iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** III **Month of publication:** March 2021

DOI: https://doi.org/10.22214/ijraset.2021.33425

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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 III Mar 2021- Available at www.ijraset.com

IoT based Cattle Feed and Health Monitoring System

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Abstract: ***Diseases are the causes of the decrease dairy cow productivity to produce milk The difficulty of early detection and handling of cows that are affected by disease is caused by monitoring the condition of cows that aren't administered at any time, also as limited knowledge of Breeders about the disease. This study aims to develop a dairy cattle health management system, from health monitoring until the detection and handling of cows that are suffering from the disease. The monitoring system processes the temperature and pulse data of cows from the sensor, then gives results of a cow's health condition, normal or abnormal. Experiments shows that the monitoring system can monitor health conditions in dairy cows supported temperature and pulse with a mistake rate of 0.6 degrees Celsius and three .5 Beats per minute. Experiments on the detection system shows that the detection system can diagnose diseases in dairy cows supported physical symptoms with an accuracy rate of 90 percent.***

I. INTRODUCTION

The quality of national food consumption. One of them can be proven by the increase in protein consumption. As protein consumption increases, the demand for milk as a source of protein also increases. The high imports of milk from abroad have resulted in direct losses on dairy farms in Indonesia. This condition is caused by the low productivity of dairy farming to produce milk. Health in dairy cows is one of the factors that affect productivity. Dairy cows that are affected by a disease cannot produce milk optimally. For example, decreasing milk production due to mastitis ranges from 14.6 percent to 19 percent per day or two liters per head per day. To maintain the health of dairy cows, they are well maintained, Breeders need to carry out good maintenance management. One of them is the process of checking conditions in cattle and handling of dairy cows that are attacked by disease. But according to, at present, maintenance management, especially in controlling and handling diseases, is still one of the problems faced by livestock The difficulty of early prevention and treatment of diseases can be caused by several factors, one of which is the process of checking the condition of cattle that are not carried out at any time. In general, Breeders check the condition of livestock three times, in the morning, afternoon and night. This happens because the checking process is done conventionally using human power, so it is difficult to be examined continuously. Checking the condition of dairy cows in the conventional way is not efficient when applied to middle and upper scale farms that have many dairy cows. The checking process that is not carried out at any time has an impact on the difficulty of early detection of dairy cows affected by the disease, if the early detection process is difficult, then the treatment of dairy cows affected by the disease will also be difficult. In addition, another factor that causes difficulties in early prevention and treatment of diseases is the lack of knowledge of Breeders about the identification of diseases that attack their dairy cows; this has an impact on the slow treatment of dairy cows affected by the disease. Several studies have been conducted related to health monitoring and early detection of diseases in diary cows.

II. RELATED WORK

Yixing chen, Maher Elshakankiri proposed implementation of an IOT based pet care system applying several sensors and actuators on three devices (food feeder, water dispenser and litter box). The food feeder subsystem contains functions such as instant and remote food dispensing and food consumption monitoring. The water Dispenser can monitor water consumption. The litter box records the frequency and timing of the pet goes to the toilet. The combination of three subsystems, we use an interface in a smartphone to control and monitor the devices as well as display the statistical records. The main drawback of the system was Less indication.

Varun Mhatre, Vishwesh Vispute, Nitin Mishra proposed IoT based health monitoring system for dairy cows this system capture and monitors parameters namely body temperature, relative, humidity, heartratrumination rate of a cow at regular intervals based upon which the prediction of milk yield is feasible . Finally, the parameters captured are going to be transmitted through NodeMCU to a web platform named Thing represent processing and health analysis. Health parameters of a cow can be tracked every minute utilizing the system proposed in this paper.

Thus, abrupt transmutations in the milk yield can specifically be noted and any abnormality in the health parameters namely body temperature, relative humidity, heart rate, and rumination rate can be distinguish. The main drawback of the system was is used to monitor only one cow.

Tannopangvanloy, Kingkarn Sookhanaphibarn proposed automatic pet food dispenser by using Internet of Things (IoT). This system we developed a feeder to help allocate dry food diet to small pets such as dogs and cats. It will be very useful for a pets owner is outside the residence or unable to feed his/her pets normal. When the free feeding is happened, it'll cause the obesity of pets. This machine will be used for monitor pet's eating habits to train the pets for scheduled meals. This pet-food feeding machine is the solution to the problem and helps taking care of their pets more conveniently. Using this machine will be different from normal way in case that the owners feed their pets by themselves, with more accurate feeding on time as we set, could be controlled from distance which normal way could not archive. The main drawback of the system was sometimes there is a risk of free feeding.

