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AN ADVANCED MONITORING AND HEALTH CARE FOR ASTHMA

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Abstract - *Asthma is a common chronic disease that affects most of the children world-wide. It is characterized by continuous cough, wheezing, shortness of breath, reversible air flow limitation and bronchial hyperresponsiveness. Asthma in young children is difficult to diagnose as lung function measurements are not much reliable in young children. Symptoms that the young children possess are not necessary to be asthma specific symptoms. This proposed system is to provide support and help the children to be diagnosed and treated in advance to reduce the chances critical complications. The sensors implemented in this prototype detect the pollution and dust particles levels. If any difficulties in breathing is detected among the children, the IOT alert system triggers an alarm and alert the emergency contact person's device connected to the alert system through message notifications. In this way, proper medical assistance can be given to the children immediately.*

***Key Words*: Node MCU, Blynk Server Application, Humidity Sensor, Gas Sensor, Dust Sensor**

1.INTRODUCTION

Asthma, a respiratory disease, is primarily caused by genetic inheritance and it can also be allergy induced. It causes difficulties in breathing and make challenges in physical activities for people of all ages. [1] Although the healthcare support are getting upgraded in Indian hospitals over the recent years, there is less than one doctor for every 1000 population (0.62:1000). This ratio is less than the World Health Organization (WHO) requirement (1:1000). [2] In recent years, Asthma appears to be the one of the most common disease that needs hospitalization. Using a low-cost sensor-based IoT system can help in management of these diseases. [3] This paper describes a cost-effective portable model of health monitoring system for asthma monitoring. The abnormality is detected with alert notification. [1][3] An android application is used to record the vital signs to avoid burden and maintenance cost of medical servers. [4] The signals are obtained from the sensors and can be monitored through android application. The real-time value can be monitored from the connected device. [1][3][4] The patient's condition is monitored from distant location and emergency alert is given to safeguard the life of patients using real-time monitoring.[5]

The method proposed is a prototype model for wearable band asthma monitoring system. An IoT based alert system will help the patients to be treated in time, that will provide the patients with needed medical assistance in correct time.

The signals are obtained from the sensors and can be monitored with the help of the mobile application, BLYNK. Blynk is an IoT platform for android devices that are connected to Internet.

The prototype model is connected with a specific user name and password for a particular patient. The android device with that username and password gets connected automatically. N number devices can be connected to a single patient that will be helpful in giving alert to doctors, nurses and care-takers at the same-time. The real time values have been monitored from the connected devices through Blynk application.

Therefore, patients' condition can be monitored from distant location and an emergency alert in emergency conditions will be given to save the lives of the patients with the help of this real-time monitoring.

2. METHODOLOGY

2.1 Block Diagram

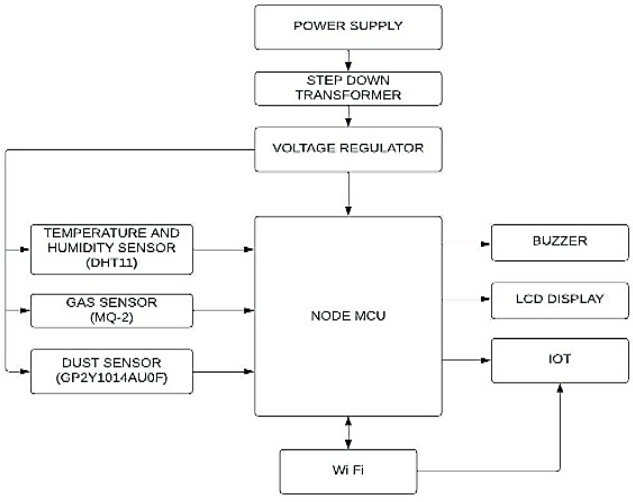

Fig -1: Transmitter Section

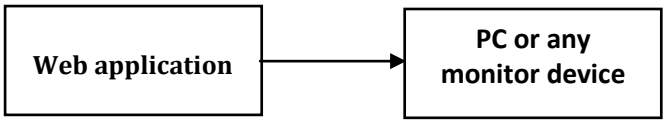

Fig -2: Receiver Section

2.2 NodeMCU ESP8266

NodeMCU is an open- source Lua grounded firmware and development board particularly targeted for IoT predicated Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressoif Systems, and accoutrements which is rested on the ESP-12 module.

Fig -3: NodeMCU ESP8266

2.3 DHT11 Temperature & Humidity Sensor

The DHT11 sensor is a temperature and humidity sensor which is used to measure temperature and humidity of a person or the surrounding. Digital signal detection method and DHT11 sensor combination are used to protect high reliability and good long-term power. It offers excellent measurement quality, fast response, translation ability at low cost.

Fig -4: DHT11 Temperature & Humidity Sensor

2.4 MQ-2 Gas Sensor

Gas Sensor Module (MQ2) is useful for detecting gas leaks (domestic and industrial). It can detect flammable gas and smoke. The output voltage from the Gas sensor increases when the gas is full. Sensitivity can be adjusted by rotating the potentiometer. MQ-2 gas sensor has high sensitivity to LPG, Propane and Hydrogen, and can be used for Methane and other combustible materials, has low cost and is suitable for alternative use.

Fig -5: MQ-2 Gas Sensor

2.5 Optical Dust Sensor

The GP2Y1014AU0F is a small six-pin air output / visible dust sensor designed to detect dust particles in the air. It works with the Laser dispersion system and is particularly effective in detecting fine particles such as cigarette smoke, and is often used in air purification systems. This sensor has an IR emitting diode and a phototransistor. It works with 4.5V which claims to be 5.5V DC.

