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Posture Analysis and Behavioural Recognition of a Child using IOT

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Abstract: ***Now a day's most of the families are well busy families. Thus a most important task faced by parents in the present day is child protection. Finding the problem at initial level will be finest approach to stay away from various risks affected by it. The child under observation cannot all the time stay in surrounding area of caretaker. It has brought on the design and production of several remote control gadgets manufactured for kids. Thus, system includes the idea of monitoring babies & infants. The system shows three different actions. In case of unsafe situation such as fire around baby is alerted via alarm through buzzer. The system consists of microcontroller, LCD display, MEMS sensor, Temperature sensor, and Node MCU.***
Keywords: Arduinno UNO microcontroller, ADXL sensor, Node MCU board, temperature sensor, LCD display, Buzzer, Doll.

I. INTRODUCTION

"Child-protection" is one of main task for parents. Particularly for babies, who require regular alert monitoring. Falls, sudden baby Death disorder, choking/blocking airflow & CCHD are few troubles may caused to kids therefore it need instant notice to the caretaker. The caretaker sometimes busy in different works in different areas inside the building. And also this isn't desirable for kids to be leaved unnoticed for long period of time, so regular observation scheme has became essential for protecting the infant. The proposed system includes accelerometer sensor to monitor the physical activities of a baby, such as sitting, walking, standing, crawling, rolling and climbing. Accelerometers will be fixed at different places such as shoulder, leg, hand etc. The sensors value is read for different postures and sent to android application and obtained pie chart for different movements so that at earlier stage the problem can be notified. In case of emergency or risky situation such as fire around baby is alerted via alarm through buzzer, temperature is monitored via LM35 temperature sensor, the wireless contact between system and Mobile phone or PC is via Internet of Things. The accelerometer sensor, NodeMCU, LCD, buzzer and temperature sensor are interfaced to Arduino UNO microcontroller.

II. FUNCTIONAL BLOCK DIAGRAM AND DECRIPTION

The figure 1 depicts the block diagram of Posture analysis and Behavioral recognition of a child system. The components description and detailed working of a system is given below.

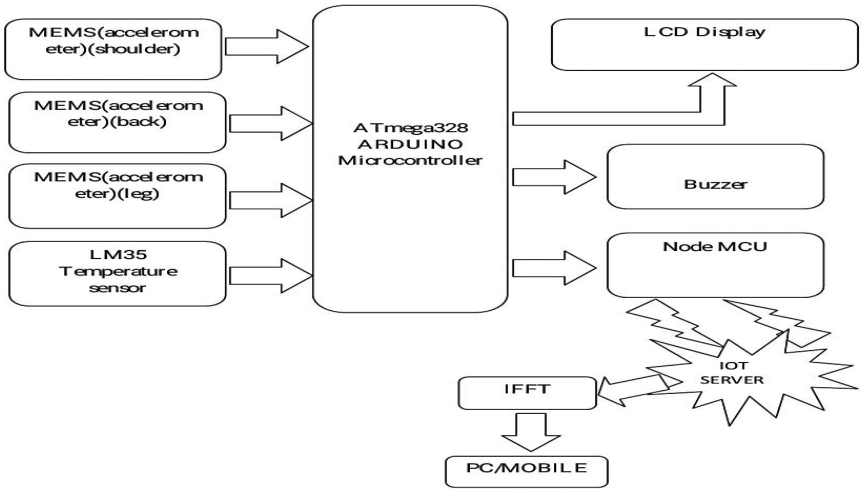


Fig 1: Functional block diagram

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A. Components required

The Components required for "Posture analysis and Behavioral recognition of a child using IOT" system are given below.

1) *Arduino UNO Board:* The Arduino is a µC board set up on ATmega-328P. It contains 014 digital-pins & 06 analog-pins, USB associations, power jacker, IS-PC header & resets.
2) *ADXL335 Sensor:* The ADXL335 be an entirely 3-axis acceleration dimension structure. It has a capacity scale of ±3 g minimum. It consist a "poly silicon" plane micro-machine detector and signal modifying structure to execute open-loop acceleration ability structural design.
3) *LM35 Temperature Sensor:* Temperature sensor is commonly known as LM35 sensor that gives output as an analog-signal, and it is proportionate to the instant temperature. Effortlessly, the voltage at output can be constructed to attain reading of temperature in degree-Celsius. The benefit of LM35 compared to thermistor is it need not require any calibration externally.
4) *Node MCU (ESP8266):* The Node Microcontroller Unit commonly known as NodeMCU is an open source software & hardware advance kit which is constructed around much less expensive "system-on-chip" known as ESP8266. The ESP8266 itself is an autonomous Wi-Fi sorting out course of action offering as an expansion from existing littler scale controller to Wi-Fi and is moreover prepared intended for organization free application.
5) *LCD Display:* LCD derives it's description from it's name only. Its a mixture of solid state and the liquid state. LCD makes use of liquid crystal to yield a observable picture. Displays used in LCD's are of super-thin technique display screen which are normally used in screens of laptop, Television, mobile and so on. Liquid crystal display (LCD) has many layers which comprise of 02 polarized panel filters & electrodes.
6) Buzzer: A buzzer is an electronic equipment that produces a beeping & buzzing sound. The most basic buzzer is piezo-electric buzzer. This buzzer is horizontal, even piece of piezo-electric substance and also has two electrodes. Upon applying a DC voltage only a click sound is produced.

