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Design and Implementation of Car Fire Detection and Automatic Car Door Opening Using Iot

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ABSTRACT:
The immense benefits of fire detection in roadtransport cannot be overemphasized. During car fire accidents, the lives couldn't be saved because of the failure in opening the vehicle doors. There are systems available for the detection and control of fire accidents in automobiles but those systems are designed to detect the fire. The system designed to unlock the vehicle door automatically along with alerting alarm fire by giving hazard light stops the car and also opens the door automatically using IoT. The automatic system, consisting of flame, temperature, and smoke sensors as well as a re-engineered mobile carbon dioxide (CO 2)air-conditioning unit, was tested on a medium-sized physical car. An innovative, very promising solution module for hardware implementation in fire detection. Automobile industries are constantly defining and refining manufacturing techniques and services to avoid combusting their loyal customers. Yet for reasons ranging from fuel efficiency, manufacturing cost reduction, durability, through comfort and safety to aesthetics, motor vehicles are made with several potential ignition sources with prevalent threats of fire outbreak. These fires causes many deaths and injuries every year. It is very important to study the problem of automobile fire outbreak to gain better understanding of and effectively deal with the burning of automobile

KEYWORDS: Arduino uno , Node mcu, Arduino software , car safety,Gas sensor, Flame sensor.

I. INTRODUCTION

Fire prevention mainly deals with employing effective design principles to curb operational interferences that may lead to fire outbreak. This may involve but not limited to choose of materials, materials geometry and form of orientation in relation to other materials. Fire minimization concerns itself with employing fire-resistant materials in locations where there is the likelihood of fire propagation. Most automobiles have fire resistant materials serving as firewalls to protect the passenger compartment from engine compartment fire. These firewalls are now perforated with openings to allow the flow of pipes, cables and wires not seen on older automobiles. Fire suppression aims at extinguishing active fire. Most fire suppression systems require some form of contact with the fire to be more effective. Engine compartment fires sometimes knock off the bonnet locking mechanism making fire suppression more difficult in automobiles. Toxicological effects of burning cars and the ability of egested fumes to prevent escape from fire environment and induce death have long been issues of grave concern. Many resources have been directed at passenger escape or rescue from automobile fire outbreaks, leaving costly cherished vehicles prone to thermal insults, which render motor vehicles useless in 20 minutes. Abandoned and stationary vehicles are often at the mercy of arsonists and rioters. Several standards have been enacted to date but the problem of automobile fire has not been fully addressed. Combustion is defined as a self-sustaining chemical reaction between fuel and an oxidant evolving into heat, flame (light), smoke and fire gases. In the motor vehicle, the fuel in a combustion process may range from liquid/gaseous. fuels, transmission and engine oils, power steering and brake fluids, coolant and refrigerant, upholsteries, foams and plastic

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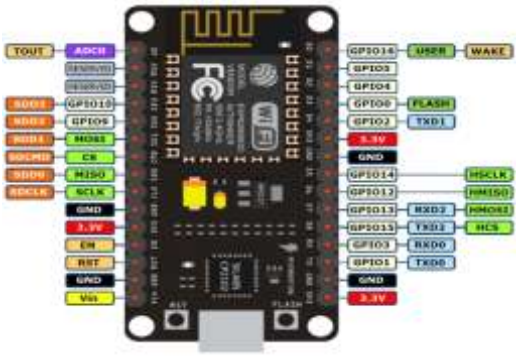
materials such as in dashboards, bumpers and wire insulations, tyres, any material being conveyed by the vehicle and probably the chassis itself. To save combustible material (automobile) from burning; oxygen, heat and the chain reaction components must be dealt with. Oxygen can be replaced directly by spray of carbon dioxide.

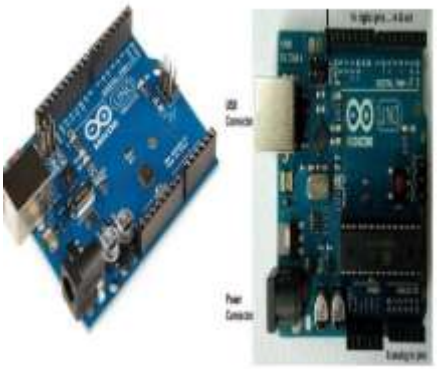
[1]. To monitor and detect fire in automobile system using various sensors such as Flame, Temperature and gas sensors. the gas sensor senses the gas smell and Fire sensor senses the fire by giving hazard light stops the car and also opens the door automatically. The gas sensor senses the gas smell

