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N0 Smoking Zone Monitoring &Alerting System

k.Sanath kumar
Assistant professor, Department of Electronics & communication Engineering)

Palnatijayaram
Electronics&communication engineering
Guru nanak institute of technology

Marla pavan
Electronics & communication engineering Guru nanak institute of technology

Pagidikathula Lokesh
Electronics & communication engineering
Guru nanak institute of technology

Abstract— *There is a campaign to stop smoking in public places or Non-Smoking Areas because smoke can harm people. But some people violate and still smoke in Nonsmoking areas such as in Campus, School, or hospital. The government has arranged forbidden places to smoke according to the Law. Therefore, a monitoring system is needed to detect offenders who smoke in no-smoking areas. Cigarette smoke detection system has made based on internet and Node MCU technologies. This smoke detection system has designed using a Node MCU a gas sensor (MQ-2), and data communication. We need an internet connection via WiFi or Ethernet to transfer data to the database server. When the Sensor releases the cigarette immediately, the system will send a notification to the administrator. This system is expected to be implemented to support the smart city or smart campus.*

Keywords—*Smoke detector, Node MCU, IOT, Gas Sensor*

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I. INTRODUCTION

A. Background

Cigarette addiction that most people give the most hits. If you continue to smoke. It is even harder to stop smoking cigarettes, it can be just one excuse for people who do not want to quit or no effort, because in the cigarette is filled with nicotine, if the body has been long. Heart disease and other adverse effects on the organs. Followed by many. Cigarette smoke is also effective in hurting people around.

Currently there is a campaign to stop smoking in public places. Because smoke can harm people. But there are some people who violate and smoke in the ban on smoking zones as in School buildings and in the hospital building. Or in place Government.

For this reason, we has developed a smoke detector in which will be installed in Non-smoking zones. When the smoke is detected beyond the specified level(250ppm) then the voice module will trigger the speaker as "warning No somking zone".

B. Research objective

This research aims to develop a study and design cigarette smoke detectors in No-smoking zones using Gas Sensor (MQ-2), Node MCU (ESP8266)to detected beyond the specified level, Then the voice module will get trigger and send warningto the smokers.

II. LITERATURE REVIEW

Usually in the room we have dust or particles suspended in the air. 10 micrograms per cubic meter If the room is smoking, the amount of dust can rise to 45 micrograms per cubic meter. In cigarette smoke, the main constituent is a particle smaller than 1 micron, and may be as small as 0.1 micron. The carbon dioxide particle is composed primarily of carbon. The components in the gas and organic components are Carbon dioxide (CO_2) Carbon monoxide (CO), Nitrogen oxide (No_x), which is the combustion gases, also contains volatile

organic compounds such as Nicotine, Acetone, Benzene, Phenol, Tolune, Formaldehyde and Benzopyrene and also contains more than 4,000 other substances. The size of the particles in cigarette smoke is very small. The mass is so small that the gravitational pull on the particle is very high. This is called weight loss, which is much less intense than the buoyancy of cigarette smoke due to the movement of air. The smoke can spread. Float in the air Do not fall to the ground. Like dust large Particles can diffuse in the air like this Aerosols. The particles in cigarette smoke are formed into larger particles as shown in Figure 1. Based on the graph. Graphs showing the size and number of particles of cigarette smoke occur at different times. It can be seen that the particle size of cigarette smoke produced within 18 minutes is smaller than that of cigarette smoke for 300 minutes. The average particle size is larger. This is because the particles in cigarette smoke gather together because of the collision. Of small particles and combined into a larger particle size. But the number of particles in the smoke decreased.

