FOREST FIRE PREDICTION SYSTEM

Rachitha.K.T[1], Sanchitha.N.[2]
Vidya Vardhaka College of Engineering, Mysore.

Abstract

The forest is considered as one of the most important and reliable resources. A forest fire is an uncontrolled fire that occurs in nature. Sometimes, the forest fire is so large that it takes a long time for the fire control authorities to gain control over the situation. This could result in massive destruction. Forest fire is affected by some human uncontrolled behaviour in social activities and abnormal natural factors. It was considered as one of the severest disasters, which destroyed forest resources safety and threatened human-living environment.

The prevention and detection of the forest fire, have been researched hotly in worldwide Forest Fire Prevention Departments. Based on the deficiencies of conventional forest fire detection on real time and monitoring accuracy, we introduced the wireless network prediction system to prevent the forest fire before the actual fire catches up the forest areas.

Index Terms: wireless network, GSM, arduino, DHT11 temperature sensor, gas sensor, control room.

I. INTRODUCTION

A. why forest fire should be detected?

FOREST fire is the most reliable resource requires for every living being on this planet. living forests are an important part of the earth's climate system.

Human-caused fires constitute the greater percentage of forest fires in our forests, but natural fires constitute the great majority of the total area burned.

B. forest fire detection using wireless sensor network:

In the wireless sensor network, a mass of integrated Microsensor nodes were deployed in the monitoring area, and each of these nodes contain a temperature sensor, which can predict high temperature which can lead to fire. each node also contain humidity sensor. they are also deployed with gas sensors, if in case the forest fire is detected.

By the cooperative nodes, those information conducted by embedded systems, then transferred to the user. The information is sent to the forest control rooms with the help of wireless network ,in this case,we make use of GSM module.

The nodes deployed in the forest collect the dynamic changing fire information such as temperature, humidity, carbon-monooxide gas real-timely. The wireless sensor network technique sets an alarm as well as sents a message to the respective authorities to quickly take the appropriate measures to fight the fire or to provide basis for decision making.

II.REAL APPLICATION OF DETECTION SYSTEM

A. Advantages of wireless network over traditional methods

[1]Traditional forest fire prevention methods usually include methods such as patrols, observation from watch towers and satellite monitoring(which have been adopted from recent times). Although observation from watch towers is feasible, it has several defects. This method requires many financial and material resources and a trained labour, but the labour may show carelessness, absence from the post, inability for real-time monitoring and the limited area coverage.

The application of satellite detection systems is also restricted by a number of factors, which reduces its effectiveness in forest fire detection. To overcome all the drawbacks as mentioned above, we have come up with a modification to

the traditional method, by using various wireless network methods.

B. Components,part of the forest fire detection system

Main components used in our experiment are as follows:

Arduino Uno: is a microcontroller board based on the ATmega 328P which is a datasheet.it has 14 digital input /output pins.Arduino boards are able to read inputs-light on a sensor,a finger on a button, or a twister message and it turns into output. the output may be activating the monitor, turning on a led, and to do all these Arduino programming language and the Arduino software(IDE),based on the processing is used.The arduino which we worked is in the below figure.

Carbon monoxide sensors: these sensors are mianly used to detect the smoke. during initial stage of forest fire it will be not noticed so these sensors can detect the smoke and can prevent the widespread of the fire.

Carbon dioxide sensors: during initial stage of forest fire as fire is in small amount and is noticeable in the large places, fire consists primarily of water vapour, oxygen and nitrogen ,where the carbon dioxide is the sensed by these sensors .

Temperature sensors: the normal temperature of the forests are   .if the temperature goes beyond this these sensors sense it which is very helpful in avoiding the forest fire.

Humidity sensors: the normal humidity of the forests are   .if the humidity goes beyond this there is a chance of fire. which it can be detected in early stage using the humidity sensors.

In this experiment DHT-11 sensors are used which is used to sense temperature as well as humidity.

In real time, sensors capable of sensing for higher ranges can be used.

GSM(global system for mobile) module: It is used to establish connection between the computer and the GSM system.GSM module sim900 is mainly used only to send alert message to the receiver or the forest control room head.

GPRS(Global packet radio service):it is an extension of GSM that enables higher data transmission rate. The GSM module is used for shorter distance communication. The GPRS is extensively used for long-range distances and also at a higher rate of transmission.

This can majorly help when the service to the forest fire is required immediately as fire can catch up easily in forests especially during summer due to dry land .

