Ahsanullah University of Science & Technology
Department of Computer Science & Engineering
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CSE 3216
Microcontroller Based System Design Lab

Project Final Report

Project Name: ***Alert System***

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Objective

Since the dawn of civilization, technology is being developed day by day. It is proven to be a blessing for most of the time. Life is uncertain and we may face difficulties in the most unpredictable way anytime throughout our life. But if we are smart enough, we can avoid many of the catastrophes using the power of technology.

In our house, many hazards can occur like fire breakouts, gas leakage which we may not notice initially. In this pandemic situation, it is also needed to be checked if the outsider entering our house is in good physical condition or not. "Alert System" will alert the house residents in these scenarios. If there is any fire breakout or gas leakage , the Alert system will alert the house residents and spray water into the fire if there is any.This will also alert people if someone with high temperature is entering the house which is very essential in this COVID-19 pandemic situation.

Social Values

As the system alerts us about various situations like fire or gas leakage,it will be very much helpful in homestead uses.It will be economically beneficial as we used cheap device and modules and did our best to reduce the pricing.

No one can predict a pandemic or catastrophe. But using our skills and technology, we can reduce the affect or take precautions from them. We hope to achieve our goal to help people with this project, If people use this they will be able to reduce a lot of risks in their daily life.

Required Components

These following parts and tools are required for building this project

- **Arduino MEGA(2560):** The Mega 2560 is a micro-controller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the micro-controller; simply

connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.This micro-controller will work as the brain of the system

- **Flame Sensor:** A flame detector is a sensor designed to detect and respond to the presence of a flame or fire, allowing flame detection. Responses to a detected flame depend on the installation, but can include sounding an alarm, deactivating a fuel line (such as a propane or a natural gas line), and activating a fire suppression system.

- **Buzzer:** A buzzer or beeper is an audio signalling device,which may be mechanical or electro-mechanical. Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

- **MQ-2 Gas sensor:** MQ2 gas sensor is an electronic sensor used for sensing the concentration of gases in the air such as LPG, propane, methane, hydrogen, alcohol, smoke and carbon monoxide.MQ2 gas sensor is also known as chemiresistor. It contains a sensing material whose resistance changes when it comes in contact with the gas. This change in the value of resistance is used for the detection of gas.

- **LM35 Temperature Sensor:** LM35 is a precision IC temperature sensor with its output proportional to the temperature (in C).With LM35. It also possess low self heating and does not cause more than 0.1 degree C temperature rise in still air. The operating temperature range is from -55C to 150C.

- **Infrared Sensor:** An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measure only infrared radiation. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation.

- **16X2 LCD Display:** The LCD display is used to display the alert functionality.It will display any typed alert signal as designed.

- **L293D Motor Driver:** L293D H-bridge driver is the most commonly used driver for Bidirectional motor driving applications. This L293D IC 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.

- **DC Motor:** Motor will rotate and generate a torque.In physics and mechanics, torque is the rotational equivalent of linear force. It is also referred to as the moment, moment of force, rotational force or turning effect, depending on the field of study.so it can be used as a valve also.

- **LED:** The Light emitting diode is a two-lead semiconductor light source.The LED is a special type of diode and they have similar electrical characteristics of a PN junction diode. Hence the LED allows the flow of current in the forward direction and blocks the current in the reverse direction.

- **Male to Male, Female to Female and Male to Female wire :** the wires will connect the whole circuitry.

Design

The proposed circuit diagram is given below.

