs a system with the function of non-contact temperature measurement and automatic data collection system. This system is suitable for the company or school where the flow of people is large and the temperature needs to be measured quickly, and upload information in real time.
6) *Sumeeth Asnani et.al. [6]:* Amongst the various symptoms developed by humans infected with Coronavirus disease (COVID-19), rise in body temperature is the most preliminary symptom. As the corona virus is highly contagious, it is very important to avoid physical contact with an infected person in order to prevent the spread of this pandemic. Towards achieving this, entry into public places such as airports, railway stations, malls, schools and colleges, offices, etc. is allowed after scanning of body temperature manually through infra-red temperature guns. However, apart from being cumbersome and time consuming, this method of temperature scanning and manually regulating entry is unsafe too. Moreover, there is no record keeping and monitoring of any individual who is diagnosed with fever and can be a suspected COVID-19 virus carrier. As the virus is highly transmittable, it is thus imperative to automate the entry of people based on body temperature measurement. This paper covers designing and developing a system which would measure the body temperature and regulate the entry of people through a mechanized door which would be actuated for opening only if the person seeking entry does not have fever. The system would

also have a digital camera for capturing the Aadhar card/ID card details of any fever infected person at the entry point and these details can be transmitted to any designated email ID by a network video recorder, which would also be part of the system.

7) *Azmi, F., et.al. [7]:* Since the end of 2019, the spread of Corona Virus Disease (COVID-19) has always shown an increase from time to time, this is due to the rise of physical contact, both directly between humans and through contact with equipment or public facilities. Automated public facilities and early detection of humans who have the potential to spread disease are effective ways to prevent physical contact between the spreader and other humans. Body temperature is one indicator that shows how the human body is and its ability to generate or reduce heat in the body. Based on the information obtained, the normal human temperature is in the range of 36.5-37.20C, whereas if it is above that temperature a person can be said to have a fever, where fever is a symptom of COVID-19. However, the human body temperature is also relatively fluctuating depending on activities and environmental conditions. For this reason, a method that makes it easier to analyse body temperature based on grouping is used, namely the fuzzy logic method which is implemented into the Arduino Uno microcontroller as an automatic control tool

8) *MIA GALINA, et.al. [8]:* An automatic hand cleaning box is a device that can help the hand cleaning process be more efficient than conventional hand washing. The Covid 19 pandemic situation requires a device with a contactless system to reduce the spread of the virus. This research aims to develop an automatic hand sanitizer box that can read body temperature using MLX90614 temperature sensor combined with a solenoid door lock to keep someone who enters the room clean their hands and have a temperature below the limit. When entering the room, body temperature measurement is done by placing the visitor's hand on the left and right sides of the automatic hand sanitizer box, equipped with sensor MLX90614. This system works accurately and can read body temperature optimally from 1 cm - 3 cm, with the difference between the thermometer guns only ranging from -0.27%~-1.92%. Furthermore, the ADHC system is able to increase time efficiency by 83,15% if compared with the conventional method.

9) *Nur Hudha Wijaya, Zanella Oktavihandani,* et.al. [9]: Measuring body temperature depends on the type of thermometer and measured body area. A thermometer placed on the tympanic membrane is considered ideal because the tympanic membrane and hypothalamus have arterial blood supply originating from the carotid artery (neck). Therefore, it is considered directly close to the core temperature. The Tympani Thermometer with external storage can facilitate the doctor's performance in diagnosing patients. This tool is designed using the MLX90614 sensor as a passive infrared sensor that can receive infrared energy from the tympanic membrane. The study aims to design a tympani thermometer. It compared the measurement results of the designed tool with ear thermometers that have been calibrated to get the error value. Based on the results, this prototype works well and has an error of 0.7°C in the left ear and an error of 0.24°C in the right ear.

10) *Chan LekTan[12]Elizabeth K.Cooke[12]et.al. [10]:* Prolonged deviations in core body temperature outside a narrow range are incompatible with life, and consequently, body temperature is tightly regulated by a homeostatic system . In response to cold or warmth, the brain triggers an array of counter regulatory responses that defend body temperature against change. These responses include both autonomic effectors such as thermogenesis, vasodilation, and sweating, as well as behavioral mechanisms that trigger flexible, goal-oriented actions, such as warm- or cold-seeking, nest building, and putting on clothing. How the brain coordinates these diverse effector mechanisms in order to achieve body temperature stability is a longstanding and unresolved question. Classical models posited the existence of a central integrator in the brain that senses temperature signals, compares them to a set point, and then orchestrates the homeostatic response . In contrast, more recent theories propose that the brain has no central integrator for body temperature; instead, thermoregulatory effectors are thought to be regulated independently, giving the appearance of coordinated action without the existence of a controller . Discriminating between these models has fundamental implications for our understanding of how the brain gives rise to homeostasis, yet at present these ideas remain speculative due to the lack of information about the underlying neural substrates. Progress toward addressing these questions will require a deeper understanding of the cells and circuits that mediate thermoregulation.

