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An Advanced Air Quality Monitoring and Health Care for Asthma

Selvendran G (AP/BME)[1], Vanjith K[2], Rithika S[3], Jeeva A[4], Swetha M[5]
Department of Bio Medical Engineering Mahendra Institute of Technology, Namakkal, Tamilnadu

Abstract: ***Asthma is a chronic, often devastating, condition his has no cure and causes a remarkable Economic burden to the associated family as well as to the government and state. Poor air Quality(AQ) is one of the sources that is causing health issues which induce multiple irritating or vital symptoms and diseases such as asthma, allergies, and even cancers. Thus, the devices related to personal air quality monitoring is getting more attention in recent era. But it can be controlled and managed with personal diagnostic of triggering factors of asthma and through tobacco smoke etc. Asthma attack triggered factors of asthma and through preventive care. Sometimes it is as simple avoiding air pollutants like dust, tobacco smoke etc. Asthma attack triggered from air pollution could easily be avoided if there is a way to monitor air pollution level continuously in the surroundings. In this project, we have presented a system that will be able to predict possible asthma attack for individuals and alert them. The system is developed using an air pollutant monitoring device combined with an android application. This system presents a prototype of such a monitoring system that enables patients suffering from asthma or their care-takers to Monitor the environment, keep an eye on the trigger. factors an managing their medication, as well alerting the medics, in case of an emergency where the patient requires immediate attention as in case of a sudden asthma attack.***
Keywords: Air quality, Asthma Attack

I. INTRODUCTION

Introduction to an Asthma Monitoring System Incorporating ESP32 Technology. Asthma, a respiratory condition, is primarily influenced by genetic factors and can be triggered by allergies, resulting in breathing difficulties and restricting physical activities across all age groups. Despite advancements in healthcare infrastructure in Indian Hospitals, there remains a scarcity of doctors, with less than one doctor for every 1000 individuals, as recommended by the World Health Organization. Consequently, asthma has emerged as a leading cause of hospitalizations. The adoption of cost- effective. sensor-based solution holds significant promise in managing this condition.

This paper presents a cost-efficient, portable health monitoring system tailored for asthma management, proficient in detecting abnormalities and issuing alert notifications. To alleviate the burden and maintenance costs associated with medical servers, vital signs are monitored. Sensor data is collected and monitored in this compact device, enabling real-time tracking of the patient's condition remotely, with emergency alerts promptly dispatched to ensure patient well-being.

By the proposed method, we can able to introduce advancement in wearable band for for asthma monitoring augmented by an alert system employing ESP32 technology and an LCD display, ensuring timely medical intervention when necessary. Sensor data can be effortlessly monitored using the Blynk mobile application, an IoT platform customized for Android devices connected to internet. Each prototype is associated with a unique username and password, facilitating automatic connection to designated android devices. Multiple devices can be linked to a single patient, enabling simultaneous alerts to healthcare professionals and caregivers. Real-time data from connected devices can be monitored through the Blynk application, facilitating remote patient monitoring and immediate emergency responses, ultimately enhancing patient care and potentially saving lives.

II. METHODOLOGY

A. Proposed Block

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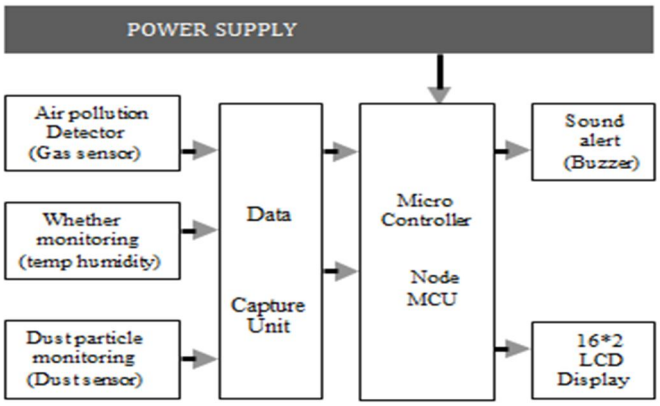


Fig- 1: Proposed Block

B. NODE MCU ESP32

The NodeMCU ESP32 is a development board on the ESP32. microcontroller. It's popular for IoT. projects due to its built-in-Wi-Fi and Bluetooth, capabilities, as well as its compatibility with the Arduino IDE.



Fig- 2: Node MCU ESP32

C. DHT11 Temperature & Humdity Sensor

The DHT11 Temperature & Humidity sensor is employed for measuring the surrounding Temperature. and humidity levels. Utilizing a digital signal detection method and the DHT11 sensor combination ensures high reliability and Long-term power efficiency. It delivers precise Measurements, swift response times, and translation capabilities, all at an affordable price Point.