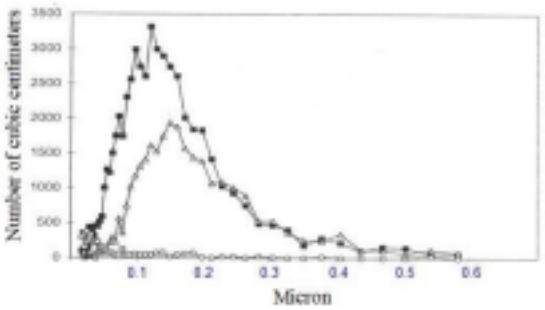

Fig. 1. Display size and number of particles in smoke at intervals of 18 minutes and 300 minutes.
 Smoke particles after 18 minutes
∆Smoke particles after 300 minutes.
 Particles in normal environment

ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) has defined a ventilation system for rooms with occupants. By setting a standard of 4 cubic feet per minute The people in the room to have enough oxygen to breathe. If the smoke is to be vented out of the room, the rate increases to 20-28 cubic feet per minute per person. To smoke and substances caused by smoking. Make sure that the room is air-conditioned. Consume more energy in the cooling system from the above information and from various media. Smoking is both harmful to the health of the smoker and neighbor. It also makes us need more energy.[1]

Gas Sensor (MQ-2) is module is useful for gas leakage detection (home and industry). It is suitable for detecting H2, LPG, CH4, CO, Alcohol, Smoke or Propane. Due to its high sensitivity and fast response time, measurement can be taken as soon as possible. The sensitivity of the sensor can be adjusted by potentiometer. In a concentration of 300 to 10000 ppm (part per million). The structure of the MQ-2 consists of a micro tube. Made from aluminum oxide (Al_2O_3) and tin oxide (SnO_2). [2]

NodeMCU is an open source IOT platform. It includes firmware which runs on the ESP8266(System on-chip) from Espressif Systems Company . It is a 32 bit Microcontroller. In this research NodeMCU used an ESP8266 module . NodeMCU is similar to the Arduino which has built in input and output ports. NodeMCU is compatible with Arduino IDE code .NodeMCU has advantages on Arduino where it is smaller and can connect to WIFI system [3]

Chieochan, A. Saokew and A. Boonchieng.[6] Presented the IOT for Smart Farm: A case study of the Lingzhi Mushroom Farm at MaejoUniversity.This research aims to prototype a smart Lingzhi mushroom farm. This research applied the use of IOT with a sensor to measure and monitors the humidity in the Lingzhi mushroom farm. The humidity data processed through NETPIE was developed and provided by NECTEC as a free service for IOT. Humidity data was stored into a NET FEED (a sub service from NETPIE) and displayed on mobile devices and computers through NET FREEBOARD (another sub service of NETPIE). This research also controlled sprinkler and fog pumps automatically and the functional status (switching on and off for periods of time) pushes notifications through thing speak on the Application. The equipment and tools used in this research were NodeMCU, humidity sensor, RTC (real time clock), relay module, sprinkler and fog pumps. The services and protocol used were NETPIE (Network Platform for internet of everything) with subservices such as NETPIE FEED, NETPIE FREEBOARD, and NETPIE REST API. The results of the research showed that using IOT with the sensor enhanced the prototype of smart farming.

S. Tunyala and P. Yanaso. [7] Presented the Simulator protection and fire alarm systems. This project has studied and developed a fire alarm system in building before developing for constructing a simulator of fire alarm protechin system. This system can apply with real work and install in other places by using the

microcontroller as a operating controller. Due to the modern residence nowadays that is located n town is an apartment or a condominium, this building has also necessary to implement other security system such as the fire alarm system. The protecting systems will be alert rapidly for warning the fatal accident. This project has been modifying the warning system for residence to send a warning message by telephone as soon as possible. The design and construction the simulator of a fire alarm system has sketched a drawing on the plastwood board. The board dimension has two sheets of 666mm x 562mm, two sheets of 562 mm x706mm, one sheets of 666mm x706mm, and one sheet of 700mm x 600mm. When the boards were fitted together as a simulator of residency room in the building, the smoke detectors were also installed for detecting the smoke and sending the signal to the controller to alert a residency superintendent. From experiment the simulator of fire alarm system in each, the experiment results has different results, because the networks have dissimilar that make the inequality values. The distance of sending a short message (SMS) is injustice. The sending message of the simulator of fire alarm system cannot send all messages in one time because the program was designed by sending a message line per a telephone number.

