

# Forest Fire Detection and Caring System

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**Abstract:** It has been found in survey that 80% losses caused due to fire would have been kept away from if the fire was identified promptly. UNO Arduino based fire indicator and observing framework is the answer for these issue. In these task, we have assembled fire finder utilizing UNO Arduino which is interfaced with a temperature sensor, a smoke sensor & humidity sensor. The temperature sensor detects the warmth and smoke sensor detects any smoke produced because of fire. The buzzer associated with Arduino gives us an alert sign. At whatever point fire is activated & produces smoke senses by the sensor & it send the emergency message and location to the forest department. Fire alarm gives indication in forest department through Arduino and GSM and forest department take action on situation. Then it helps to protect our forest and animals from fire. The additional feature is taking care of forest and animal wildlife. This feature is rainwater measurement detector in forest areas. This system is mostly use in rainy season. For how much rain are dropped in the forest & how much. Rain is sufficient to the forest & Animals.

**Keywords:** Forest fire, Sensors, Arduino, GSM messaging, Alarm, Rainwater measurement.

## 1. Introduction

Forest fire detection system are gaining a lot of attention because of the continue threat from fire to both economic properties and public safety. Hundreds of millions of hectors and destroyed by wildfire each year and over 200000 forest fire happen every year in the world. Forest fires destroy a total area of 3.5 to 4.5 million km. The solution of this situations or problems we invent forest fire detection and caring system project. In this project we use Arduino, GSM, temperature and carbon monoxide sensors, alarm and rainwater measurement detector. In our project fire present in forest our sensor sense the temperature and smoke and it send message and exact location of this place to forest officer mobile and alarm is create voice in forest department by using Arduino programming and GSM. This system helps to finding fire place. Then forest department takes action on this problem and protects forest and animals from fire. This system minimizes problems faster than other system. In this project we add additional feature for taking care of forest and animal wildlife. This feature is rainwater measurement detector in forest areas. This system is mostly use in rainy season. For how much rain are dropped in our forest? and how many rain are sufficient to our forest and animals? It take care of our forest and animal wildlife and make ecosystem balancing.

## 2. Literature review

Forest fire detection and caring system is important for forest wildlife. and it also important for our future. Our project plays vital role for maintaining earth's ecological system. In this project we use Arduino. GSM, heat sensor, carbon monoxide sensor, alarm and rainwater measurement detector. The fire is created in forest then this fire temperature and carbon gases senses our temperature sensor and smoke sensor. And it sends emergency message and location and alarm is created voice in forest department through Arduino and GSM and forest department take action on situation. then it helps to protect our forest and animals from fire. And in rainy season our rainwater measurement detector measures rainwater in mm for how many rainwater are dropped in forest for taking care and precaution of forest and animals.

The scope of our project in future fire accidents can be controlled to great extent in places such as forest homes, colleges, industries, trains and some other public places. fire accident creates to death of local people by using this technique we can save those lives' easily. To detection of temperature and smoke we can easily minimizes and early than other system. In the future scope we can implement this project by using carbon monoxide and temperature sensors, Arduino, GSM, alarm to detect the fire and exact location. To avoid decreasing of forest trees and decreased animal categories. The main scope of our project when the trees are burned due to fire which causes more emission of carbon dioxide and reduction in oxygen. For example – In Brazil the forest known as Amazon this provides 20 % of oxygen of total world. The forest was burned due to fire and more CO2 emission and reduction in oxygen which affected by whole world.

## 3. Proposed methodology and Operating principal

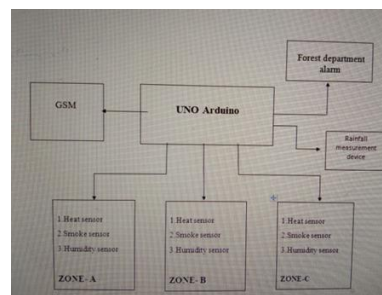


Fig. 1. Block diagram

In forest fire detection and caring system we are using different types of sensors like heat sensor, humidity sensor, smoke sensor is installed in different zones of forest. This sensor is connected to UNO Arduino. In UNO Arduino the values are sated and it compare with sensors value and when there is change in signal is transmitted (alarm) to the forest office department with the help of GSM module. The GSM send signal in forest department through messaging system. In this system it sends message with location and how many heat and smoke are produced in forest due to fire. This all features we add in our messaging system. The new feature we added in our project is rainfall measurement device. It measures rainfall falling in our forest, it measures how many rainfalls falling in forest and it is helpful in summer days for taking care of forest trees and wild animals. This feature solves water problem in forest.

**A. UNO Arduino**

The Arduino Uno is a microcontroller board based on the ATmega328. In UNO Arduino 0 to 7, 8 to 13 are total 14 digital pins are available and A0 to A5 are total 6 analog pins are available and operating voltage 12V. Arduino can interact with buttons, LEDs, motors, speakers, GPS units, cameras, the internet, and even your smart-phone or your TV! This flexibility combined with the fact that the Arduino software is free, the hardware boards are pretty cheap, and both the software and hardware are easy to learn has led to a large community of users who have contributed code and released instructions for a huge variety of Arduino-based projects.



Fig. 2. Arduino

It is easy-to-find the microcontroller brain which is the ATmega328 chip. It has more number of hardware features like timers, external and internal interrupts, PWM pins and multiple sleep modes. It is very convenient to manage power inside it and it had a feature of built-in voltage regulation. This can also be powered directly off a USB port without any external power. You can connect an external power source of upto 12v and this regulates it to both 5v and 3.3v.