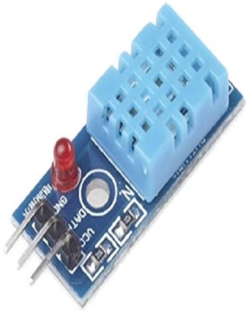


Fig- 3: DHT11 Temperature & Humidity Sensor

D. MQ-2 Gas Sensor

The MQ-2 Gas Sensor Module is designed to detect gas leaks, both in domestic and industrial Settings. Capable of identifying flammable gases and smoke, its output voltage rises in the presence of gas. Sensitivity adjustments are possible through potentiometer rotation. With high sensitivity to LPG, propane, and hydrogen, as well as suitability for methane and other Combustible materials, the MQ-2 gas sensor is cost effective and adaptable for various Applications.

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Fig- 4: MQ-2 Gas Sensor

E. Dust Sensor

The Dust Sensor, known as the GP2Y1014AU0F, is a compact six-pin device engineered to detect airborne dust particles. Utilising a laser dispersion system, it excels at identifying fine particles like cigarette smoke, making it a popular choice for air purification systems. Equipped with an IR emitting diode and a phototransistor, this sensor operates within a range of 4.5V to 5.5V DC.



Fig- 5: Dust Sensor

F. Buzzer

The Buzzer, also known as a beeper, serves as a Signalling device. Operating on lower AC voltage typically at 50 or 60 cycles, it emits familiar sounds like a ring or beep to indicate various actions. This buzzer circuit features an innovative design incorporating a series relay a smal audio transformer, and a speaker.



Fig- 6: Buzzer

G. Display

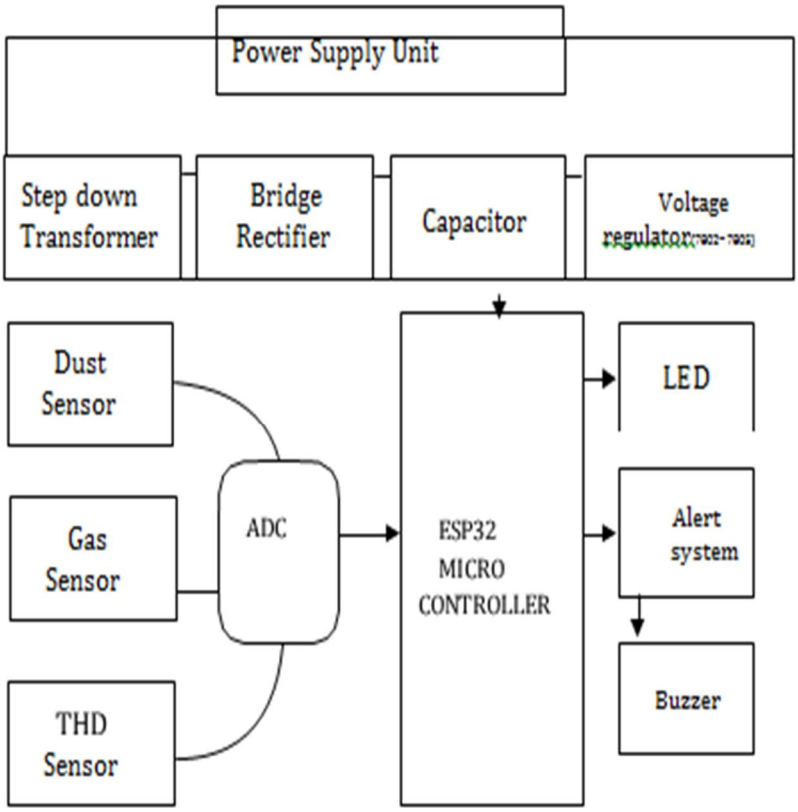
An LCD, or liquid crystal display, is an electronic gadget crafted into a compact, flat panel containing colored or monochrome pixels filled with liquid crystals. Positioned in front of a light source(backlight) or display, it's frequently employed in battery-operated devices due to its minimal power consumption.

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Fig- 7: Display

III. BLOCK DIAGRAM



IV. RESULTS & DISCUSSION

Access to real-time air quality data empowers individuals to understand and avoid triggers, reducing the frequency and severity of asthma Symptoms. This proactive approach improves asthma control and overall management, enhancing quality of life. Healthcare providers can now tailor treatment plans based on individual sensitivities and environmental Exposures. This personalized approach optimises treatment efficacy, leading to better outcomes and medication adherence for patients. Advanced monitoring systems for asthma exacerbations, detecting changes in air quality parameters. Timely interventions based on these alerts prevent exacerbations; reducing reliance on emergency healthcare services. Integration of air quality data with healthcare systems generates valuable insights for public health initiatives. Analysis of large datasets identifies trends and risk factors associated with asthma exacerbations, Informing evidence-based policies to reduce air pollution and protect vulnerable populations. Access to real-time air quality data empowers individuals to take control of their health by understanding environmental impacts on asthma. Educational programs raise awareness about indoor and outdoor air quality, promoting behaviour changes for better health outcomes.