III. RESEARCH METHODOLOGY

3.1. Requirement and Feasibility study

The requirement of this research was to study and design cigarette smoke detectors for No-Smoking zones. The smoke detector is designed by the Gas Sensor (MQ-2) to detect smoke and NodeMCU (ESP 8266) to measure the gas sensor voltage values. When the sensor detects the smoke until the voltage is exceeded the triggered value. Node MCU will send the information to voice module then the voice module contating speaker will aleart the smoker and as well the node mcu will send the data to the thing speak application in which we can moniter the values of the Gas sensor readings.

For this research the tools and software that used are shown in and table 1-2.

TABLE I. HARDWARE AND PURPOSE OF THE USE

Hardware	**Purposes of use**
Node MCU (ESP8266)	Control devices and send data into internet via WIFI connection
Gas Sensor (MQ-2)	Detects smoke
Voice module(APR9600)	Voice recording and play back capabiliity
OLED(organic light emitting diode)	To display the measured values of gas sensor.
Transformer	To step down the voltage from 230v-12v.
Led	To indicate when the smoke is detected
Rectifier	To convert voltage from ac to dc

TABLE II. SOFTWARE AND PURPOSE OF THE USE

Software	**Purposes of use**
Arduino IDE	The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board
Embedded c	Programming language to Node MCU

3.2.**BLOCK Diagram**

Figure 1. shows the functional block diagram of system. At first the input power supply is given to the system then it will convert the input voltage to required Dc voltage(5v).Then the 5v dc supply is given to the node Mcu and through the node mcu analog pin the mq2 gas sensor is connected to it. And for the indication purpose led is connected to it. And the OLED is connected to node MCU to display the measured values on the display.APR9600(voice module) is connected to the node MCU to record and paly back the voice. And speaker is connecte to it to play pre record

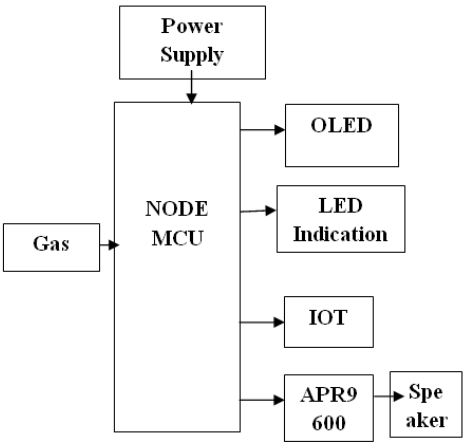

FIGURE.2. Block Diagram

3.3Hardware Design

Figure.2 shows the complete hardware design of the no smoking zone monitoring and alerting system.

A. POWER SUPPLY

The power supply section is the section which provide +5V for the components to work. IC LM7805 is used forproviding a constant power of +5V.The ac voltage, typically 220V, is connected to a transformer, which steps down that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by asimple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation.A regulator circuit removes the ripples and also retains the value

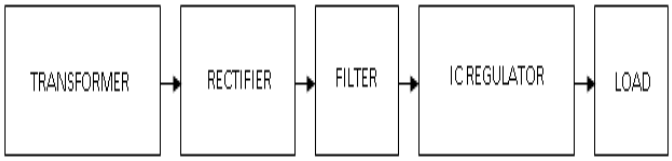

Figure.3 Block Diagram of Power Supply

B.NodeMCU ESP8266

Node MCU is an open-source Lua based firmware and **development board** specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module.

Node MCU ESP8266 Specifications & Features

- Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
- Operating Voltage: 3.3V
- Input Voltage: 7-12V
- Digital I/O Pins (DIO): 16
- Analog Input Pins (ADC): 1
- UARTs: 1
- SPIs: 1
- I2Cs: 1
- Flash Memory: 4 MB
- SRAM: 64 KB

- Clock Speed: 80 MHz
- USB-TTL based on CP2102 is included onboard
- PCB antenna

Small sized module to fit inside your IoT projectsESP8266EX has 17 GPIO pins which can be assigned to various functions by programming the appropriate registers.

