AUTOMATIC TOXIC GAS INDICATOR

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ABSTRACT - In every developing and developed nation the utilization of automobiles is a maximising day by day and apparently the accidents relating to automobiles have increased drastically too. In our projectawe identify the problem of leakages of toxic gases taking place in a closed volume of an maximising and also develop an application through which the person inside the closed cabin or any of it's family member/friend can be notified of the situation. To overcome this situation we have introduced the automatic toxic gas indicator which enables us to detect any such hazardous leakage taking place at almost all environment conditions very effectively with the help of smart sensors. Anhydrous Ammonia is favoured in many large cooling systems because it has better heat transfer characteristics and is cheaper than the refrigerant gases used in home cooling systems and refrigerators. The problem is that the material is very reactive and toxic. Fortunately, the gas is extremely irritating at well below the toxic level so that when a minor leak happens, unprotected people evacuate the area quickly with little urging. A catastrophic leak, however can overcome people before they have a chance to get clear. This is partially because man people are temporarily blinded by less than lethal concentrations. The smart sensors will be enabled to detect any such leakages taking place inside the cabin and will also send signals to the motors of the power window to roll down automatically and when any situation of gas leakage is detected and alert sms/call is sent to the user and he is notified of the situation.

KEYWORDS – IoT (Internet of Things), ATGI (Automatic toxic gas indicator), CO Sensor.

I. INTRODUCTION

Internet of Things (IoT) is an ecosystem of connected physical objects that are accessible through the internet. The 'thing' in IoT could be a personawith a heart monitor or an automobile with built-in-sensors, i.e. object that have been assigned an IP address and have the ability to collect and transferadata over a network without manual assistance or intervention. The embeddedatechnology in the objects helps themto interact with internal states or the external environment, which in turn affects the decisions taken. The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. An Automatic Toxic Gas Indicator (ATGI) is a device to detect any leakage of toxinsentering the closed chamber of an automobile via the air-conditioning system of it owns,with the help of smart sensor, thereby eradicating the treat to human life. The refrigerantsused in many cooling systems of our automobiles are An-hydrous ammonia and chlorofluorocarbons (CFC) . But the vital problem of using these cheap refrigerants is thatthese materials are highly reactive and considered very toxic. Inhalation of these toxic gasesover a certain period of time may even lead to death for those who are inside the closedcabin of an automobile. Thus, the Automatic Toxic Gas Indicator (ATGI) detects any suchleakages taking place within the help of smart sensors provided within the closed cabin and this in turn allows the power windows of an automobile to roll down by making provision for the toxic gases to escape into the atmosphere without affecting the human life. We alsoconnect a mobile application to the ATGI, when such situation of gas leakage is detected it.

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MIT App Inventor is an intuitive, visual programming environment that allows everyone – even children – to build fully functional apps for smartphones and tablets. Those new to MIT App Inventor can have a simple first app up and running in less than 30 minutes. And what's more, our blocks-based tool facilitates the creation of complex, high-impact apps in significantly less time than traditional programming environments. The MIT App Inventor project seeks to democratize software development by empowering all people, especially young people, to move from technology consumption to technology creation. Thing Speak is an IoT analytics platform service that allows you to aggregate, visualize, and analyze live data streams in the cloud. You send data to Thing Speak from your devices, create instant visualizations of live data, and send alerts using web services like Twitter and Twilio. With MATLABanalytics inside ThingSpeak, you can write and execute MATLAB code to perform pre-processing, visualizations, and analyses. ThingSpeak enables engineers and scientists to prototype and build IoT systems without setting up servers or developing web software.

II. METHODOLOGY

Any project or an application is partitioned in tiny groups called as modules for easy coding and understand. This paper mainly contains four modules which are sensor, L293D , Application and ESP 8266 Wifi module. Sensor Module Sensitive material of MQ-7 gas sensor is SnO2, which with lower conductivity in clean air.