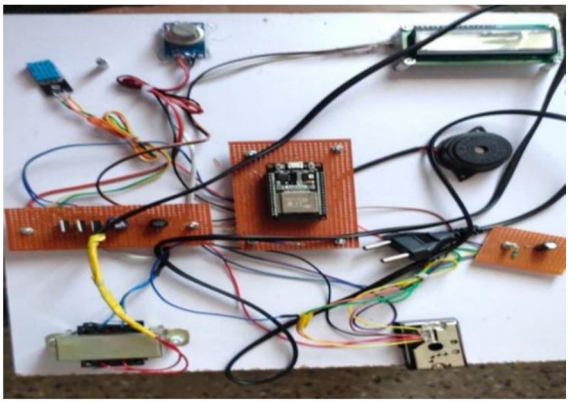


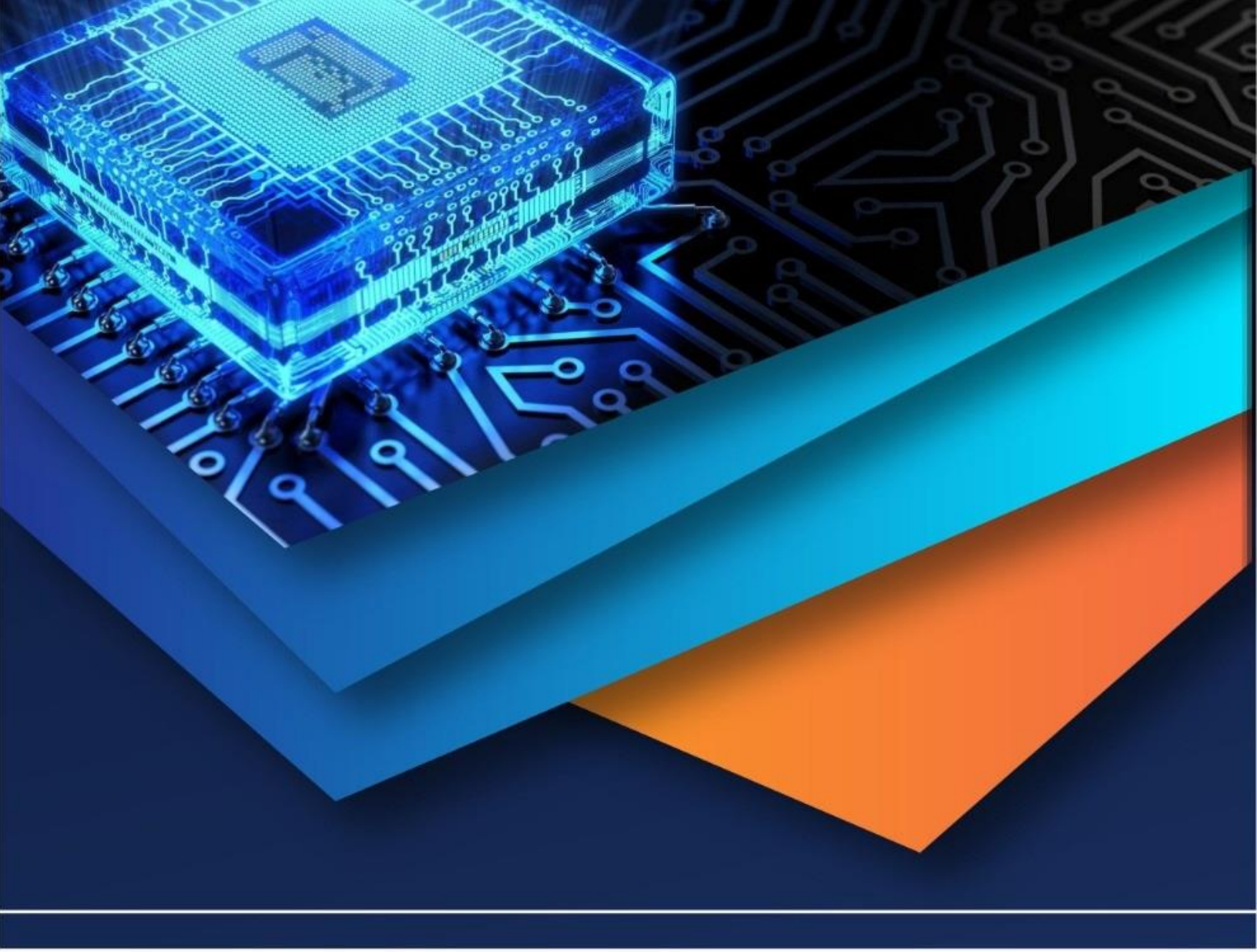
Fig- 12 An Advanced Air Quality Monitoring and Healthcare for Asthma

V. CONCLUSION

This paper successfully acquired physiological parameters, including moisture content, smoke, dust, and temperature, from patients within the environment. These parameters were processed using Arduino IDE and then transmitted via cloud computing to a remote health-care site, where they were visualized on an LCD display.

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