Each GPIO can be configured with internal pull-up or pull-down, or set to high impedance, and when configured as an input, the data are stored in software registers; the input can also be set to edge-trigger or level trigger CPU interrupts. In short, the IO pads are bi-directional, non-inverting and tristate, which includes input and output buffer with tristate control inputs.

These pins can be multiplexed with other functions such as I2C, I2S, UART, PWM, IR Remote Control, etc.

Figure.4. ESP8266 Node MCU

C. OLED(Organic light emitting diode)

OLED (Organic Light Emitting Diodes) is a flatlight emitting technology, made by placing a series of organic thin films between two conductors. When electrical current is applied, a bright light is emitted. OLEDs are emissive displays that do not require a backlight and so are thinner and more efficient than LCD displays (which do require a white backlight).OLED displays are not just thin and efficient - they provide the best image quality ever and they can also be made transparent, flexible, foldable and even rollable and stretchable in the future. And it is interfaced to node mcu using the inter integrated circuit(I2C).

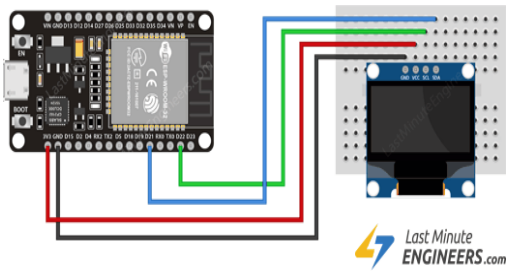

Figure.5. OLED interfacing with node MCU

D.Gas sensor (MQ2)

A gas detector is a device which detects the presence of various gases within an area, usually as part of a safety system. This type of equipment is used to detect a gas leak and interface with the node mcu .A gas detector can also sound an alarm to operators in the area where the leak is occurring, giving them the opportunity to leave the area. This type of device is important because there are many gases that can be harmful to organic life, such as humans or animals.MQ2 is used in gas leakage detecting equipment in family and industry, are suitable for detecting of LPG, natural gas , town gas, avoid the noise of alcohol and cooking fumes and cigarette smoke. When the smoke interacts with this sensor, it is first ionized into its constituents and is then adsorbed by the sensing element. This adsorption creates a potential difference on the element which is conveyed to the processor unit through output pins in form of current.

Figure.6..MQ2 Gas sensor

E.APR 9600 VOICE MODULE

The APR9600 device offers true single-chip voice recording, non-volatile storage, and playback capability for 40 to 60 seconds. The IC is 28 pin device used to record & playback of maximum of 8 messages. The device supports both random and sequential access of multiple messages. Sample rates are user-selectable, allowing designers to customize their design for unique quality and storage timeneeds. the device is ideal for use in portable voicerecorders, toys, and many other consumer and industrial applications.

The circuit diagram of the module is shown in Figure 2. The module consists of an APR9600 chip, an electrets microphone, support components, a mode selection switch (-RE, MSEL1, MSEL2 and – M8) and 9 keys (-M1 to –M8 and CE). The oscillation resistor is chosen so that the total recording period is 60 seconds with a sampling rate of 4.2 kHz. Users can change the value of the ROSC to obtain other sampling frequencies. It should be noted that if the sampling rate is increased, the length of recording time is decreased. Table 3 gives the details. An 8-16 Ohm speaker is to be used with the module. Users can select different modes using the mode selection switch. The module is measured 80mm´55mm. Connection points (0-8, C and B) can connect to other switches or external digital circuits. In this cased, on-board keys M1 to M8 and CE are by-passed.

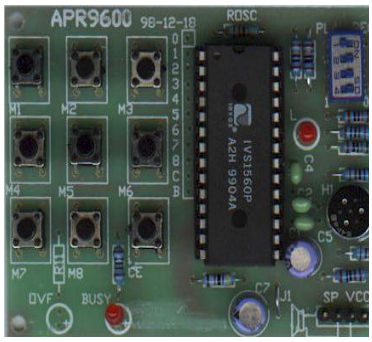

Fig.7.APR9600

IV. Circuit Design:

First the power supply is given to the transformer. And after that the power is convert into the 5v and then the power is converted into 5v dc using the rectifier. And 5v dc given to the node MCU and to the voice module. When the wifi is connected to the node MCU then the gas sensor will measure the ppm values and it will display the measured values on oled screen and when the triggered value is reached then the led will blink .Then the voice module will on and the prerecorded will play i.e "warning no smoking zone" will play by the speaker. Hence the overall process is completed by binding software and hardware.