III. WORKING OF PROPOSED SYSTEM

The above figure consists of two sensors & a NodeMCU unit. The sensors and the NodeMCU unit are interfaced to Arduino board. The sensor senses the conditions of the baby and gives that as input to microcontroller. The microcontroller compares the sensed data with the data stored. If any of the data is found to be abnormal then the microcontroller sends the information using IOT module to parent's Android phone, parents can see their child status on Adafruit Io Server where they can monitor the child each and every status in mobiles and laptop, and it Display on LCD and if the baby felt, sensor will be switched using controller and displays it on the IOT communication and as well as Display on LCD, which lasts up to four Different Angles. It also have LM35 sensor, it will help to indicate the body temperature of baby or temperature of surrounding area such as if the baby is suffering from high fever or fire around baby is alerted via alarm through buzzer.

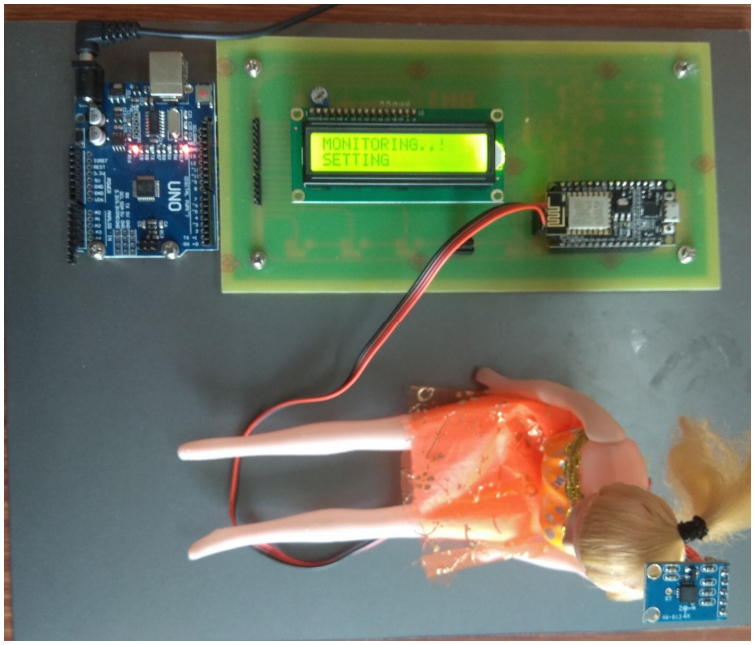


Figure 2: Picture of Implemented proposed system

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IV. PROPOSED SYSTEM FLOWCHART

The below figure depicts the flow-chart of Proposed system. The flow chat contains two sensors. One is MEMS sensor & temperature sensor. Consider the temperature sensor, here the sensor sense the left, right, front & back movements of a child.

If suppose the child felt left in x-axis and the value is less than or equal to 330, then sensor gives that as input to microcontroller. The microcontroller compares the sensed data with data stored. If any of the data is found to be abnormal then the microcontroller sends the image using IOT module to parent's mobile phone and the parents/caretaker will take the action. The procedure is continue for child's right, front and back movements. If the child is in normal position that is if the child is sitting then no action takes place. Now consider the LM35 sensor, it will help to indicate the body temperature of baby or temperature of surrounding area such as if the baby is suffering from high fever or fire around baby is alerted via alarm through buzzer and display on LCD. Then caretaker takes the action.