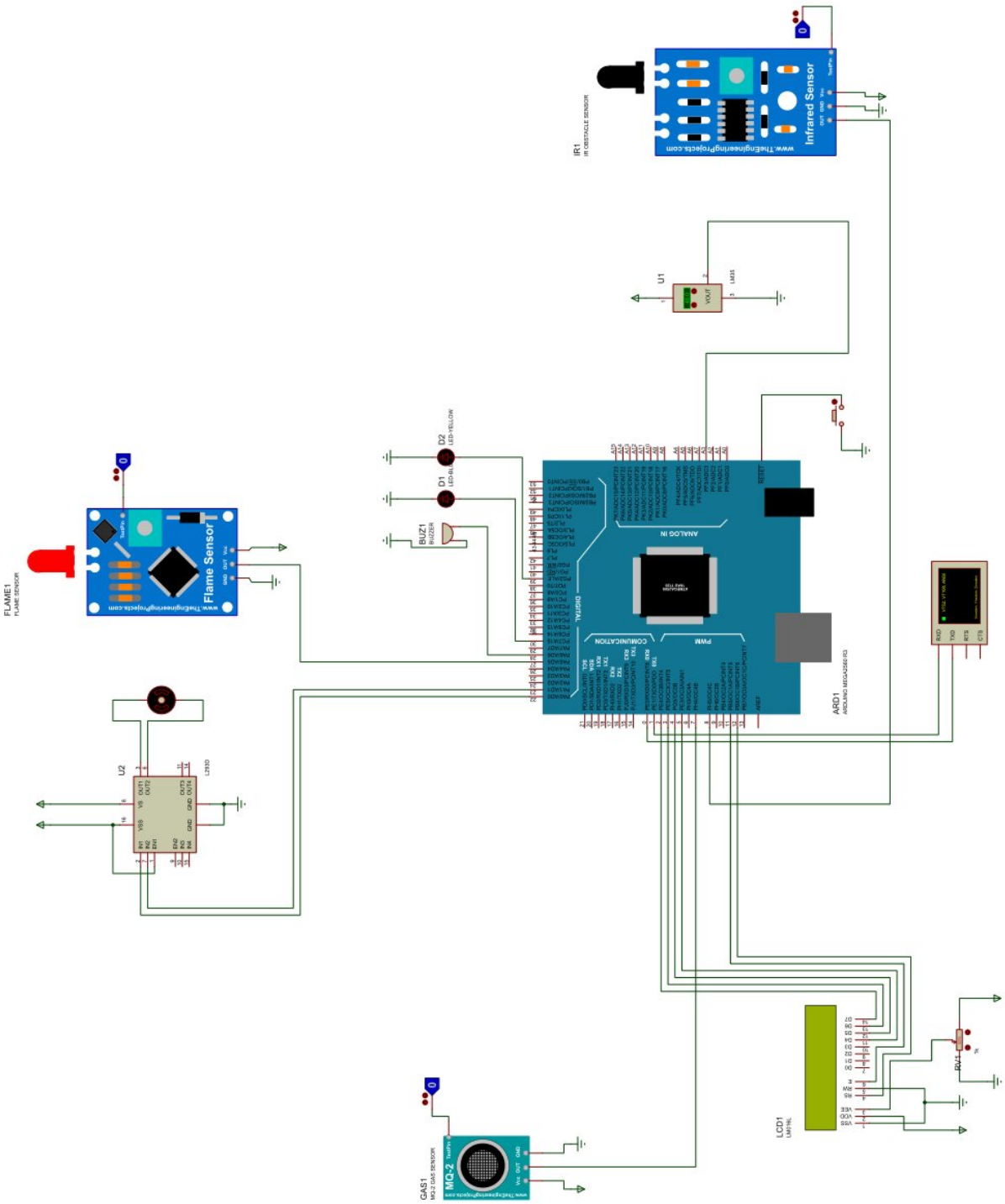


Figure 1: Proteus Design for Alert System

Working Procedure

There are three major components in our Alert system

- Fire Alert (Flame Detection)
- Gas Alert (Chemical concentrated air detection)
- COVID-19 Suspect Alert

The system will alert the user in three scenarios - if there is any flame, if there is any gas leakage or if someone with high temperature enters the house. The LED and buzzer will be used to alert the user.