A. Sensor Module

Sensitive material of MQ-7 gas sensor is SnO2, which with lower conductivity in clean air. It make detection by method of cycle high and low temperature, and detect CO at low temperature(heated by 1.5V).The sensor's conductivity gets higher along with the CO gas concentration rising. At high temperature(heated by 5.0V),it cleans the other gases adsorbed at low temperature. Users can convert the change of conductivity to correspond output signal of gas concentration through a simple circuit. Features It has good sensitivity to carbon monoxide in wide range, and has advantages such as long lifespan, low cost and simple drive circuit & etc. Main Applications It is widely used in domestic CO gas leakage alarm, industrial CO gas alarm and portable CO gas detector.
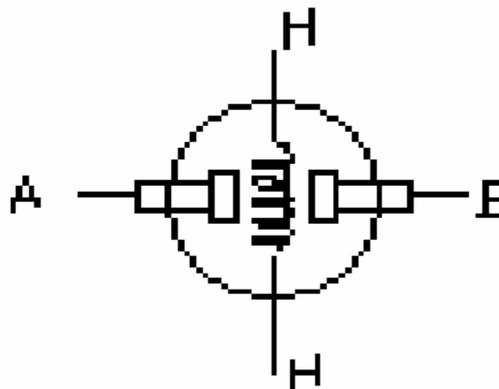

Fig 1 Representing the structure of MQ-7

SENSITVITY ADJUSTMENT Resistance value of MQ-7 is difference to various kinds and various concentration gases. So, When using this components, sensitivity adjustment is very necessary. we recommend that you calibrate the detector for 200ppm CO in air and use value of Load resistance that(RL) about 10 KΩ(5KΩ to 47 KΩ). When accurately measuring, the proper alarm point for the gas detector should be determined after considering the temperature and humidity influence. The sensitivity adjusting program: a. Connect the sensor to the application circuit. b. Turn on the power, keep preheating through electricity over 48 hours. c. Adjust the load resistance RL until you get a signal value which is respond to a certain carbon monoxide concentration at the end point of 90 seconds. d. Adjust the another load resistance RL until you get a signal value which is espond to a CO concentration at the end point of 60 seconds.

B. L293D Motor Module

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Fig 2 explains about the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you now voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, Hence H-bridge IC are ideal for driving a DC motor.In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors. Given below is the pin diagram of a L293D motor controller.There are two Enable pins on l293d. Pin 1 and pin 9, for being able to drive the motor, the pin 1 and 9 need to be high.

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For driving the motor with left H-bridge you need to enable pin 1 to high. And for right H-Bridge you need to make the pin 9 to high. If anyone of the either pin1 or pin9 goes low then the motor in the corresponding section will suspend working. It's like a switch.
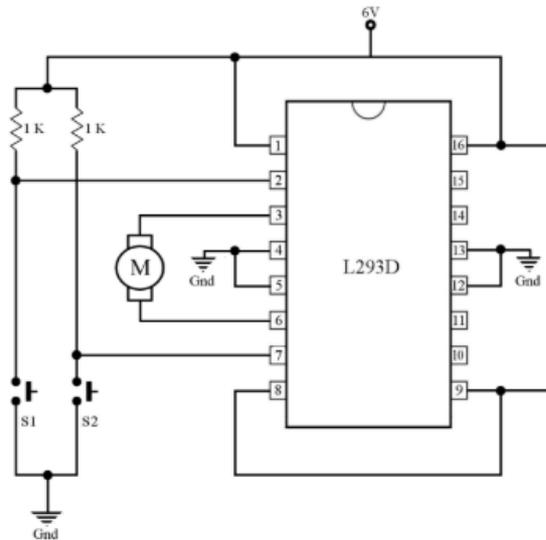

Fig 2 Representing the Pin diagram of L293D.