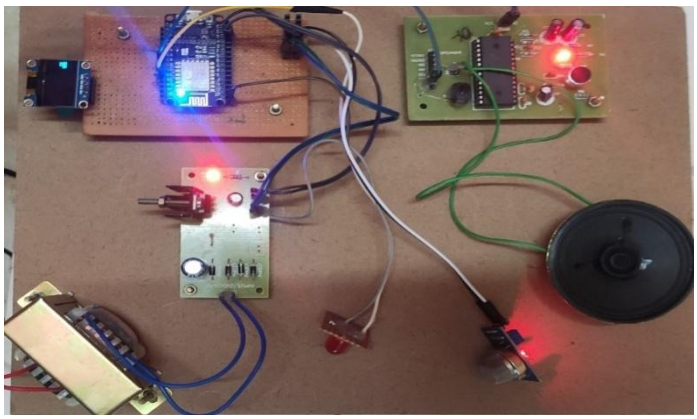

Fig.8. proposed circuit Design

V. RESULT AND DISCUSSION

Result shows the developed of prototype of No Smoking Zone detection system successfully done and tested. Figure 5 shows the configuration of MQ2 gas sensor with the prototype. when ever the mq2 sensor detects the cigarette smoke in the no smoking zones then, the node MCU will receives the input and it display the detected smoke concentration(ppm) in the oled display as shown in figure.2. when ever the detected gas concentration is more and equal to the triggered value then the led will blink for the indication and the voice module gets activated and plays prerecorded voice through the speaker i.e warning no smoking zone. And also the ESP8266 Wi-Fi module sends the data to web page(thing speak).user can also monitor the gas concentration on thing speak application that display the values of the cigarette smoke in ppm a graph.TheESP8266 Wi-Fi module is set to send the data every 15secondstowebpage.

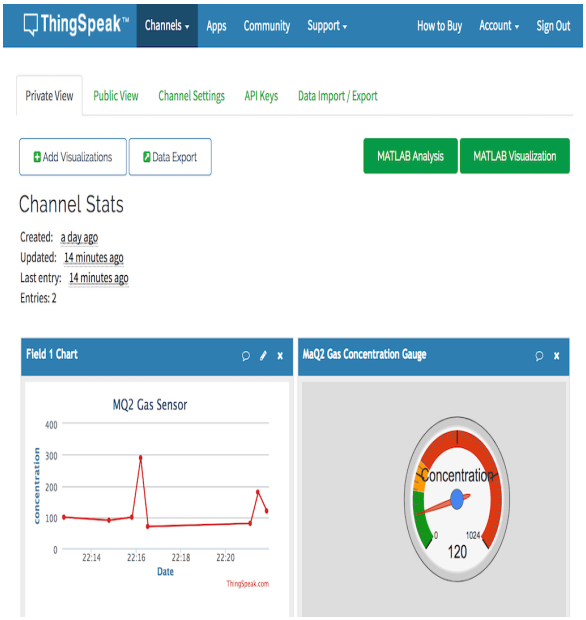

Figure.9. published of cigarette smoke data

VI. CONCULUSION

As a conclusion, this paper presents the no smoking zone system that manages to detect the cigarette smoke in an area. The schedule time have been tested that collected the cigarette smoke data is collected which presents the distance and type of condition that are open and air condition areas. The system also benefits where collected data can be published online through thing speak application. And through it we can be able to monitor the cigarette smoke and the environment safety. This system using the embedded c programming language to control the entire system. The system has ESP8266 wi-fi module to transfer the from node MCU to thing speak application to monitor the data. This research is significant for safety environment able to maintain the clean air environment through online monitoring system and alert society on possible smoking places that they wish to avoid is possible.

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