Flame Alert: For this alert sub system we used a Flame sensor.The main working principle of a Flame sensor is it detects the presence of fire or flames.If there is no flame or fire the sensor normally pass a LOW value to Arduino .When there occurs a situation where the flame sensor detects presence of fire or flame it will pass the Arduino a HIGH value.When the Arduino gets the HIGH value it will initiate(turn ON) a motor which is driven by L293D motor Driver. The motor is connected with main water tank through a pipe.The motor will act as an opening valve that pass the water through the pipe.When the Arduino gets the HIGH value it will also turn a Buzzer and a LED on to alert the people inside alert-zone(home). Thus ensure the safety of the people.

Gas Alert: For this alert sub system MQ2-Gas Sensor is used.This is a robust Gas sensor suitable for sensing LPG, Smoke, Alcohol, Propane, Hydrogen, Methane and Carbon Monoxide concentrations in the air.It is a Metal Oxide Semiconductor (MOS) type Gas Sensor also known as Chemiresistors as the detection is based upon change of resistance of the sensing material when the Gas comes in contact with the material.When the gas sensor detects such presence of Gas it will pass the HIGH value to Arduino and the Arduino will turn a LED. Watching the LED glowing people will get alerted of such presence of gases.

COVID-19 Suspect Alert For this alert sub system we use a IR sensor, a temperature sensor (LM35), a 16x2 LCD display. People who wants to enter the house will stand in front of the temperature checking module. This module uses infrared sensor to detect whether there is a person in front of the home or not. If a person is present the IR sensor will pass a HIGH value to Arduino. When the Arduino gets HIGH value

From IR sensor it will initiate the LM35 temperature sensor. The temperature sensor will detects the body temperature of the individual who is standing outside the house. Now after getting the temperature we are comparing the value with WHO recognized temperature value who is not been affected with COVID-19. In the COVID-19 rules and regulations recognized by WHO it says "A person who is infected with COVID-19 will have a body temperature higher than 100 degree Fahrenheit". So we compare our value received from LM35 with 100 degree Fahrenheit. If the temperature in higher than 100 degree Fahrenheit that person or individual might be affected by COVID-19. So it will be potentially harmful for the people inside the house.SO we used a LCD display and print a "ALERT" signal. So the people get alerted about the individual outside the home.

Estimated budget

Equipment	**Quantity**	**Budget(Tk)**
Arduino Mega 2560 (China)	1	750
KY-026 Flame sensor	1	300
16x2 Serial LCD Module Display	1	350
MQ-02 GAS Module	1	150
LM35 Temperature Sensor	1	100
IR Sensor	1	120
Buzzer	1	15
LED	As required	5
Male to Male, Female to Female and Male to Female wire	As required	100
Male/Female headers	As required	40
Double connection on/off switch	1	100
Breadboard	4	400
Card Board	4	250
Cutter	1	50
Pipe	As required	40
Soldering Iron	1	150
Total		**2,920**