C.The working principle of forest fire detection system:

The average normal temperature in the forests is the range of - $2\,°C$ to $40\,°C$. The temperature and humidity are inversely related. that is when temperature increases ,humidity decreases. where rise in temperature is one of the cause for the forest fire. As soon as the temperature increases, the temperature sensors detects it and an alert message is send to the main control office using the GSM module.

If in the specified temperature range only if the fire catches,

the detector will work using the temperature sensors. ay work sometimes and initial stages of the fire is not noticeable in the large space, so the carbon monoxide sensors, which detects the smoke when the fire catches is used. and also carbon monoxide sensors which detects the carbon dioxide in the fumes are used , and as soon the sensors detects these gases it is sensed and an alert message is sent to the main station.

The main idea here is the wireless communication, where the GSM are directly connected to the satellite for faster communication, and the immediate action can be taken, which saves from large destruction of forest. The Figure(1) helps about the working of forest fire prediction system..
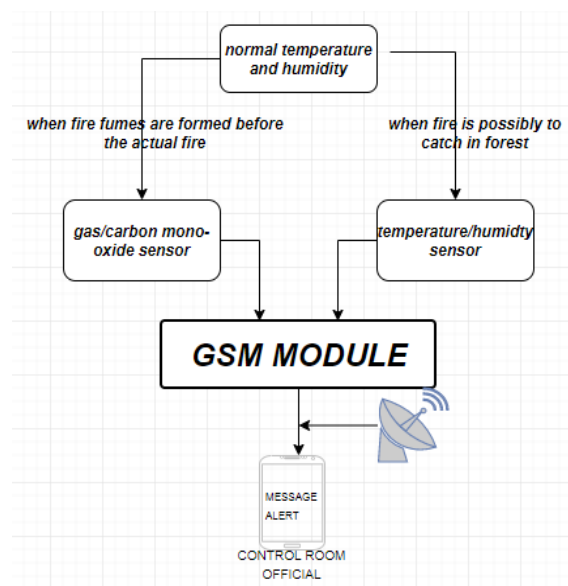

Figure 1:The block diagram of how forest fire is predicted.

D.Outcomes:

1: As we are implementing forest fire prediction system rather than fire detection,ehich can lead to post-attack control,we need to make sure the system detects or alerts the forest officials to take early precautions even when there is early signals of fire fumes or gases.

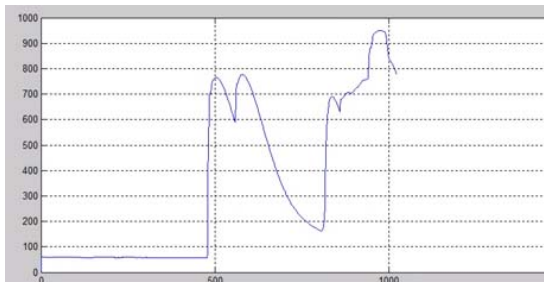The below figure(2) shows the change in graph when the fumes are detected.

Figure 2:The graph which displays the change in gas levels.

2: Unfortunately, if the temperature is detected when the gas sensors fail to alert, then we have made use of temperature sensor which ,at any cost, can detect the fire or the rapid increase in temperature in an area .The below figure(3),graph shows of how the temperature increases, and as and when the temperature reaches the normal temperature, and if crosses the threshold, then the detector detects and the normal alert is sent and received by the forest officials.

If, in case, the officials fail to notice the message, there is an alarm set up in every control room, which continuously beeps until necessary measures are taken immediately.
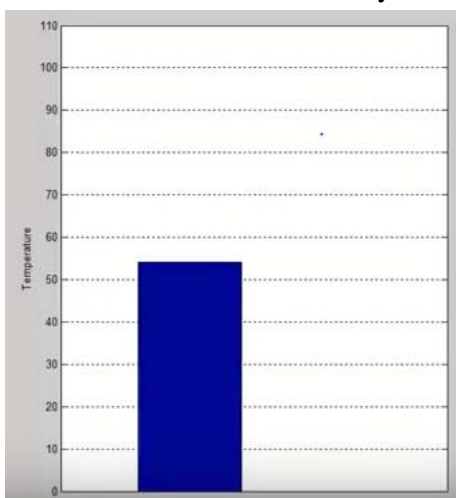

Figure 3: Temperature increase shown in the graph, which when crosses the threshold set, is detected by the detector.

III. CONCLUSION

The better available solution for forest fire detection is using sensors and the gsm modules, because it can provide all required information that influences the environment at any point in time precisely.

These sensors are small, low cost , fairly densely that can observe and influence the physical changes in the forest around them and gathers all the physical information, transforming it into electrical signals, does all the analysis, and sends it to a remote location for further precautions which should be taken care by the officials.

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