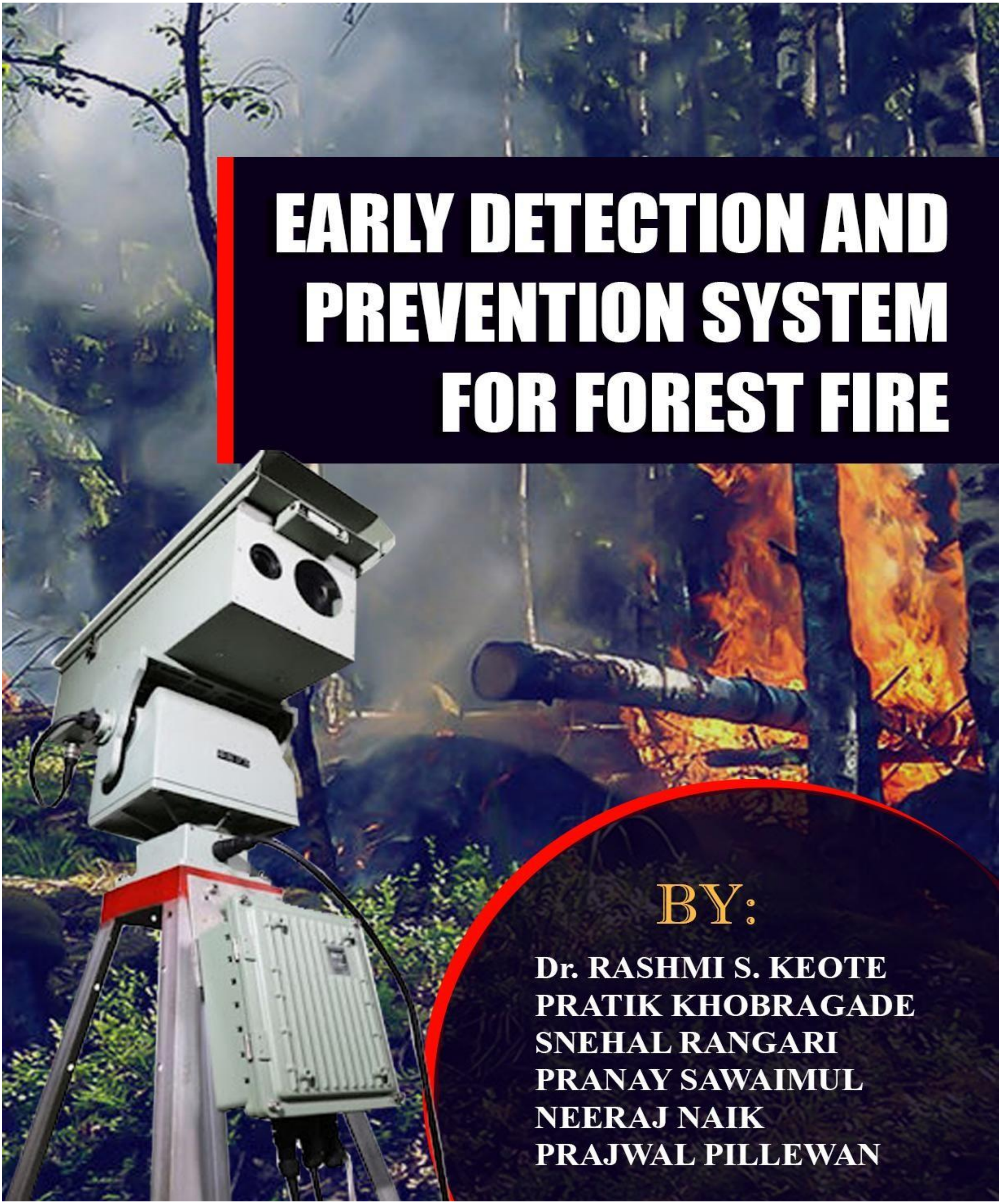

EARLY DETECTION AND PREVENTION SYSTEM FOR FOREST FIRE

BY:

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Preface

This monograph introduces the Early Detection and Prevention System for Forest Fire which will give us information about the temperature and smoke detection and it will be continuously display on the host computer. Due to early detection we can immediately take action to get control over fire. It will save numerous forest natural resources. As soon as we get the early fire warning we can take spontaneous and immediate action by rehabilitant nomadic people living under forest shade. This system helps to make remote area people aware about the future forest danger Implementation of sprinkler provide additional supportive hand to minimize the affect of fire.