Code

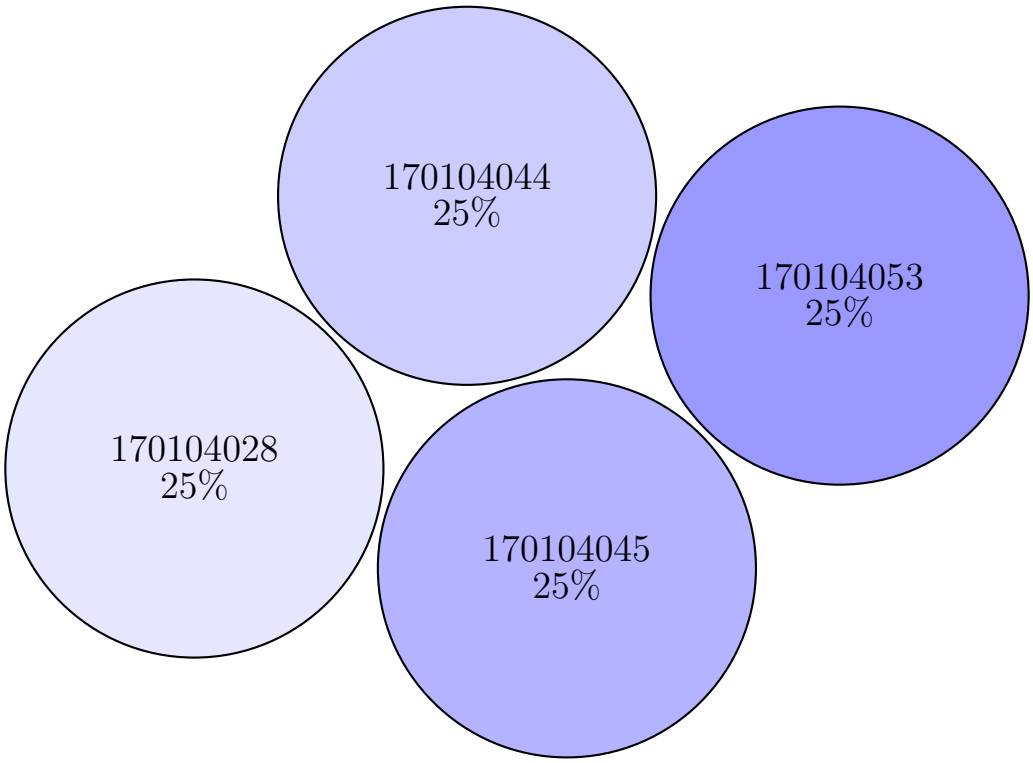
```

#include <LiquidCrystal.h> //this is for servo motor header file

/******************** initialize all pin value  **********************/
/**
 *
 * rs pin                  ⟹   12
 * en pin                  ⟹   11
 * d4 pin                  ⟹   5
 * d5 pin                  ⟹   4
 * d6 pin                  ⟹   3
 * d7 pin                  ⟹   2
 * buzzer pin              ⟹   28
 * LED pin                 ⟹   30
 * LED2 pin                ⟹   39
 * flame_sensor pin        ⟹   27
 * inf sensor pin          ⟹   8
 * gas sensor pin          ⟹   7
 *
 */

//lm35(temperature) sensor pin number
int lm35 = A3;

//Gas sensor pin number
int Gas = 7;

//buzzer pin number
int buzzer = 28;

//LED pin number
int LED = 30;
int LED2 = 39;

//flame sensor pin number
int flame_sensor = 27;

//infrared sensor display pin number
int inf = 8;

//LCD display pin number
const int rs = 12, en = 11, d4 = 5, d5 = 4, d6 = 3, d7 = 2;
/******************** ending all pin value  **********************/


/******************** initialize all variables  **********************/
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);
bool isFlame = 0;
bool isGas = 0;
bool isIr = 0;
int value = 0;
/********************  ending all variables  **********************/

/******************** setup function for arduino  **********************/
```

```
void setup()
{
  Serial.begin(9600);
  pinMode(buzzer, OUTPUT);
  pinMode(LED, OUTPUT);
  pinMode(LED2, OUTPUT);
  pinMode(flame_sensor, INPUT);
  pinMode (Gas , INPUT);
  pinMode (inf , INPUT);
  pinMode(22, OUTPUT);
  pinMode(23, OUTPUT);
  lcd.begin(16, 2);
  lcd.setCursor(0, 0);
  lcd.clear();
  lcd.print("Initializing..");
  delay(500);
  lcd.clear();
}
/******************* ending setup function for arduino
    **********************/

/******************* fever detection function **********************/
void feverAlert() {
  lcd.setCursor(4, 1);
  lcd.print("ALERT!!!");
  delay(100);
}

/******************* loop function for arduino **********************/
void loop()
{
  delay(100);
  if (digitalRead(flame_sensor) == HIGH ) //digitalRead for flame sensor is
    HIGH
  {
    isFlame = 1;
    Serial.println("Flame detected...! take action immediately.");
    digitalWrite(buzzer, HIGH);
    digitalWrite(LED, HIGH);
    digitalWrite(22, HIGH);
    digitalWrite(23, LOW);
  }
  if (digitalRead(flame_sensor) == LOW ) //digitalRead for flame sensor LOW
  {
    isFlame = 0;
    Serial.println("No flame detected. stay cool");
    digitalWrite(buzzer, LOW);
    digitalWrite(LED, LOW);
    digitalWrite(22, LOW);
    digitalWrite(23, LOW);
  }

  if (digitalRead(Gas) == HIGH) {  //digitalRead for Gas sensor HIGH
    isGas = 1;
    Serial.println("YES GAS");
  }
  if (digitalRead(Gas) == LOW) { //digitalRead for Gas sensor LOW
    isGas = 0;
```

```
    Serial.println("NOT GAS");
  }

  if (digitalRead(inf) == HIGH) {  //digitalRead for infrared sensor HIGH
    Serial.println("Present");
    isIr = 1;
  }
  if (digitalRead(inf) == LOW) {  //digitalRead for infrared sensor LOW
    Serial.println("Absent");
    isIr = 0;
  }

  //analogRead for lm35(temperature) sensor
  value = analogRead(lm35);

  //calculate temperature values
  float milivolts = ( value / 1024.0) * 5000;
  float cel = milivolts / 10;
  float farh = (cel * 9) / 5 + 32;


  String tempFar;
  tempFar = String(farh);
  lcd.clear();
  if (isIr == 1) { //when infrared true

    Serial.print("TEMPRATURE = ");
    Serial.print(cel);
    Serial.print("*C");
    Serial.println();

    Serial.print("TEMPRATURE = ");
    Serial.print(farh);
    Serial.print("*F");
    Serial.println();

    lcd.setCursor(4, 0);

    lcd.print(tempFar + " *F");

    if (farh > 100) { //when body temperature in greater then 100
      feverAlert();
      digitalWrite(LED2, HIGH); // Blink LED 2
    }
    else {
      digitalWrite(LED2, LOW); // Unblinking LED 2
      lcd.setCursor(4, 1);
      lcd.print("Fine");
    }

    lcd.clear();
  } else {
    digitalWrite(LED2, LOW);
  }
  delay(200);

}
```

```
169 /******************** ending loop detection function ********************
    */
```

