MID TERM REPORT

ON

FOREST FIRE DETECTION AND EXTINGUISHER

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About the Project:-

The fire in the forest is by natural fire or man-made fire and it results into land clearing and deforestation. Natural forest fire includes an unplanned burning of Trees, bushes, and wood due to lightning, while human-induced forest fire results from the unauthorized burning practice of forests for attaining farmland.

Fire Detectors play a very important role in this field because it help in detecting fire or smoke at an early stage and can help in saving Trees. Commercial Fire detecting systems usually have an alarm signaling, with the help of a buzzer or Siren. We have designed an IOT based Fire detection and Extinguisher System using Temperature and a smoke sensor,GPS system , Motor pumps which would not only signal the presence of fire in a particular premise but will also help as a extinguisher as we use pumps so that the the automatically pumps get on and water the fire so that fire can not spread in the forest and through GPS we can find exact location so that we can call authorities for further Safety. These System do not require any Human interaction.

Objective of the Project:-

Detection of fire in forest is necessary to avoid destruction of trees due to fire accidents both natural and induced. Detection of fire can prove to be very important as it could mean the difference between life and death. Fires can occur from anywhere and at any point of time, hence the presence of Fire Alarm System helps in keeping Trees and Wildlife safe. One of the most destructive properties of fire is that it spreads exponentially and with the right medium can spread uncontrollably. To overcome from this problem we have used motors in this system so that whenever sensor sense fire our automatic system can sprinkle water on the fire using motor so that it does not spread vigorously.

Audience Target:-

We have made this system basically for the Wild Forest because it is very difficult to reach their and also difficult to extinguish the fire .
Butt we can use this system in many other places like big malls, a large playground, temples and in many ways as we know sometimes fire is a natural process and it is also unplanned. This is why timely detection of fire is necessary for avoiding a fire hazard.

System Design:-

System design is the most creative phase of system development. The term describes system and the process by which it is developed. The question in system design is: How the problem is to be solved?

A systematic method has to achieve beneficial results in the end. It involves starting with a vague idea and developing it into a series of steps.The series of steps for successful system design are:

The first step is to study the problem completely because we should know the goal .We should see what kind of output we require and what kind of input we give so that we can get the desired output.

We should see what kind of program should be developed to reach the final goal.Then we write individual programs,which later on joining solve the specified problem.Then we test these programs and make necessary corrections to achieve the target of the program.

We have code of sensors like Gas sensor, flame sensor, GPS sensor,DHT11 sensor.

1.) **Gas Sensor:-** Gas sensor is a device that sense the presence of gases in an area, often as part of safety system. This type of sensor is important because there are many gases that can be harmful to organic life,such as humans or animals. Here we have used gas sensor to detect the methane gas to control fire in the forest.

```
int
redLed=12;
                int greenLed=11;
                int smokeA0=A0;
                //Threshold value
                int sensorThres=400;
                void setup() {
                  // put your setup code here, to run once:
                Serial.begin(9600);
                pinMode(redLed,OUTPUT);
                pinMode(greenLed,OUTPUT);
```

```
pinMode(smokeA0,INPUT);
}
void loop() {
  // put your main code here, to run
repeatedly:
int analogSensor=analogRead(smokeA0);
Serial.print("Pin A0:");
Serial.println(analogSensor);
//check the value and compare with threshold
value
if(analogSensor>sensorThres)
{
  digitalWrite(redLed,HIGH);
  digitalWrite(greenLed,LOW);
}
else
{
  digitalWrite(redLed,LOW);
  digitalWrite(greenLed,HIGH);
}
delay(100);
}
```

2.) **DHT11 Sensor:-** The DHT11 is a commonly used Temperature and Humidity sensor. The sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data.

The sensor can measure temperature from 0 to 50 degree celcius and humidity from 20% to 90%.

This is sensor is highly easy to setup because DHT11 sensor is factory calibrated and outputs serial data and hence easy to set it up.

```
#define DHTTYPE DHT11   // DHT 11 #define dht_dpin 0
# define dht_dpin 0
DHT dht(dht_dpin, DHTTYPE);
void setup(void)
{  dht.begin();
 Serial.begin(9600);
 Serial.println("Humidity and temperature\n\n");
 delay(700);
}
void loop() {
```

```
float h = dht.readHumidity();
float t = dht.readTemperature();
Serial.print("Current humidity = ");
Serial.print(h);
Serial.print("%  ");
Serial.print("temperature = ");
Serial.print(t);
Serial.println("C");
delay(800);
}
```