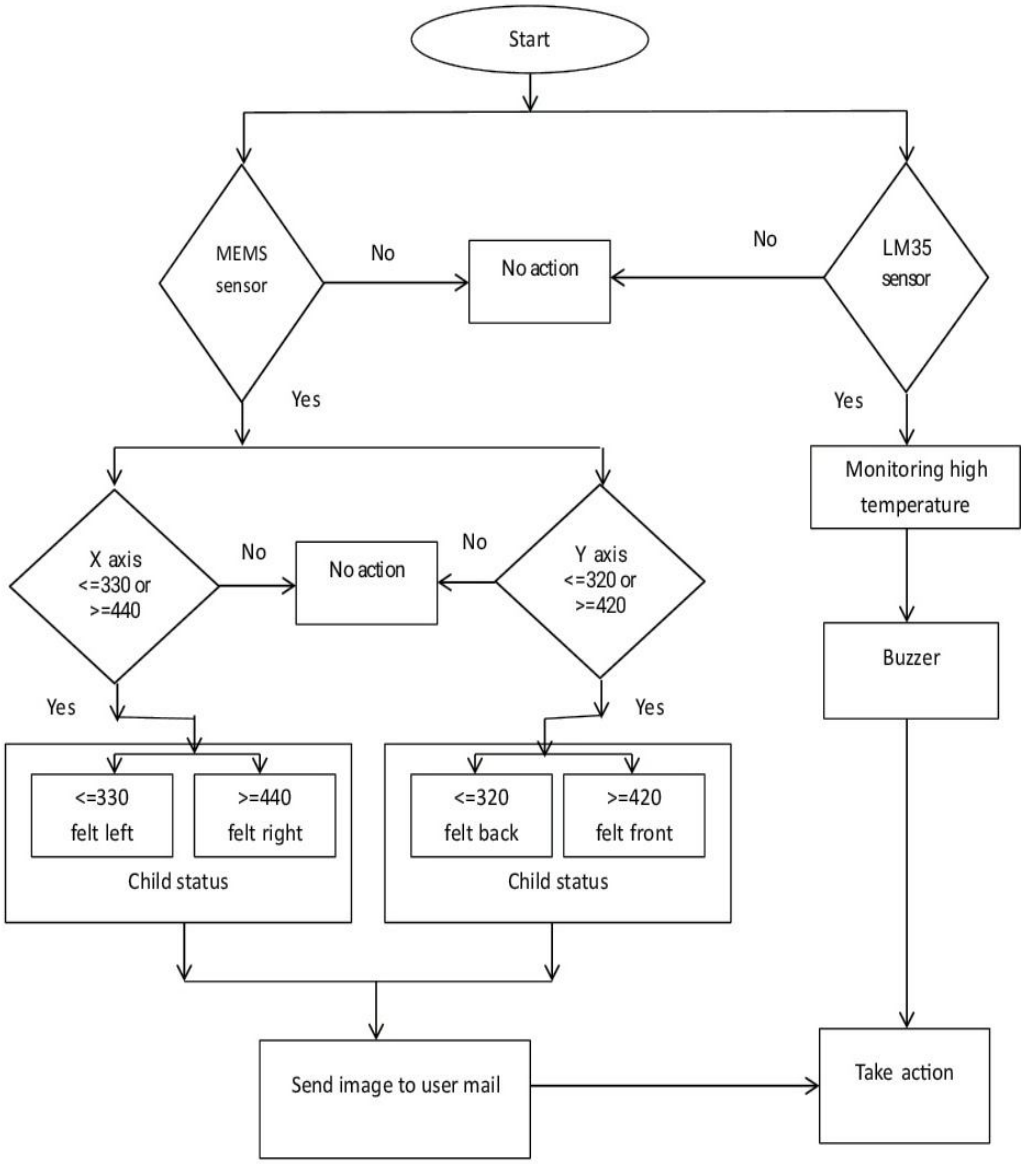


Fig 3: proposed system flowchart

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V. RESULTS

If the child is sitting that indicates child is in normal position & child is safe, and the child status is displayed on LCD that is “child is sitting”.

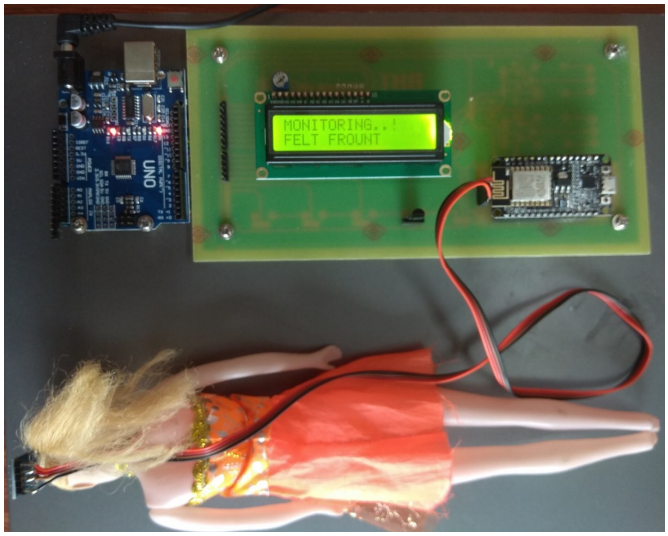


Figure 4: When the child felt front.