Ceichen proposed dairy cow health monitoring system based on NB-IoT communication. This work uses the latest NB-IoT narrow-band communication means, covers a wider range, power consumption and cost are significantly reduced compared with similar products in the market. At the same time, the system is committed to achieving the lowest power consumption in terms of microprocessor selection, sensor selection, algorithm design, etc. The system also creatively improves the detection rate of estrus detection and reduces the rate of false detection through the monitoring of cow body temperature and image recognition of cow behavior as an auxiliary method. The main draw back of the system was need bulky transmitting relay.

Faruq' Iwan Syarif, Ahmad Syauqi Ahsan proposed health monitoring and early diseases detection on dairy cow based on Internet of Things and Intelligent System. This system developed a new system for dairy cow health management, from health monitoring until the detection and treatment of cows affected by disease. We combine monitoring systems and intelligent systems into one application utilizing internet of things technology and intelligent systems. With internet of things technology, Breeders can use a monitoring system to monitor the health condition of dairy cows at a long distance, Breeders will be notified when there are cows that are not normal, so Breeders can immediately check the cows. To identify abnormal cows, Breeders can use an intelligent system, so that Breeders will immediately know the estimated diagnosis of the disease in the cow. That way Breeders can handle early cows that are attacked by disease.

J. Dharanidharan, R. Puviarasi proposed simulation of automatic food feeding system for pet animals. This specific research paper is about the plan and manufacture of a "Programmed Fish Feeder System utilizing Arduino Uno" which discovers its application in the aquarium. This gadget will administer angle nourishment at certain time interim with exact measure of sustenance. Additionally the planning can be modified to guarantee that the nourishing timetable is steady. The programmed angle feeder is an answer for guarantee that the pet fishes are nourished in solid route and on plan. The model executes the joining of equipment and programming to control the fish nourishing operation. The controller utilized for this gadget is Arduino Uno microcontroller board. The controller controls the nourishing component of the framework.

Ji-Yong Jung, Chul-Min Ji, Joo-Rak Sohn proposed a remote pet feeder control system via MQTT protocol. In this system Users can use an Android mobile phone to send MQTT publish message to a MQTT server through our APP. MQTT is an ISO standard publish- subscribe-based messaging protocol. It is a quite lightweight transfer protocol specially designed for the Internet of Things (IoT). In the proposed scheme, an open source implementation, Eclipse Mosquito, is installed on a microcomputer (Raspberry Pi) that is regarded as a MQTT server. When the server receives the message, it analyzes the instruction and uses the PINs of the Raspberry Pi to send the GPIO control signals. Here, we can control two DC motors, a servo motor, and a submerged motor. The main draw back of the system was high cost and difficult to understand.

Bhisham Sharma, Deepika Koundal proposed cattle health monitoring system using wireless sensor network. This study document various wireless sensor network based automatic health monitoring systems for monitoring various diseases of dairy cow . The main objective of based intelligent monitoring systems in farm automation is to monitor the health dairy cattle. This monitoring system must be installed in local and remote locations of farms which can assist the concerned farmers in monitoring their cattle activities from diverse locations for the whole day. All collected factors from the automated system are getting to be stored during a database. With the assistance of farm automation, farmers retrieve information for the execution of correct farm control strategy. the most drawback of the system was failure in noticing development.

Qi Li, Zhanghua Liu, Junsheng Xiao proposed a knowledge collection collar for vital Signs of cows on the grassland supported LoRa. during this paper, Lora technology is applied to the wisdom of farming , the use of GPS locators to capture grassland cattle trajectory; the use of accelerometers to collect grassland cattle grazing data, health data. It solves the matter of manual collection and observation which consumes plenty of manpower and material resources.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
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III. PROPOSED SYSTEM

Health monitoring of dairy cow plays an important role for increasing the dairy products supply worldwide. Nowadays farmers are showing less interest in dairy sector as animals are affected by various ailing health issues, unpredictable killing diseases, and advanced breeding costs. The aim of this proposal is to design an efficient system to monitor the health condition of the cattle to prevent attack of varies diseases. This innovation is designed by using Internet of Things and embedded system. The model consist of IOT cloud/devices, Arduino/Rasberry pi modules, high resolution cameras heartbeat sensors, temperature sensor, buzzer etc. This innovation is designed in such a way that if the cattle looks dull and if there is any variation in the activities of the cattle the camera will monitor all the activities and will automatically be updated in the IOT cloud. These sensors will continuously monitor the temperature and heartbeat rate, if these values exceed the threshold value alert system will be enabled through buzzers. The availability and intake of food is also monitor by the weight sensor. These devices are connected to the Wi-Fi and the information will be transmitted to the user with the help of internet of things.