11) *Hemlata Panwar, Raksha, Gajendra Singh Sherawat, et.al. [11]:* Nowadays, everyone prefers thermal screening test to protect against corona, whenever you go inside the mall, multiplex, supermarkets, railway stations, airports, and various other places before granting access to the visitors. You need a human for that thermal screening test at the entrance, then this automatic door will not require that person, it will automatically go to thermal screening whenever, In this every human will have to bring his/her hand forward and put it in front of the sensor, then there will be display a temperature on the screen, then it will show the temperature under controlled or not. The MLX90614 is a high- performance Infrared Temperature Sensor that can be used to automatically make a temperature check-up and decide whether to grant the door access. The body temperature is under

controlled when the door will open automatically it shows green light and the door will not open when the body temperature is out of range it shows red light. Keywords- Infrared Temperature Sensor

12) *HongXiang Kou, YiQiang Zhao Kang Ren et.al. [12]:* The body temperature of cattle varies regularly with both the reproductive cycle and disease status. Establishing an automatic method for monitoring body temperature may facilitate better management of reproduction and disease control in cattle. Here, we developed an Automatic Measurement System for Cattle's Surface Temperature (AMSCST) to measure the temperature of metatarsus by attaching a special shell designed to fit the anatomy of cattle's hind leg. Using AMSCST, the surface temperature (ST) on the metatarsus of the hind leg was successively measured for 24 hours a day with an interval of one hour in three tested seasons. Based on ST and rectal temperature (RT) detected by AMSCST and mercury thermometer, respectively, a linear mixed model was established, regarding both the time point and seasonal factors as the fixed effects. Unary linear correlation and Bland-Altman analysis results indicated that the temperatures measured by AMSCST were closely correlated to those measured by mercury thermometer (R^2 = 0.998), suggesting that the AMSCST is an accurate and reliable way to detect cattle's body temperature. Statistical analysis showed that the differences of STs among the three seasons, or among the different time points were significant (P<0.05), and the differences of RTs among the different time points were similarly significant (P<0.05). The prediction accuracy of the mixed model was verified by 10-fold cross validation. The average difference between measured RT and predicted RT was about 0.10 ± 0.10°C with the association coefficient of 0.644, indicating the feasibility of this model in measuring cattle body temperature. Therefore, an automated technology for accurately measuring cattle body temperature was accomplished by inventing an optimal device and establishing the AMSCST system.

13) *Abhishek Dewangan et.al. [13]:* The idea of the proposed system i.e. "Automated Door Lock and Sanitiser Dispenser System for Covid 19" has risen keeping in mind the current unavoidable issue faced by the world i.e. Covid 19. As Covid 19 variant is becoming precarious day by day so, this calls for certain emergent and effective ways to be espoused to control the spread of the virus. Fever is a common symptom of Covid19, it is one of the ways our body tries to fight off infection, and fever can be detected by detection of body temperature. All of us are familiar with the method that's being adopted in public places like Malls, Airports, etc, that's the method of measuring temperature to detect if the person is infected with this virus (Coronavirus) and consequently preventing the spreading of this virus. A person with a body temperature of 100.6-degree Fahrenheit is a Coronavirus-infected patient. This temperature is two notches above the normal or standard body temperature i.e., 98.6-degree Fahrenheit. Health and hygiene go hand in hand and good health requires fine hygiene methodologies.

14) *Trung Thien Pham et.al. [14]:* This paper researched about the solution of designing the public disinfection chamber which helps us prevent SARS-CoV-2 epidemic. The disinfection chamber can provide automatic hand sanitizer, body temperature measurement system, and display the result of body temperature on the screen. Moreover, it can warn with excessive body temperature, 3600 automatic disinfection spraying system with silver nano antiseptic solution. The result of the study is acceptable and highly applicable in community, improving the capability of preventing SARSCoV-2 epidemic.