C. Application Module

MIT App Inventor is an intuitive, visual programming environment that allows everyone – even children – to build fully functional apps for smartphones and tablets. Those new to MIT App Inventor can have a simple first app up and running in less than 30 minutes. And what's more, our blocks-based tool facilitates the creation of complex, high-impact apps in significantly less time than traditional programming environments. The MIT App Inventor project seeks to democratize software development by empowering all people, especially young people, to move from technology   onsumption to technology creation. A small team of CSAIL staff and students, led by Professor Hal Abelson, forms the nucleus of an international movement of inventors. In addition to leading educational outreach around MIT App Inventor and conducting research on its impacts, this core team maintains the free online app development environment that serves more than 6 million registered users. Blocks-based coding programs inspire intellectual and creative empowerment. MIT App Inventor goes beyond this to provide real communities.
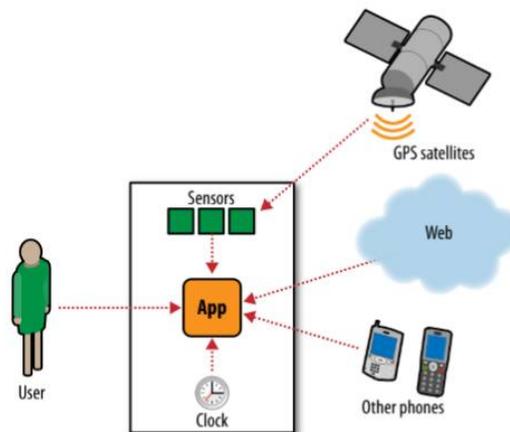

Fig 3 shows that the app can respond to both internal and external events

Figure 3shows the different functionalities about how the app can respond to both internal and external events. The required data is collected through the sensors and then the user can respond. The user can interact with the APP.

D. ESP8266 Wifiamodule

ESP8266 offers a complete and self-contained Wi-Fi networking solution, allowing it to either host theapplication or to offload all Wi-Fi networking functions from another application processor. When ESP8266 hosts the application, and when ait is the only application processor in the device, it is able to boot up directly from an external flash. It has integrated cache to improve the performance of the system in such applications, and to minimize the memory requirements. Alternately, serving as a Wi-Fi adapter, wireless internet access can be added to any microcontroller-based design with simple connectivity through UART interface or the CPU AHB bridge interface.ESP8266 on-board processing and storage capabilities allow it to be integrated with the sensors and other application specific devices

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through its GPIOs with minimal development up-front and minimal loading during runtime. With aits high degree of on-chip integration, which includes the antenna switch balun, power management converters, it requires minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area. Sophisticated system-level features include fast sleep/wake context switching for energy-efficient VoIP, adaptive radio biasing for low-power operation, advance signal processing, and spur cancellation and radio co-existence features for common cellular, Bluetooth, DDR, LVDS, LCD interference mitigation.

II.   SYSTEM ARCHITECTURE

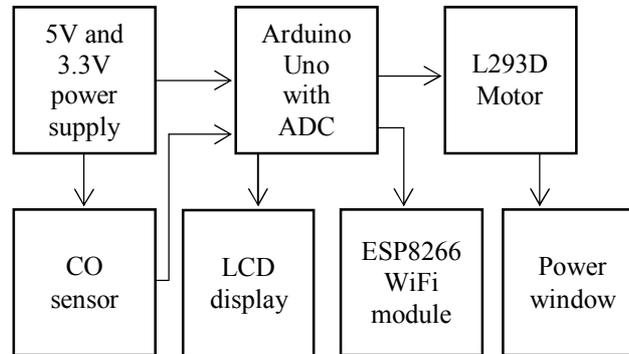In this section we describe how the connectionstake place between the four modules.