A. Block Diagram

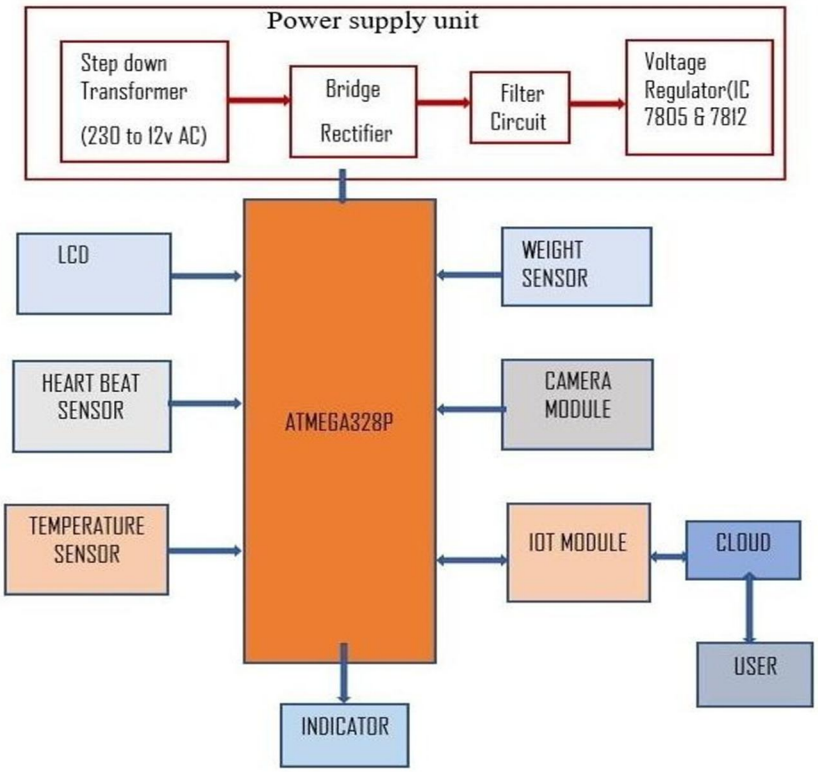

Figure 1 Block Diagram of Proposed System

Power supply for this system we use 6v battery because all the electronics components need various voltage and current values hence we use regulators to regulate the voltage values. Temperature sensor here we used to measure the temperature range because in case the temperature range gets increase in nearby surrounding atmosphere. Heart beat sensor using KG011 to sense the heart rate of cattle. The standard heart rate of cattle is 48 to 84 bits per minute. Weight sensor here we used load cell to determine the actual weight of cattle and compared with the normal approximation. Atmega328p microcontroller here we used because its easy to access open source software and also reference are available more on online. As a Indicators we used LED and Buzzer electronics components to intimate to user the status of every cattle is added here. we used LCD to intimate status about sensors and name of the project and function also displayed step by step. Camera module here we used to monitor the status and identify the current activities by viewer. Finally IoT module nodemcu which used to control the whole setup (heartbeat, temperature, weight monitoring) through mobile and update the status of camera module.

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IV. HARDWARE DESCRIPTION

A. ATMEGA 328P

ATMEGA328 is employed the same as the other controller. All there to try and do is programming. Controller merely executes the program provided by US at any instant. ATmega328P is employed in Arduino Uno and Arduino nano boards, you'll be able to directly replace the arduino board with ATmega328 chip. For that 1st you wish to put in the Arduino boot loader into the chip (Or you'll be able to conjointly get a chip with boot loader – ATMega328P-PU). This IC with boot loader will be placed on Arduino Uno board and burn the program into it. Once Arduino program is burnt into the IC, it will be removed and employed in place of Arduino board, in conjunction with a quartz oscillator and alternative parts for the project.

Figure 2 ATMEGA 328P

B. Temperature Sensor

LM35 may be a precision IC temperature sensor with its output proportional to the temperature (in 0C). The sensor circuit is sealed and thus it's not subjected to oxidation and other processes. With LM35, temperature are often measured more accurately than with thermistor. It also possess low self heating and doesn't cause 0.1 0C temperature.