3.) **Flame Sensor:-**It is mainly designed for detecting as well as responding to the occurrence of a fire or flame. The flame detection response can depend upon its fitting.

```
int Flame = HIGH;
int flag=0;
void setup()
{
   Serial.begin(9600);
   pinMode(flamePin, INPUT);
}
void loop()
{
Flame = digitalRead(flamePin);
if (Flame== LOW && flag==0){
Serial.println("Fire!!!");
flag = 1;
}
else{
Serial.println("No worries!");
flag=0;
}
}
```

GPS sensor:- The Global Positioning System is a satellite-based radionavigation system owned by the United States government and operated by the United State Space Force. It is one of the global navigation satellite systems that provides geolocation and time information to a GPS receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites.

```
#include <TinyGPS.h>
float lat ,lon ; // create variable for latitude and longitude
object
SoftwareSerial gpsSerial(3,4);//rx,tx
TinyGPS gps; // create gps object
void setup(){
Serial.begin(9600); // connect serial
Serial.println("The GPS Received Signal:");
gpsSerial.begin(9600); // connect gps sensor
}
void loop(){
while(gpsSerial.available()){ // check for gps data
if(gps.encode(gpsSerial.read()))// encode gps data
{
gps.f_get_position(&lat,&lon); // get latitude and longitude
// display position
Serial.print(lat);
Serial.print(" ");
Serial.print(lon);
Serial.print(" ");
}
}
String latitude = String(lat,6);
String longitude = String(lon,6);
Serial.println(latitude+";"+longitude);
delay(1000);
}
```

Integration Testing:- Integration testing is defined as a type of testing where software modules are integrated logically and tested as a group. A typical software project consists of multiple software modules,coded by different programmers.

```
#include <TinyGPS.h>
float lat ,lon ; // create variable for latitude and longitude
object
SoftwareSerial gpsSerial(3,4);//rx,tx
TinyGPS gps; // create gps object
int flamePin = 11;
int Flame = HIGH;
int flag1=0;
int flag2=0;
// for gas
int redLed=12;
int greenLed=11;
int smokeA0=A0;
```

```
//Threshold value
int sensorThres=400;
// for dht11
#include <DHT.h>        // including the library of DHT11
temperature and humidity sensor
#define DHTTYPE DHT11   // DHT 11 #define dht_dpin 0
# define dht_dpin 0
DHT dht(dht_dpin, DHTTYPE);
void setup()
{
    Serial.begin(9600);
    pinMode(flamePin, INPUT);
    pinMode(redLed,OUTPUT);
    pinMode(greenLed,OUTPUT);
    pinMode(smokeA0,INPUT);
    dht.begin();

    Serial.println("Humidity and temperature\n\n");

    Serial.println("The GPS Received Signal:");
    //gpsSerial.begin(9600); // connect gps sensor
    delay(700);

}
void loop()
{
Flame = digitalRead(flamePin);
if (Flame== LOW && flag1==0){
Serial.println("Fire!!!");
flag1 = 1;
}
else{
Serial.println("No worries!");
flag1=0;
}
// for gas
int analogSensor=analogRead(smokeA0);
Serial.print("Pin A0:");
Serial.println(analogSensor);
//check the value and compare with threshold value
if(analogSensor>sensorThres)
{
  digitalWrite(redLed,HIGH);
  digitalWrite(greenLed,LOW);
  flag2=2;
}
else
{
  digitalWrite(redLed,LOW);
```

```
  digitalWrite(greenLed,HIGH);
  flag2=0;
}
delay(100);
// for dht11
float h = dht.readHumidity();
float t = dht.readTemperature();
Serial.print("Current humidity = ");
Serial.print(h);
Serial.print("%");
Serial.print("temperature = ");
Serial.print(t);
Serial.println("C");
delay(800);
//Serial.println("Flame is")
while(gpsSerial.available()){ // check for gps data
if(gps.encode(gpsSerial.read()))// encode gps data
{
gps.f_get_position(&lat,&lon); // get latitude and longitude
// display position
Serial.print(lat);
Serial.print(" ");
Serial.print(lon);
Serial.print(" ");
}
}
String latitude = String(lat,6);
String longitude = String(lon,6);
Serial.println(latitude+";"+longitude);
delay(1000);
}
```

Challenges:-Main challenges which we faced included:-

- Thinking about different implementations of sensor's code.
- How to integrate code properly without any error
- To find libraries which we have to added according to our requirements
- Connecting with the server

Future planning:-

In Further project we will use database and we will store data into that and we will use that data to give information through server by using GPS sensor and all other sensor the condition of fire. And we will also motor pumps to sprinkle water to extinguish that fire.

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