[2]. The purpose of WP1 was to provide a description of available detection technologies, a summary of relevant standards and guidelines and an overview of up-to-date research in the field of fire detection in vehicles. The results of WP1 have been published in SP Report 2015:68 "Fire detection & fire alarm systems in heavy duty vehicles : WP1 – Survey of fire detection in vehicles". The first part of that report gives a general understanding of how a fire can be detected, available technologies and how an alarm system may be structured. The main four fire signatures that are used for detection are gas, smoke, flames and heat. Gas detectors may be constructed to detect incipient gases or gases that are products of the combustion. Smoke detectors mainly react on the soot produced in case of incomplete combustion. Gas and smoke detectors may also be part of a sampling system, meaning that air is sampled and transported to the place where the detector/sensor is positioned. Flame detectors react on the radiation from the flames and may be sensitive to infrared or ultraviolet radiation, or both. At last, heat detectors are sensitive to the heat generated in the combustion process. The most comprehensive part of the report summarises the standards and guidelines that are most relevant for fire detection in vehicles. No international standard for fire detection in road- or off-road vehicles exists, which was the original rationale for this project. Instead of fire detection standards applicable for other areas were examined. There are general approval standards for fire detection, for example EN 54. These are comprehensive and useful standards, however mainly applicable for buildings. In EN 54 it is explicitly stated that it is only valid for detectors used in buildings, but can be used as a guideline for other applications. This overview is very short due to the fact that not much has been published regarding this application.

CONNECTING HARDWARE IN TO CAR



Arduino uno



Arduino uno

Express will make the ESP8266 arrangement, or family, of Wi-Fi chips Express. If Systems, a fables semiconductor organization working out for Shanghai, China, then the ESP8266 is incorporating the "ESP8285 and ESP8266EX chips". ESP8266EX (essentially alluded to as ESP8266) is a framework on-chip (SoC) that incorporates a"32-bit Tensilica microcontroller", standard sophisticated fringe interfaces, control intensifier, receiving wire switches, RFbalun, low disorder get enhancer, channels and power organization modules under a little bundle. It provides capacities to 2.4 GHz Wi-Fi (802. 11 b/g/n, supporting WPA/WPA2), simple tocomputerized transformation (10-bit ADC), mostly utilized information/yield (16 GPIO), I²S interfaces with DMA (offering pins to GPIO), Inter-Integrated circlet (I²C), serial peripheral interface (SPI), UART (on committed pins, as well to a transmit-no one but UART might be enabled on GPIO2), and heartbeat width tweak (PWM)

NodeMCU Dev Board is based on widely explored esp8266 System on Chip from Expressive. It combined features of WIFI access

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point and station + microcontroller and uses simple LUA based programming language

II. EXPERIMENTATION

POWER SUPPLY

The ac voltage, typically 220V rms, is connected to a transformer, which steps 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 a simple 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 remains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.

Transformer

The potential transformer will step down the power supply voltage (0-230V) to (0-6V) level. Then the secondary of the potential transformer will be connected to the precision rectifier, which is constructed with the help of op–amp. The advantages of using precision rectifier are it will give peak voltage output as DC; rest of the circuits will give only RMS output.

Bridge rectifier

When four diodes are connected as shown in figure, the circuit is called as bridge rectifier. The input to the circuit is applied to the diagonally opposite corners of the network, and the output is taken from the remaining two corners. Let us assume the transformer is working properly and there is a positive potential, at point A and a negative potential at point B. the positive potential at point A will forward bias D3 and reverse bias D4

The negative potential at point B will forward bias D1 and reverse D2. At this time D3 and D1 are forward biased and will allow current flow to pass through them; D4 and D2 are reverse biased and will block current flow. The path for current flow is from point B through D1, up through RL, through D3, through the secondary of the transformer back to point B. this path is indicated by the solid arrows. Waveforms (1) and (2) can be observed across D1 and D3.

One-half cycle later the polarity across the secondary of the transformer reverse, forward biasing D2 and D4 and reverse biasing D1 and D3. Current flow will now be from point A through D4, up through RL, through D2, through the secondary of T1, and back to point A. This path is indicated by the broken arrows. Waveforms (3) and (4) can be observed across D2 and D4. The current flow through RL is always in the same direction. In flowing through RL this current develops a voltage corresponding to that shown waveform (5). Since current flows through the load (RL) during both half cycles of the applied voltage, this bridge rectifier is a full-wave rectifier.

One advantage of a bridge rectifier over a conventional full-wave rectifier is that with a given transformer the bridge rectifier produces a voltage output that is nearly twice that of the conventional full-wave circuit. This may be shown by assigning values to some of the components shown in views A and B. assume that the same transformer is used in both circuits. The peak voltage developed between points X and y is 1000 volts in both circuits. In the conventional full-wave circuit shown—in view A, the peak voltage from the center tap to either X or Y is 500 volts. Since only one diode can conduct at any instant, the maximum voltage that can be rectified at any instant is 500 volts

Gas Sensor

A **gas sensor** is a device which detects the presence or concentration of gases in the atmosphere. Based on the concentration of the gas the sensor produces a corresponding potential difference by changing the resistance of the material inside the sensor, which can be measured as output voltage. Based on this voltage value the type and concentration of the gas can be estimated.