Fig 4 System architecture of admin and student module

Initially we connect the Arduino uno Serial port toWiFi Module ESP8266. After this process is doneMQ-7 Module's Analog Output to Analog Pin – A0 in Arduino Board. Connect Arduino GPIO Pin 4&5 to LD293 Module input 1&2. Initialize arduino Serial Port – RS232 to 9600,8bit Data, Parity None, Stop Bit 1 and the ESP-8266 WiFi Module in the Same serial Configuration.The communication between Arduino and ESP-8266 is UART-RS232 and the communication between Android Mobile and ESP-8266 is WiFi - 802.11 b/g/n.

III.   IMPLEMENTATION

The code given below initializes all the pins through the lcd function. It uses two pins (6 and 7) to drive the motor that is used to open and close the window. When both the pins are Low, the motor does not move. When the pins are in High-Low state, the motor causes the window to close. When the pins are in Low High state, the motor causes the window to roll down. Initially the motor closes the windows.Once the sensor detects a value greater than the normal Co level and the windows are opened.

```
#include <LiquidCrystal.h>
constintrs = 12, en = 11, d4 = 5, d5 = 4, d6 = 3, d7 = 2;
LiquidCrystallcd(rs, en, d4, d5, d6, d7);
constintsensorPin = A0;
constint OutPin0 = 6;
constint OutPin1 = 7;
constint Moto0 = 8;
constint Moto1 = 9;
intsensorValue = 0;
intsensorMin = 0;
intsensorMax = 1023;
void setup() {
lcd.begin(16, 2);
lcd.print("CO_MntrLife Save");
lcd.setCursor(0, 1);
lcd.print("...Wait...");
pinMode(OutPin0, OUTPUT);
pinMode(OutPin1, OUTPUT);
digitalWrite(OutPin0, HIGH);
DigitalWrite(OutPin1, HIGH);
pinMode(Moto0, OUTPUT);
pinMode(Moto1, OUTPUT);
digitalWrite(Moto0, HIGH);
digitalWrite(Moto1, LOW);
delay(1000);
```

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```
digitalWrite(Moto0, LOW);
lcd.setCursor(0, 1);
lcd.print("Wait.20sec.");
for(inti=0;i<=20;i++){
lcd.setCursor(13, 1);
lcd.print(i);
delay(1000);
}
}
void loop() {
lcd.setCursor(0, 1);
lcd.print("CO LVL ");
do{
sensorValue = analogRead(sensorPin);
lcd.setCursor(13, 1);
lcd.print(sensorValue);
}
//while(sensorValue<= 350);
lcd.setCursor(0, 1);
lcd.print("CO LVL Danger");
digitalWrite(Moto0, LOW);
digitalWrite(Moto1, HIGH);
digitalWrite(OutPin0, LOW);
digitalWrite(OutPin1, LOW);
delay(2000);
digitalWrite(Moto1, LOW);
do{
sensorValue = analogRead(sensorPin);
lcd.setCursor(13, 1);
lcd.print(sensorValue);
}
while(sensorValue>= 350);
digitalWrite(Moto0, HIGH);
digitalWrite(Moto1, LOW);
delay(1000);
digitalWrite(Moto0, LOW);
digitalWrite(OutPin0, HIGH);
digitalWrite(OutPin1, HIGH);
}
```

We use think speak to see a visual representation of the toxic gases that are present in the system environment. We create a new Channel that contains
Field1:Actuator1
Field2:COLevel
Filed3:TimeStamp
This channel is integrated with the hardware devices. The result will be displayed according to the CO levels present. The Think speak module will provide the userwith a unique channel number and an API key. This key can be written into the code directly or should be stored in a separate file that will be called during execution. Initially, the Wi-Fi should be connected. Once it is connected the channel can be updated.