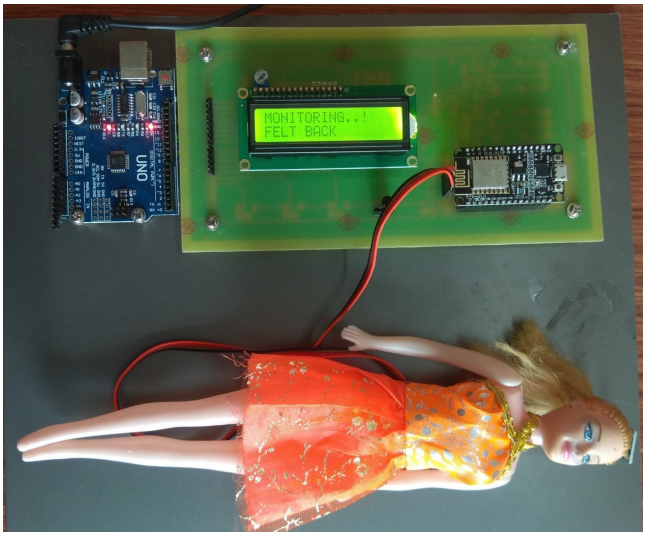
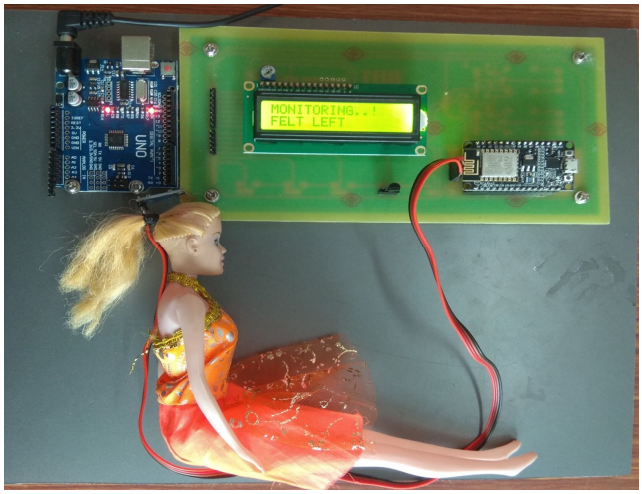


Figure 5: When the child felt back

The figure 4 shows that the child is felt front that is child is not in normal position so caretaker have to take the action. And the child status is displayed on LCD that is “child is felt front”.
The figure 5 shows that the child is felt back that is child is not in normal position. And the child status is displayed on LCD that is “child is felt back”.
The figure 6 shows the child is felt left that is child is not in normal position. And the child status is displayed on LCD that is “child is felt left”.
The figure 7 shows the child is felt right that is child is not in normal position. And the child status is displayed on LCD that is “child is felt right”.



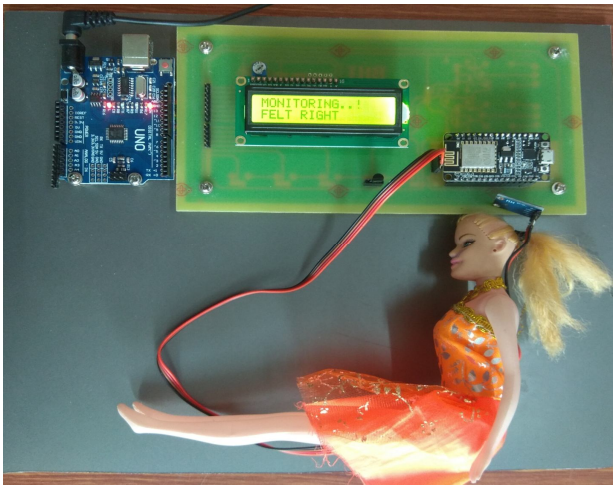


Figure 6: When the child felt left Figure 7: When the child felt right

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In case of emergency or risky situation such as fire around baby or if the child is suffering from high fever is alerted via alarm through buzzer, temperature is monitored via LM35 temperature sensor & it shows child is unsafe so we have to take action and the child status is displayed on LCD that is “High temperature”.