15) *Aman Saini et.al. [15]:* The COVID-19 pandemic also known as the Corona Virus worldwide epidemic is contemplate as the transcendent critical global health disaster in the world. Pneumonia, acute respiratory syndrome, and even death is the severity of this virus. We are living in a situation where Covid infection cases can be increased unexpectedly anytime if we do not follow the advisory of World Health organization (WHO). Most people who are infected with the virus has experienced mild to moderate fever. This virus spread rapidly in public places such as hospitals, metro station, railway station, malls etc. In such crowded areas, the chances of virus spread is high and we can prevent this by social distancing and measuring the temperature of every individual without using human interference. In our idea we have introduced a fully automatic temperature detection system which would energized by piezoelectric generator. We have also implemented an automatic door opening system in which the door of a particular place will remain closed if temperature is above the pre-set value. The opening and closing of door is done through the piezoelectric generated power.

16) *Hanifudin Sukri et.al. [16]:* The world is currently being hit by the COVID-19 virus. In this New Normal era, a rule is enforced that everyone must wear a mask wherever we are. Checking masks and body temperature is still done manually or by human observation, thus allowing for inaccuracies in observing and checking temperature. The problem occurred at Trunojoyo Madura University which still uses a manual mask and body temperature checking system. So, for accuracy and to reduce the risk of contracting officers. A tool was created to detect the mask and temperature automatically. In this study using a camera, temperature sensor MLX90614, and proximity sensor using Raspberry Pi. This research uses a machine learning system with the Deep Learning Convolutional Neural Network (CNN) Single Shot Detector (SSD) method. From this study, the results of mask detection obtained a success percentage of 93.4% and an error percentage of 6.6% from the entire test and obtained an

average detection time of 2.63 seconds. And the average time of the whole system is 3.8 seconds. In this study, there was a delay during detection due to the heavy computational load on the system, so for further research, use a mini pc that has better performance.

17) *Zanella Oktavihandani*, et.al. [17]: Measuring body temperature depends on the type of thermometer and measured body area. A thermometer placed on the tympanic membrane is considered ideal because the tympanic membrane and hypothalamus have arterial blood supply originating from the carotid artery (neck). Therefore, it is considered directly close to the core temperature. The Tympani Thermometer with external storage can facilitate the doctor's performance in diagnosing patients. This tool is designed using the MLX90614 sensor as a passive infrared sensor that can receive infrared energy from the tympanic membrane. The study aims to design a tympani thermometer. It compared the measurement results of the designed tool with ear thermometers that have been calibrated to get the error value. Based on the results, this prototype works well and has an error of 0.7°C in the left ear and an error of 0.24°C in the right ear.
18) *Kirti raj Patil [1]:* In this Research paper author says that the COVID-19 pandemic has pushed us to accept certain changes and has made us more vigilant. With no infection specific and evidence-based remedy available yet with all public places opening, prevention is only option we are left with. Sanitizers have become the most significant commodities right now. By the new rules and regulations given by WHO vigorous sanitization is needed to survive. The paper gave the solution for the problem stated.
19) *Okuzu Daniel I. et.al. [19]:* People are still dying every day, of covid-19. As of April 1, 2021, approximately 3 million deaths had been traced to COVID-19 globally, with over 2,000 deaths from Nigeria. These deaths are increasing, every hour, as a result of a continuous transmission of the virus among people, and also due to the violations of the covid-19 preventive measures, recommended by the World Health Organisation. However, to save humanity from this novel virus and also to prevent transmission of other future viruses, hence led to the purpose of this paper. This paper introduces an artificial intelligence door as a solution to covid-19 transmission in public buildings. It establishes how 3D sensor, facemask detection camera, infrared thermometer, and sanitizer dispenser will prevent human crowd, reduce violation of facemask rules, identify covid-19 suspects, and ensure hand sanitization respectively, when integrated in a door. The priority of this design is to save mankind.
20) *Tsu-Tian Lee et.al. [20]:* The current populace of the elderly is apparently abandoned by the younger generations due to their individual circumstances. To heighten the vitality and strengthen the fitness of elders, assisting a home care system can be an admittance that provides comprehensive nursing and monitoring them in the regular interim. To deliver an interactive service supervision platform to the elders a smart environment of various sensors are clubbed together to establish an intuitive platform that can control the home appliances and gadgets within the living space of elders. The proposed system used voice and gesture (MPU6050 accelerometer) to control the home appliances like turning on/off the light, closing/opening of curtains, TV, and fan or AC within the living spaces. The system also monitors the real-time activity like heart rate and body temperature for the elderly citizens. In the case of emergency, for instance, anomalous behaviors like heart stroke occurs, the proposed system set-up triggers an alarm and the emergency bulb will be strikes "on" to alert their kin. This smart environment can set the temperature and help control the living parameters based on the users' comfort and their health conditions. The whole design is to provide modest support systems for the elder to live healthily and safely in an independent living environment.
21) *Singh Sherawat et.al. [21]:* The COVID 19 outbreak forced governments around the world to implement lockdowns to deter virus transmission. According to survey reports, wearing a face mask at public places reduces the risk of transmission significantly. In this paper, an IoT-enabled smart door that uses a machine learning model for monitoring body temperature and face mask detection. The proposed model can be used for any shopping mall, hotel, apartment entrance, etc. As an outcome a cost-effective and reliable method of using AI and sensors to build a healthy environment. Evaluation of the proposed framework is done by the Face Mask Detection algorithm using the TensorFlow software library. Besides, the body temperature of the individual is monitored using a non-contact temperature sensor. This proposed system can detect the users from COVID 19 by enabling the Internet of Things (IoT) technology.
22) *Sumeeth Asnani et.al. [22]:* Amongst the various symptoms developed by humans infected with Coronavirus disease (COVID-19), rise in body temperature is the most preliminary symptom. As the corona virus is highly contagious, it is very important to avoid physical contact with an infected person in order to prevent the spread of this pandemic. Towards achieving this, entry into public places such as airports, railway stations, malls, schools and colleges, offices, etc. is allowed after scanning of body temperature manually through infra-red temperature guns. However, apart from being cumbersome and time consuming, this method of temperature scanning and manually regulating entry is unsafe too. Moreover, there is no record keeping and