Flame sensor

A flame-sensor is one kind of detector which is mainly designed for detecting as well as responding to the occurrence of a fire or flame. The flame detection response can depend on its fitting., propane & a fire suppression system. This sensor is used in industrial boilers. The main function of this is to give authentication whether the boiler is properly working or not. The response of these sensors is faster as well as more accurate compare with a heat/smoke detector because of its mechanism while detecting.

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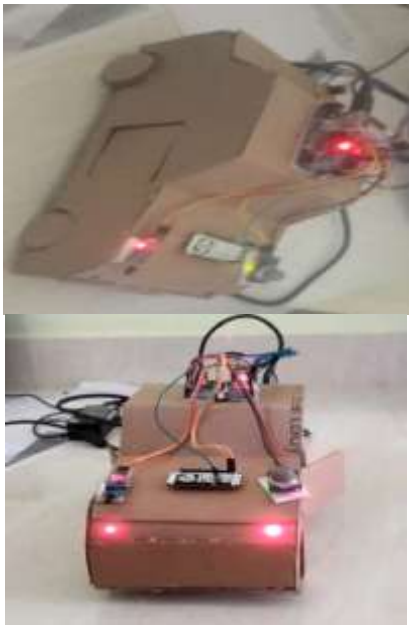

Side and front view of Hardware connecting car

III. SOURCE CODE FOR THE MICRO PROCESSOR;

```
#include <Servo.h>
Servo servo1;
Servo servo2;

int servoPin = 12;
int servoPin2 = 13;
int mq = A0;
int flamesensor=8;
int gasvls;
int flamevls;
int light=9;

void setup() {
  servo1.attach(servoPin);
  servo2.attach(servoPin2);
  pinMode(mq, INPUT);
  pinMode(flamesensor, INPUT);
  pinMode(light, OUTPUT);
  Serial.begin(9600);

}

void loop() {

gasvls = analogRead(A0);
  Serial.println(gasvls);
  delay(500);

  flamevls=digitalRead(flamesensor);
  Serial.println(flamevls);
  delay(500);
 if (gasvls > 600 || flamevls ==0) {
   digitalWrite(light, HIGH);

   servo1.write(160); // left open
   delay(1000);


   servo2.write(0); //right open
   delay(1000);

   delay(10000);


 } else {
    digitalWrite(light, LOW);

   servo1.write(0); //left close
   delay(1000);
   servo2.write(160); // right close
   delay(1000);
 }

 //servo1.write(0); //left close
 //delay(1000);

 // servo1.write(160); // left open
 //delay(1000);


 // servo2.write(0); //right open
 //  delay(1000);

 // servo2.write(160); // right close
 // delay(1000);
```

The NodeMCU programming model is similar to that of Node.js, only in Lua. It is asynchronous and event-driven. Many functions, therefore, have parameters for callback functions. To give you an idea what a NodeMCU program looks like study the short snippets below. For more extensive examples have a look at the lua_examples folder in the repository on GitHub.

```
- a simple HTTP server
srv = net.createServer(net.TCP)
srv:listen(80, function(conn)
   conn:on("receive", function(sck, payload)
      print(payload)
      sck:send("HTTP/1.0 200 OK\r\nContent-
Type: text/html\r\n\r\n<h1> Hello,
NodeMCU.</h1>")
   end)
   conn:on("sent", function(sck) sck:close() end)
end)
    -- connect to WiFi access point
wifi.setmode(wifi.STATION)
```

```
wifi.sta.config("SSID", "password")

-- register event callbacks for WiFi events
wifi.sta.eventMonReg(wifi.STA_CONNECTING,
function(previous_state)
   if(previous_state==wifi.STA_GOTIP) then
      print("Station lost connection with access
point. Attempting to reconnect...")
   else
      print("STATION_CONNECTING")
   end
end)
    -- manipulate hardware like with Arduino
pin = 1
gpio.mode(pin, gpio.OUTPUT)
gpio.write(pin, gpio.HIGH)
print(gpio.read(pin))
```

IV. CONCLUSION;

At current scenario, the above-mentioned system could be one of best fire emergency door unlocking system. It can be noticed from research papers that, there is no any mechanisms available so far to unlock the door during an automobile fire situation. A car safety system is planned here; it will facilitate to supply safety for car users furthermore as people. In the car, the gas sensor senses the gas smell and Fire sensor senses the fire by giving hazard light stops the car and also opens the door automatically. The gas sensor senses the gas smell. This is the age of automation where human efforts are reducing to a great extent. Making lives simpler and smarter.

SOME OF THE ADVANAGES FROM THE ABOVE RESULTS

- This is the age of automation where human efforts are reducing to a great extent.
- Making lives simpler and smarter .

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