Fig -6: Optical Dust Sensor GP2Y1014AU0F

2.6 Buzzer

A buzzer or beeper is a signaling device, This buzzer, works on a reduced AC voltage in 50 or 60 cycles. Some of the most common sounds used to indicate a button are a ring or a beep. This buzzer circuit novel uses a series relay with a small audio transformer and speaker.

Fig -7: Buzzer

2.7 Display

A liquid crystal display (LCD) is an electronic device that is shaped into a small, flat panel made of any color number or monochrome pixels filled with liquid crystals and decorated before a light source (backlight) or display. It is commonly used in battery-powered appliances because it uses very small amounts of electricity.

Fig -8: LCD

3. PROPOSED DESIGN

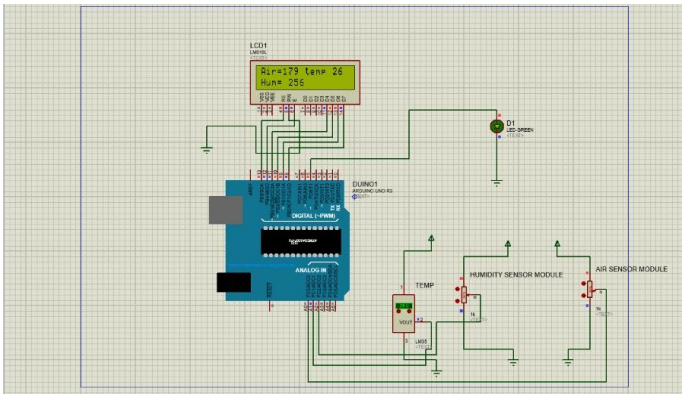

Fig -9: Proteus Simulation

A proteus simulation of our design is given in the fig -9. This is programmed in Arduino IDE to display the temperature of the environment, dust level measured in μg/m^3 and gas level.

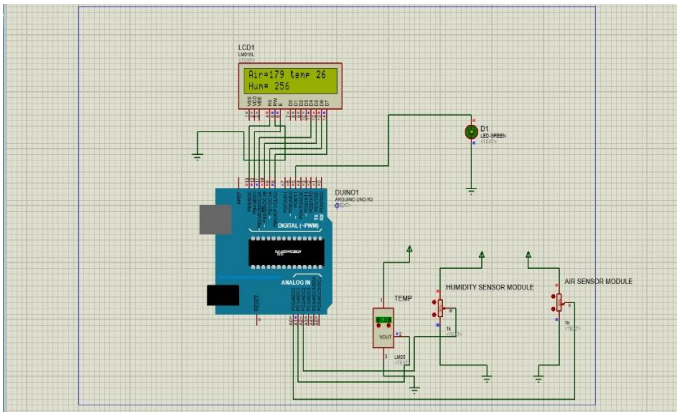

Fig -10: Output of the simulation

3.1 Blynk Server Application

Internet of Things requires a common server in which the data can communicate around a required set of people. Hence the Blynk Server Application plays such a role to serve the IoT application over our design. This platform provides us with Blynk App, Blynk Server and Blynk libraries. It can work in both Android and iOS with a clean User Interface. The Cloud storage can be connected through Ethernet, Wi-Fi, Bluetooth and GSM.

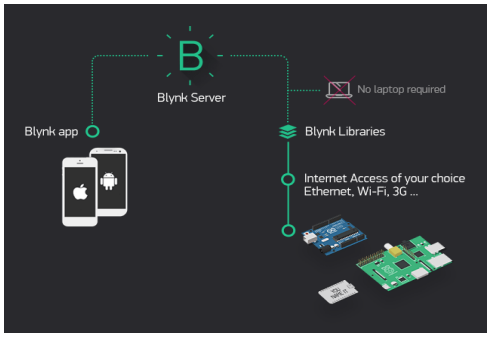

Fig -11: Blynk Architecture

4. RESULTS AND DISCUSSION

The study phase, which lasted ten weeks, revealed that an asthma sufferer could seek help within 1-6.5 minutes on average using any of the alarm modalities. According to the data analysis, the loud buzzer drew more attention to the asthma patient and gave immediate first assistance, while medical practitioners were advised of the same by text message. The device emits a loud sound buzzer to the neighboring units that have been designated as emergency contacts, increasing their chances of receiving assistance. Some occurrences of chronic asthma result in convulsions or an asthma patient's immediate loss of consciousness. These are extreme situations that would account for a small percentage of the overall community's asthmatic population. In such instances, an on-site caregiver would be required to check on the patient on a regular basis. Furthermore, for such patients, we can have the system installed on the bed so that the patient does not have to walk to the wall.

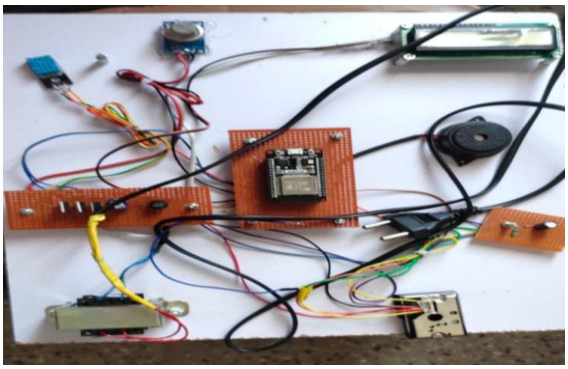

Fig -12: An Advanced Monitoring and health care for Asthma

5. CONCLUSION

In this paper, physiological parameters such as Moisture content, Smoke, Dust and temperature around the environment are obtained successfully from patients. These physiological parameters were processed via Arduino IDE. Finally, the processed data were transmitted using cloud computing and it was received at remote health-care site and also visualized at the LCD Display.

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