monitoring of any individual who is diagnosed with fever and can be a suspected COVID-19 virus carrier. As the virus is highly transmittable, it is thus imperative to automate the entry of people based on body temperature measurement. This paper covers designing and developing a system which would measure the body temperature and regulate the entry of people through a mechanized door which would be actuated for opening only if the person seeking entry does not have fever. The system would also have a digital camera for capturing the Aadhar card/ID card details of any fever infected person at the entry point and these details can be transmitted to any designated email ID by a network video recorder, which would also be part of the system.

23) *Gopas Pasaribu. [23]:* In this research paper author says that to made Since the end of 2019, the spread of Corona Virus Disease (COVID-19) has always shown an increase from time to time, this is due to the rise of physical contact, both directly between humans and through contact with equipment or public facilities. Automated public facilities and early detection of humans who have the potential to spread disease are effective ways to prevent physical contact between the spreader and other humans. Body temperature is one indicator that shows how the human body is and its ability to generate or reduce heat in the body. Based on the information obtained, the normal human temperature is in the range of 36.5-37.20C, whereas if it is above that temperature a person can be said to have a fever, where fever is a symptom of COVID-19. However, the human body temperature is also relatively fluctuating depending on activities and environmental conditions. For this reason, a method that makes it easier to analyze body temperature based on grouping is used, namely the fuzzy logic method which is implemented into the Arduino Uno microcontroller as an automatic control tool

24) *Mohamed Aasif et.al. [24]:* With an aggregate of 74, 390 COVID-19 affirmed cases in the Philippines [13], the nation keeps on executing more tight careful steps particularly with the re-opening of business and government foundations in regions under General Community Quarantine. This paper proposes a programmed social removing entryway and internal heat level recognition sensor that utilizes infrared, ultrasonic, and infrared thermometer sensors to augment productivity and limit cost. The ultrasonic and infrared sensors are combined with a speaker to screen and keep up the social separating of individuals entering the door. A programmed non-contact, internal heat level is introduced toward the finish of the passageway to check the temperature of people before at long last entering the area. A bell alerts when the recognized internal heat level is above typical to flag the door faculty for guaranteed activity. Arduino Uno runs the sensors, speaker and signal.

25) *G. Sujaykumar et.al. [25]:* The classification of COVID-19 as global pandemic has led researchers and scientists to design solutions in order to reduce the fast spreading of the virus. This paper presents a novel detection and control system that utilizes Computer Vision based video analytics to help in reducing the speed of the spreading of the virus by recognizing people and detecting masks. The system uses the body temperature and other user biometrics to give access to a particular environement. The proposed system is able to identify a person who wants to access an environment and tracks his movement. The system can also control the door of the main entrance, the elevator, or any access zone, and generate audio notifications to alert user(s) to put their mask(s). The implementation results show that the proposed system has the advantages of a high sensitivity of 98.8% for front faces and 90.3% for turned faces, and ensure a safe environment while preserving the benefits of being modular and low cost.