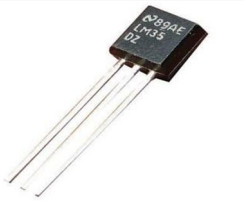


Figure 3 Temperature sensor

C. Heart Beat Sensor

Heartbeat Sensor is a device that's wont to measure the guts rate. speed of the heartbeat. Monitoring body temperature, pulse and sign are the essential things that we neutralize order to remain us healthy. The heart rate sensor measures your pulse in Beats per Minute using an optical LED light and an LED light sensor. the sunshine shines through your skin, and thus the sensor measures the number of sunshine that reflects back. the sunshine reflections will vary as blood pulses under your skin past the sunshine.

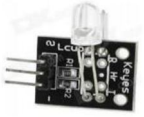


Figure4 Heart beat sensor

D. Liquid Crystal Display

LCD screen is an electronic display module and wide range of applications. A LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments multi segment LEDs. LCDs are easily programmable haven't any limitation of displaying special characters. A LCD means it can display 16 characters per line and there are 2 such lines. This LCD each character is display in pixel matrix. This LCD has two registers, Command and Data. The command register stores the command instructions to the LCD.

Figure 6 Liquid Crystal Display

E. Camera Module

The ESP32-CAM features a very competitive small-size camera module which will operate independently as a minimum system with a footprint of only 27*40.5*4.5mm. ESP- 32CAM are often widely utilized in various IoT applications. it is suitable for home smart devices, industrial wireless control, and other IoT applications. It is a perfect solution for IoT applications.ESP-32CAM adopts DIP package and may be directly inserted into the backplane to understand rapid production of products, providing customers with high- reliability connection mode, which is convenient for application in varies IOT hardware terminals.

Figure 7 ESP32 Camera Module

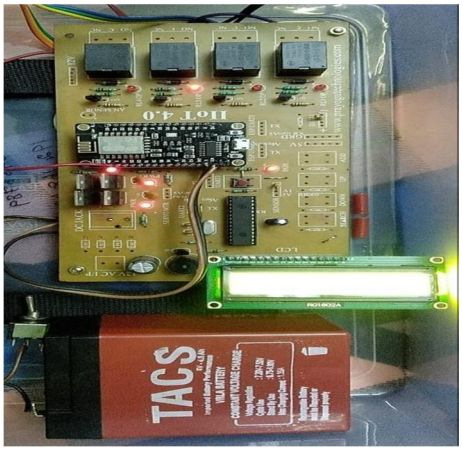
V. SOFTWARE DESCRIPTION

A. Proteus

Proteus could also be the simplest simulation software for various designs with microcontroller. It is mainly popular thanks to availability of almost all microcontrollers in it. So it is a handy tool to see programs and embedded designs for electronics hobbyist. You will simulate your programming of microcontroller in Proteus Simulation Software. After Simulating your circuit in Proteus Software you'll directly make PCB design. the aim of this tutorial is to means you ways to conduct an interactive simulation with a microcontroller using Proteus VSM. the strain are getting to get on practical usage of the simulator and IDE, with more detailed coverage of each topic being available within the reference manuals. This tutorial doesn't cover schematic entry; if you are not familiar with drawing in ISIS then you need to take the time to work through the tutorial content within the ISIS manual starting from the basics of driving the simulation from the VSM Studio IDE we'll then inspect variety of the numerous debugging and measurement tools.

VI. RESULTS AND CONCLUSION

The output of the proposed system is shown in Fig 8.



When the power is ON, the power supply from the power module sents to the all the types of sensors to senses the various body changes. Heart Beat sensors senses the normal heart rate of the Cattle, Temperature sensor senses the body temperature of the cattle. If there is any variations in the normal body conditions of the Diary farms the buzzer in this device indicates to the person and the regular body conditions and movements of cattle will be monitored with the help of IoT which produces the continuous monitoring of cattle.