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Chapter 1: Introduction

1.1 OVERVIEW

Wildfires occur when all of the necessary elements of a fire triangle come together in a susceptible area: an ignition source is brought into contact with a combustible material such as vegetation, which is subjected to sufficient heat and has an adequate supply of oxygen from the ambient air. A high moisture content usually prevents ignition and slows propagation, because higher temperatures are required to evaporate any water within the material and heat the material to its fire point. Dense forests usually provide more shade, resulting in lower ambient temperatures and greater humidity, and are therefore less susceptible to wildfires. Less dense material such as grasses and leaves are easier to ignite because they contain less water than denser material such as branches and trunks. Plants continuously lose water by evapotranspiration, but water loss is usually balanced by water absorbed from the soil, humidity, or rain. When this balance is not maintained, plants dry out and are therefore more flammable, often a consequence of droughts. Fast and effective detection is a key factor in wildfire fighting.

1.2 IMPACT OF FOREST FIRE ON BIOLOGICAL ENVIRONMENT

Forest fires also pose serious health hazards by producing smoke and noxious gases, similar to the events in Indonesia after the forest fires on the islands of Sumatra and Borneo in 1977 have shown. The burning of vegetation gives off not only carbon dioxide but also a host of other noxious gases (Greenhouse gases) such as carbon monoxide, methane, hydrocarbons, nitric oxide and nitrous oxide, that lead to global warming and ozone layer depletion. Burning forests and grasslands also add to already serious threat to the environment and also in global warming.

1.3 BACKGROUND

Early detection efforts were focused on early response, accurate results in both daytime and night-time, and the ability to prioritize fire danger. Fire lookout Towers were used in the United States in the early 20th century and fires were reported using telephones, carrier pigeons and heliographs.[2] Aerial and land photography using instant cameras were used in the 1950s until infrared scanning was developed for fire detection in the 1960s.However, information analysis and delivery was often delayed by limitations in communication technology. Early satellite-derived fire analyses were hand-drawn on maps at a remote site and sent via overnight mail to the fire manager. During the Yellowstone fires of 1988, a data station was established in West Yellowstone, permitting the delivery of satellite-based fire information In approximately four hours. Forest fires often start unnoticed and spread very quickly, causing millions of dollars in damage and claiming many human lives every year in the many countries. Early detection of hot spots and the initiation of appropriate measures can prevent, or, at least minimize damage and casualties. Common causes of forest fires are lightning, extreme hot and arid weather, severe drought, and human unawareness.

1.4 SOLUTION

As the main problem of forest fire incidence is that, we do not get early information regarding forest fire. In short, detection is one of the major problems that we face today. So, we think we should made such system which will be helpful to detect early forest fire.[1] If such a system is implemented in forest areas then majority of forest fire incidences can be controlled and minimize the damage of forest vegetation to certain extent. The system will also be provided with one preventive measure like water sprinkler which will also contribute to reduce the effect of forest fire. When the parameters like smoke and temperature is detected by the sensors it will gets transmitted to microcontroller and the value of temperature will continuously displayed on LCD screen. The microcontroller is also connected with one RF module. This RF module receives data from microcontroller and transmitted to another RF module which is connected to the host computer. The host computer will continuously monitors the temperature. We are creating such system which can collect the data from multiple forest zones. The implemented preventive measure will work when the value of temperature goes beyond the threshold value.