III. CONCLUSION

The automatic door control system with body temperature sensor has been completed. The design of this prototype uses an arduino microcontroller using the C programming language. The accuracy of the MLX90614 temperature sensor compared to a thermogun is 95%, so that the sensor can be used as a body temperature measuring device. The test results on the prototype prove that all systems and components of the automatic door control system with body temperature sensors can work with a percentage level of 100%. Therefore, an automatic door control system with a body temperature sensor can be implemented in crowded areas such as shopping areas, offices, restaurants that are placed in indoor areas or indoor areas that are not exposed to direct sunlight. In this study has shown significant results The accuracy of the MLX90614 temperature sensor compared to a thermogun is 95%.

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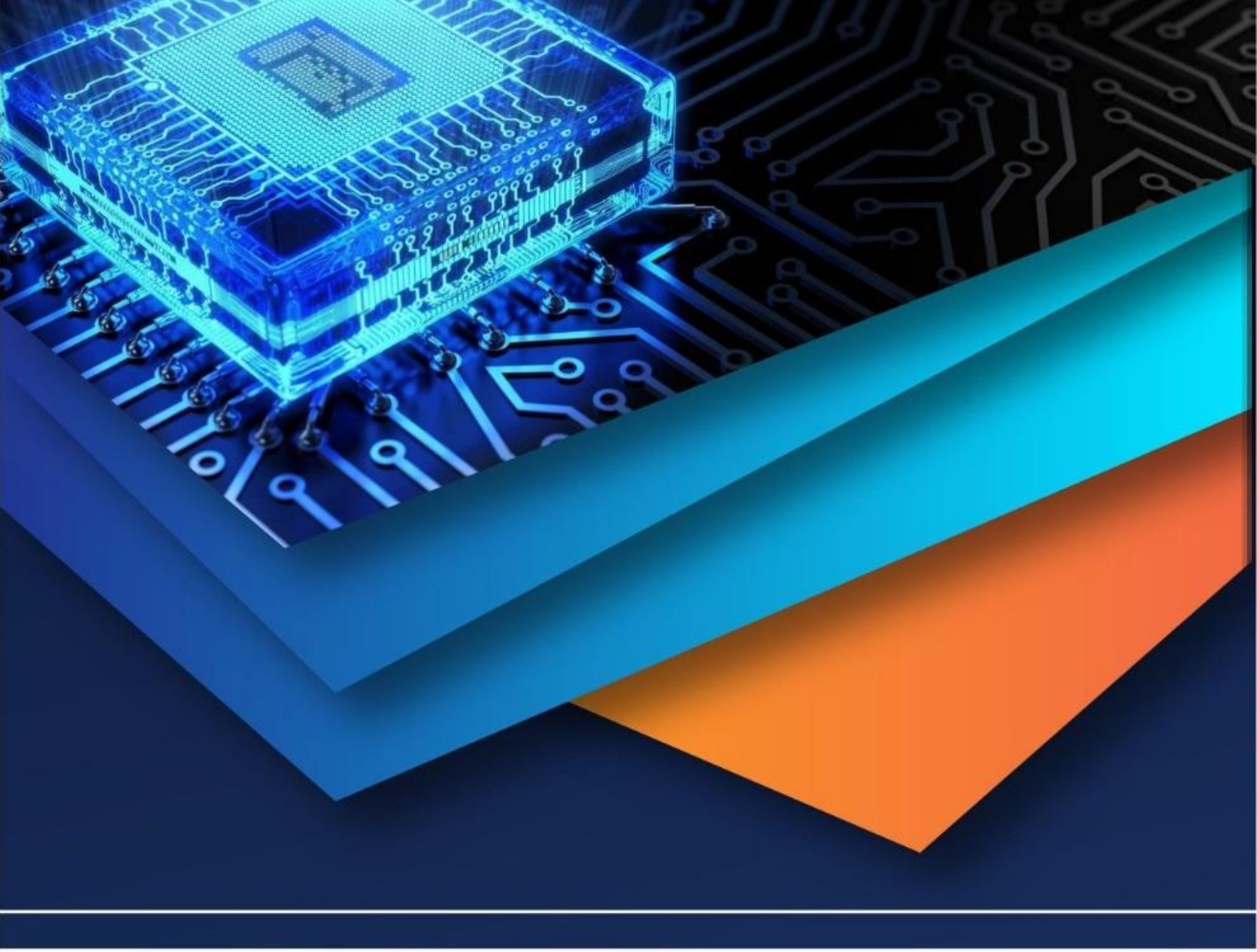

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