VI. COCNCLUSION AND FUTURE WORK

The “Posture analysis and behavioral recognition of a child using IOT” is affectively designed to determine and observe the child parameters by using MEMS sensor and Temperature sensor. Front, back, left, right movements can be detected by using MEMS sensor. The measured parameters are successfully recorded by using ARDUINO and by using Node MCU it sends the image to the mobile phone through IOT.

As a future work/further work it is better to change normal LCD by Graphical LCD so as to display path of children or babies who are under observation, when child goes far from safe place. We can use GSM to send the SMS and GPS to track the child and we can also add sensors such as cry detection (MIC/Lm358 op-amp) sensor and moisture sensor.

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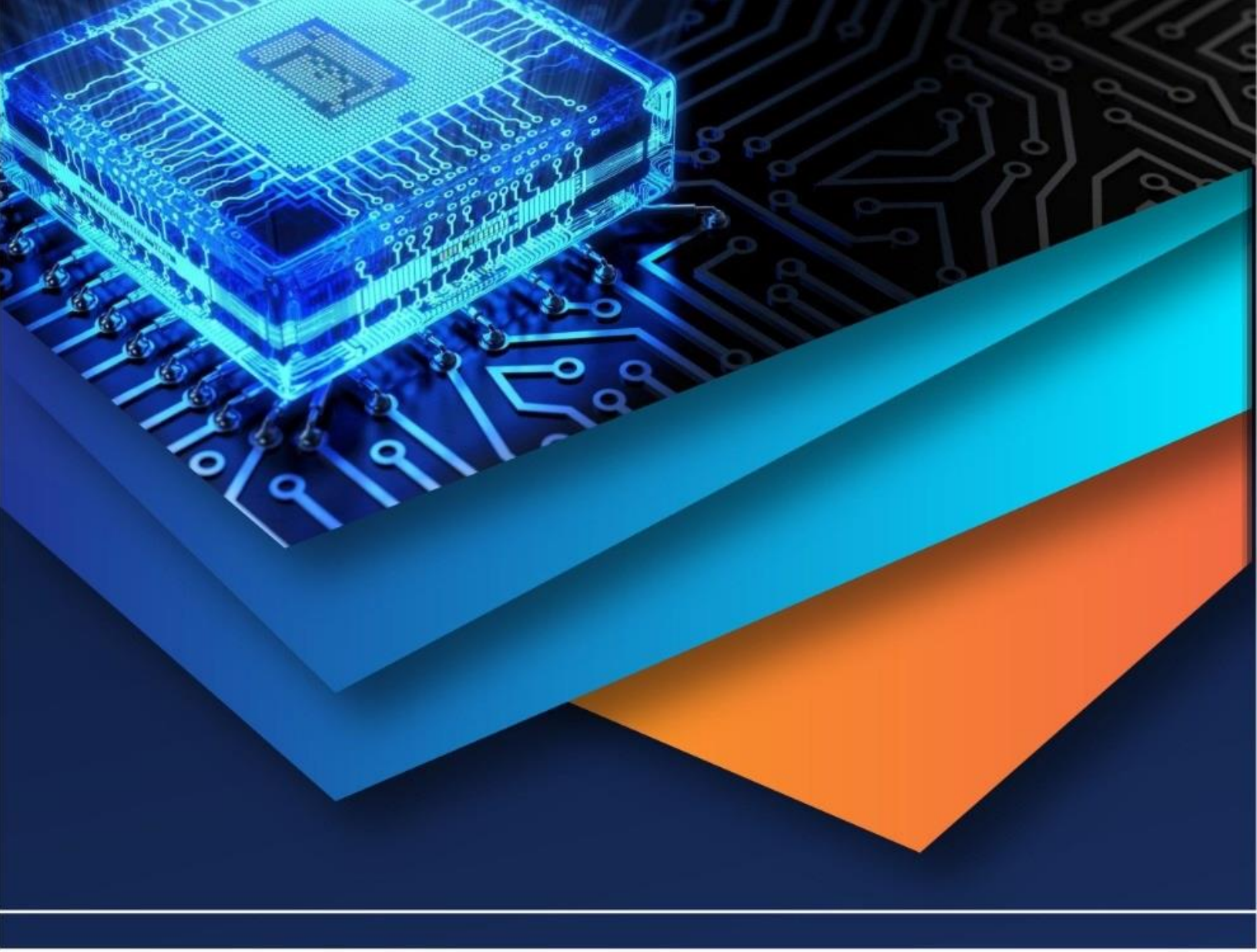
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