1.5 APPLICATION

The early detection system for forest fire will give us information about the temperature and smoke detection and it will be continuously display on the host computer. Due to early detection we can immediately take action to get control over fire. It will save numerous forest natural resources. As soon as we get the early fire warning we can take spontaneous and immediate action by rehabilitant nomadic people living under forest shade. This system helps to make remote area people aware about the future forest danger. Implementations of sprinkler provide additional supportive hand to minimize the effect of fire.

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Chapter 2:- Review of Literature

2.1 OVERVIEW

Forest is considered as one of the most important and indispensable resource, furthermore, as the protector of the Earth's ecological balance. However, forest fire, affected by some human uncontrolled behaviour in social activities and abnormal natural factors, occurs occasionally. Forest fire was considered as one of the severest disasters .In forest fire detection, it is essential to know how fire affects the soil mantle, stems and treetops, as well as how to detect underground fires. The sensor network must cover large areas, distributing high amount of sensing nodes, inexpensive sensors are needed to achieve cost reduction. Video cameras sensitive in visible spectrum based on smoke recognition during the day and fire flame recognition during the night, Infrared thermal imaging cameras based on detection of heat flux from the fire, IR spectrometer which identifies the spectral characteristics of smoke gases, and "Light detection and ranging" system which measures laser light backscattered by smoke particles. Infrared and laser-based systems have higher accuracy than the other systems.

General1y if the infrared level exceeds a predetermined threshold, an alarm 1s sent; but this methodology has some drawbacks that affect detection capability and reliability. Detection capabilities 1s negatively influenced by the fact that often fires are not directly visible from the sensor because during the first phases they grow up in the underbrush and are occluded from the vegetation. On the other hand the smoke (water vapour plus carbon monoxide), copiously produced during the wood drying process, is perfectly transparent in the infrared region (3-7 pm) so it cannot be detected by means of IR sensors. To become directly IR-visible, generally a fire must be at the tree top, so that when it can be detected is already widely extended from the fire starting instant .Handling uncertainty due to data aggregation and missing information requires space-time synthesis in rigorous formalism. Information granulation is at the heart of rough set theory. Rough set theory offers an attribute reduction algorithm and the dependency metric for feature selection. Meteorological data and images are parameters that change over space and time with relatively high frequency.

The change of meteorological data could be recognized in hour scale, and the change of image data, taking into account only information connected to forest fires, in minute scale. Also for the forest fire prediction system, meteorological data history (archive values) is quite important. In order to monitor meteorological parameters and collect images in real time, the sensory network has to be established .The most critical issue in a forest fire detection system is immediate response in order to minimize the scale of the disaster. This requires constant surveillance of the forest area. Current medium and large-scale fire surveillance systems do not accomplish timely detection due to low resolution and long period of scan. Therefore, there is a need for a scalable solution that can provide real-time fire detection with high accuracy. We believe that wireless sensor networks can potentially provide such solution. Recent advances in sensor networks support our belief that they make a promising framework for building near real time forest fire detection systems. Currently, sensing modules can sense a variety of phenomena including temperature, relative humidity, and smoke which are all helpful for fire detection systems.

Forests are the protectors of earth's ecological balance. Unfortunately, the forest fire is usually only observed when it has already spread over a large area, making its control and stoppage arduous and even impossible at times. The result is devastating loss and irreparable damage to the environment and atmosphere (30% of carbon dioxide (CO_2) in the atmosphere comes from forest fires) [1], in addition to irreparable damage to the ecology (huge amounts of smoke and carbon dioxide (CO_2) in the atmosphere). Among other terrible consequences of forest fires are long-term disastrous effects such as impacts on local weather patterns, global warming, and extinction of rare species of the flora and fauna.

2.2 MOTIVATION AND PROBLEM FORMULATION

In order to save and to minimize the degradation of forest asset due to forest fire it is necessary to manufacture certain technology which can provides us the way of early detection of forest fire. In order to meet this need we study some wireless technological terms which motivates us to think over the solution of forest fire.