Members Contribution



Difficulties

As we tried to make a virtual version of the proposed hardware project we faced some difficulties. Some of them are -

- We wanted to use MLX90614 Temperature Sensor for detecting fever but we couldn't find any Proteus library for this sensor. We used LM35 sensor instead for a virtual representation.
- We wanted to use the Red LED module in Proteus for flame detection alert but found it buggy as it did not turn off when the simulation was turned off. So, we used the Blue LED module instead.

- One of our functionality required connection with water supply and it was not possible to implement it as we wanted it to be.
- It was difficult to make the simulation as much close to the real hardware project.

Future Work

In future we will make a IOT system by which we can track someone's temperature and his family member's temperature then he will get full idea about his family health (Our IOT system will inform him this by data analysis).By getting huge data-sets and analysing them we can make a regression equation and reduce hardware dependency in future, then we can divide a city in some zone, so that government can take some initiative for keeping people safe or stop spreading virus.

Conclusion

Considering the safety issues of our loved ones and the people of our society, we tried to make an effort to improve our lives by ensuring better safety. We may not be able to avoid hazards every time but we can always take precautions to prevent or minimize the effect. And we believe, this device will go a long way to get things done. Although humble in the scale and usability of the device we hope that the impact it will create will be greater than the size of the instrument.

Changes From Initial Proposal

For some improvements and limitations, we could not implement this project as we wanted it initially.

- AS MLX90614 Temperature Sensor module was not available in Proteus library, we used LM35 Sensor module for temperature analysis
- We used the infrared sensor to detect if a person is present and then analysed that person's temperature. This was not included in our initial proposal but we implemented it for a good user experience.
- One of the functionalities of our project was to spray water if fire was detected. We couldn't implement it as we wanted it initially in this virtual environment.