```
#include "ThingSpeak.h"
#include "secrets.h"
#include <ESP8266WiFi.h>

charssid[] = "vivo 1714";
char pass[] = "joezo123";
intkeyIndex = 0;
WiFiClient client;
constintsensorPin = 0;
intsensorState = LOW;
unsigned long myChannelNumber = 734260;
```

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```
const char * myWriteAPIKey = "05H0BOEL30V0OG37";
int number;
void setup() {
pinMode(sensorPin, INPUT);
Serial.begin(115200);
WiFi.mode(WIFI_STA);
ThingSpeak.begin(client);
}
void loop() {
if(WiFi.status() != WL_CONNECTED){
Serial.print("Attempting to connect to SSID: ");
Serial.println(SECRET_SSID);
while(WiFi.status() != WL_CONNECTED){
WiFi.begin(ssid, pass);
Serial.print(".");
delay(5000);
}
Serial.println("\nConnected.");
}
sensorState = digitalRead(sensorPin);
if (sensorState == HIGH){
number = 0;
}
else{
number = 500;
}
Intx= ThingSpeak.writeField(myChannelNumber, 1, number, myWriteAPIKey);
if(x == 200){
Serial.println("Channel update successful.");
}
else{
Serial.println("Problem updating channel. HTTP error code " + String(x));
}
if(sensorState == HIGH)
number = 100;
else
number = 0;
delay(20000);
}
```

IV.   RESULTS

An embedded system for hazardous gas detection is implemented. The gas sensors and the absolute critical level of the respective gas should be known, and then this system can be implemented for detecting various gases either in domestic area such as places of educational institutions, residential and industrial areas which avoids endangering of human lives. This system provides quick response to the hazardous situation. Toxic gas like CO is less sensible by human which endangers the human lives. This critical situation can be avoided by implementing the sensors for sensing the level of CO and oxygen level and is displayed every second. When the Co level exceeds normal level that is CO is greater than 30ppm and if the Oxygen level decreases below the normal level of 19ppm then the designed system provides an alarm and also the warning message to the authorized user. Ventilation is immediately provided in the cabin, by rolling down of the car windows. The implementation of a automatic gas leakage detector corresponds to decreased cases of hazardous situations leading to death caused by gas leakage in cars. These devastating events could be avoided if CO detection systems were installed. Therefore, the main idea of this research is to create a simple and easy system that has high sensitivity and can sense the presence of CO gas in a vehicle cabin. The system has then been interfaced to the microcontroller on-board system. The microcontroller has been programmed to send a signal to the logic detector circuit then to the alarm system. The development of software was then tested to ensure it worked properly with the hardware. The communication test between hardware and software was successful. The hardware responded correctly to the command sent to it. This result shows that, the system has been implemented and tested successfully. This system has been designed to produce greater flexibility, ease of implementation and lower cost.

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Fig 5 Home Page of the APP

Fig 6To enter the emergency contacts
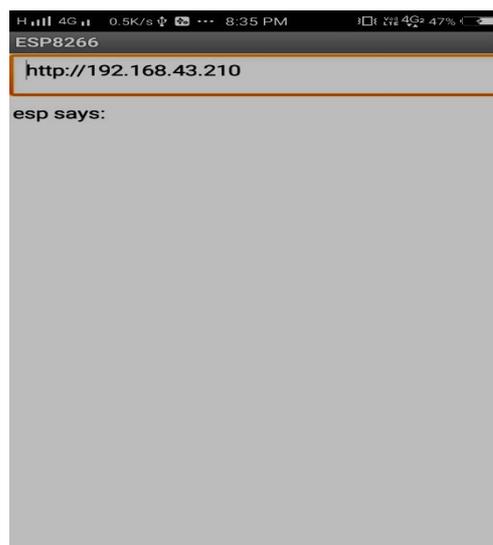
Fig 7 After entering the contacts

Fig 8 Esp status page

V. CONCLUSION

We conclude with a statement that "human life is precious". Therefore, designing and fabricating the automatic toxic gas indicator. we accomplish in fulfilling the above statement by reducing the risk of gas leaks taking place in any closed cabin of an automobile and also alerting the person with an alert SMS/Call using IOT. The mechanism of ATGI can be implemented to various other aspects of our day today life such as LPG leakage in homes, LPG leakages in industries, automobiles and so on.

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