**B. Global system for mobile communication (GSM)**



Fig. 3. Global system for mobile communication

It sends information from the mobile station to the base transceiver station and the GSM operating voltage is 12V. GSM stands for Global System for Mobile Communication. It is a digital cellular technology used for transmitting mobile voice and data services. GSM makes use of narrowband Time Division Multiple Access (TDMA) technique for transmitting signals. GSM provides basic to advanced voice and data services including roaming service. Roaming is the ability to use your GSM phone number in another GSM network. We use GSM for messaging on mobile and the GSM is connected to Arduino and sensor are also connected to Arduino and when fire creates on forest the sensors are senses and Arduino send signal to GSM module and GSM send message to mobile. The message type is given below.

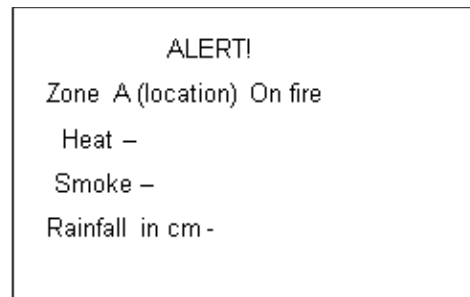


Fig. 4. Message

**C. Smoke sensor**

The smoke sensor is senses the smoke cause due to fire in forest .and it is operating voltage is 5V and operating current is 3 amp. The smoke detector has two ionization chambers, one open to the air, and a reference chamber which does not allow the entry of particles. Smoke detectors in large commercial, industrial, and residential buildings are usually powered by a central fire alarm system, which is powered by the building power with a battery backup. Domestic smoke detectors range from individual battery-powered units, to several interlinked mains-powered units



Fig. 5. Smoke sensor

#### D. Heat and humidity sensor

The heat and humidity sensor sense the heat and humidity of atmosphere cause due to fire in forest. The operating voltage is 3.3 to 5 V and operating current is 0.3 Amp. A heat detector is a fire alarm device that detects the changes in the fire or heat. Any change in the heat that exceeds the range of heat sensor ratings is sensed by using the heat sensor. To avoid fire accidents, a heat sensor generates a signal that alerts and helps avoid damage.

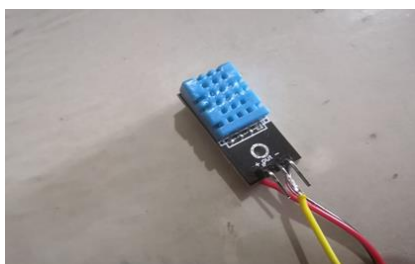


Fig. 6. Heat and humidity sensor

#### E. Fire Alarm (Buzzer)

The alarm directly connected to the Arduino, then the fire will cause Arduino send signal and alarm is creating voice in forest department. It operates on DC voltage and it operating voltage is 9V. A fire alarm system has a number of devices working together to detect and warn people through visual and audio appliances when smoke, fire, carbon monoxide or other emergencies are present. These alarms may be activated automatically from smoke detectors, and heat detectors or may also be activated via manual fire alarm activation devices such as manual call points or pull stations. Alarms can be either motorized bells or wall mountable sounders or horns.



Fig. 7. Fire Alarm (Buzzer)

#### F. Rainwater measurement device



Fig. 8. Rainwater measurement device

The additional feature is taking care of forest and animal wildlife. This feature is rainwater measurement detector in forest areas. This system is mostly use in rainy season. For how much rain are dropped in the forest & how much. Rain is sufficient to the forest & Animals. In our rainwater measurement device has 5 pins. In these one is anode and other four is cathode and first pin is given to 5V port of Arduino and other pins are go to 8 to 12 port of Arduino.

#### 4. Result

In our project fire present in forest, our sensor sense the temperature and smoke and it send message and exact location of this place to forest officer mobile and alarm is create voice in forest department by using Arduino programming and GSM. This system helps to finding fire place. Then forest department takes action on this problem and protects forest and animals from fire. This system minimizes problems faster than other system. It is used for forest protection purpose, industrial propose, commercial, residential purpose, it used rainfall measurement in forest.

#### 5. Conclusion

Forest fire detection and caring system is important for forest wildlife. and it also important for our future. Our project plays vital role for maintaining earth's ecological system. The fire is created in forest then this fire temperature and carbon gases senses our temperature sensor and carbon monoxide sensor. And it sends emergency message and location and alarm is created voice in forest department through Arduino and GSM and forest department take action on situation. then it helps to protect our forest and animals from fire.

#### References

- [1] Stipanicev D., Vuko T., Krstinic D., Stula M., Bodrozic L., "Forest Fire Protection by Advanced Video Detection System- Croatian Experiences", Split, Croatia, 2006.
- [2] Losso A., Corgnati L., Perona G., "Early Forest Fire Detection: Smoke Identification through innovative Image Processing using Commercial Sensors", Environment Including Global Change, Palermo, Italy, 2009
- [3] Kovacs R., Kiss B., Nagy A., Vamos R., "Early Forest Fire Detection System for Vegetable Fire in the Aggtelek National Park", Budapest, Hungary.

- [4] Kelha V., Rauste Y., Buongiorno A., "Forest Fire Detection by Satellites for Fire Control", European Space Agency, Finland, 2000.
- [5] K. Mayer, K. Ellis, and K. Taylor, "Cattle Health Monitoring Using Wireless Sensor Networks," In Proc. Communication and Computer Networks Conference (CCN 2004), 2004, pp. 8-10.
- [6] J. Polastre, R. Szewczyk, A. Mainwaring, D E. Culler and J. Anderson, "Analysis of Wireless Sensor Networks for Habitat Monitoring," In Proc. Wireless sensor networks, Boston, MA, 2004, pp. 399-423.
- [7] R. Szewczyk et. al., "Habitat Monitoring With Sensor Networks," Communications of the ACM - Wireless sensor networks, vol. 47, no. 6, pp. 34-40, 2004.