VII. CONCLUSION

Health management in dairy cows especially in handling and preventing diseases is difficult for Breeders, this is because Breeders cannot monitor the condition of cows at any time, so Breeders are late toknow if there are cows that are affected by the disease. This research develops a new system for health management in dairy cows, health monitoring to the detection and treatment of cows affected by disease. With internet of things technology, Breeders can use a monitoring system to monitor the health condition of dairy cows at a long distance. Breeders will be notified when there are cows that are not normal, so Breeders can immediately check the cows. The node successfully measures the temperature and heart rate values in the cow then sends it to the gateway and passes it to the server to be displayed on the frontend. The temperature sensor and heart rate sensor in the node can measure the temperature and heart rate properly with a difference in temperature is 0.6 degrees Celsius and a heart rate of 3.5 beats per minute. So that the monitoring system can be used by Breeders to monitor the health condition of cows based on temperature and heart rate.

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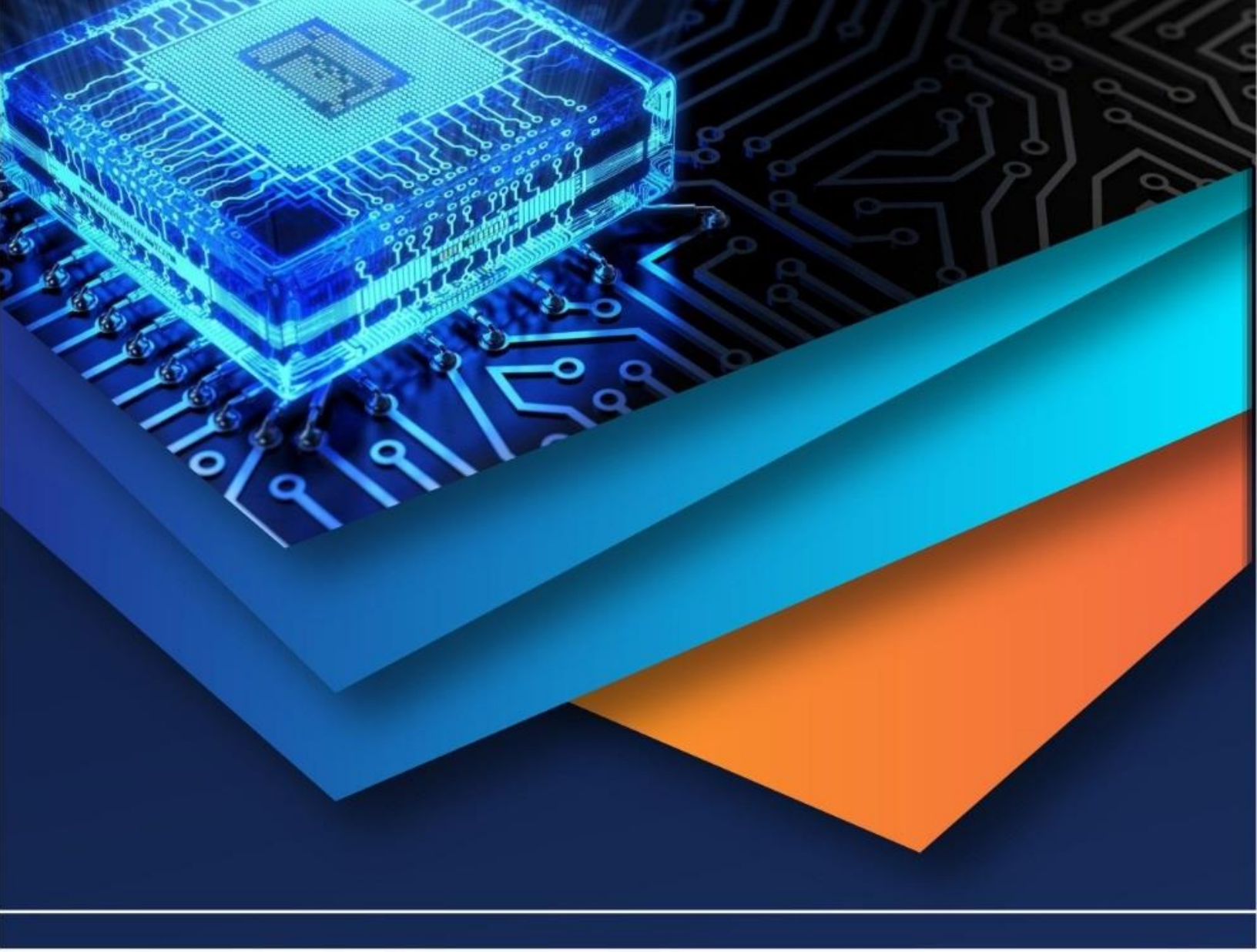
Heating and does not cause more than 0.1 oC temperature rise in still air.



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