The main objective of this project is to detect the forest fire from different zones of forest at one station . To minimize the effect of fire we are also implementing preventive measure which includes water sprinkler which will automatically gets on when the value of temperature goes beyond threshold value.

2.3 BACKGROUND

The human use of fire for agricultural and hunting purposes during the Paleolithic and Mesolithic ages altered the preexisting landscapes and fire regimes. Woodlands were gradually replaced by smaller vegetation that facilitated travel, hunting, seed-gathering and planting. [2] In recorded human history, minor allusions to wildfires were mentioned in the Bible and by classical writers such as Homer. However, while ancient Hebrew, Greek, and Roman writers were aware of fires, they were not very interested in the uncultivated lands where wildfires occurred. Wildfires were used in battles throughout human history as early thermal weapons. From the Middle ages, accounts were written of occupational burning as well as customs and laws that governed the use of fire. In Germany, regular burning was documented in 1290 in the oden Wald and in 1344 in the Black Forest. In the 14th century Sardinia, firebreaks were used for wildfire protection. In Spain during the 1550s, sheep husbandry was discouraged in certain provinces by Philip II due to the harmful effects of fires used in transhumance.

As early as the 17th century, Native Americans were observed using fires for many purposes including cultivation, signaling, and warfare. Scottish botanist David Douglas noted the native use of fire for tobacco cultivation, to encourage deer into smaller areas for hunting purposes, and to improve foraging for honey and grasshoppers. Charcoal found in sedimentary deposits off the Pacific coast of Central America suggests that more burning occurred in the 50 years before the Spanish colonization of the Americas than after the colonization. In the post-World War II Baltic region, socio-economic changes led more stringent air quality standards and bans on fires that eliminated traditional burning practices. In the mid-19th century, explorers from HMS Beagle observed Australian Aborigines using fire for ground clearing, hunting, and regeneration of plant food in a method later named fire-stick farming. Such careful use of fire has been employed for centuries in the lands protected by Kakadu National Park to encourage biodiversity.

2.4 HISTORY

In the Welsh Borders, the first evidence of wildfire is rhyniophytoid plant fossils preserved as charcoal, dating to the Silurian period (about 420 million years ago). Smoldering surface fires started to occur sometime before the Early Devonian period 405 million years ago. [5]Low atmospheric oxygen during the Middle and Late Devonian was accompanied by a decrease in charcoal abundance. Additional charcoal evidence suggests that fires continued through the Carboniferous period. Later, the overall increase of atmospheric oxygen from 13% in the Late Devonian to 30-31% by the Late Permian was accompanied by a more widespread distribution of wildfires. Later, a decrease in wildfire-related charcoal deposits from the late Permian to the Triassic periods is explained by a decrease in oxygen levels.

Wildfires during the Paleozoic and Mesozoic periods followed patterns similar to fires that occur in modern times. Surface fires driven by dry seasons are evident in Devonian and Carboniferous progymnosperm forests. Lepidodendron forests dating to the Carboniferous period have charred peaks, evidence of crown fires.

CHAPTER 3:-WORK DONE

3.1 WORKING

Two Input sensors are implemented to detect the temperature and smoke from forest. The threshold range for parameters temperature and smoke is set. When the range rises above the threshold range then we will get the information on PC. The inputs are in the form of analog signals. These sensors are then connected to analog to digital convertor where the analog signals are then converted into digital one. The ADC is connected to microcontroller. All the information about temperature and smoke are provided to microcontroller via ADC. The battery is connected which is of 12 V. The battery is then connected to regulated power supply which pump to 5 V of supply and it is connected to microcontroller. The microcontroller is connected to RF module via IC Max 232. The microcontroller provides TTL compatible signals which RF module failed to determine because in TTL signals logic 1 indicates +5 V and logic 0 indicates -5 V so to make it understand to RF module the IC Max 232 is installed in between microcontroller RF module. Rf module established the wireless communication and work as trans receiver .it can transmit data to control room and also able to receive the data from control room. At control room we can monitor temperature and smoke parameters.

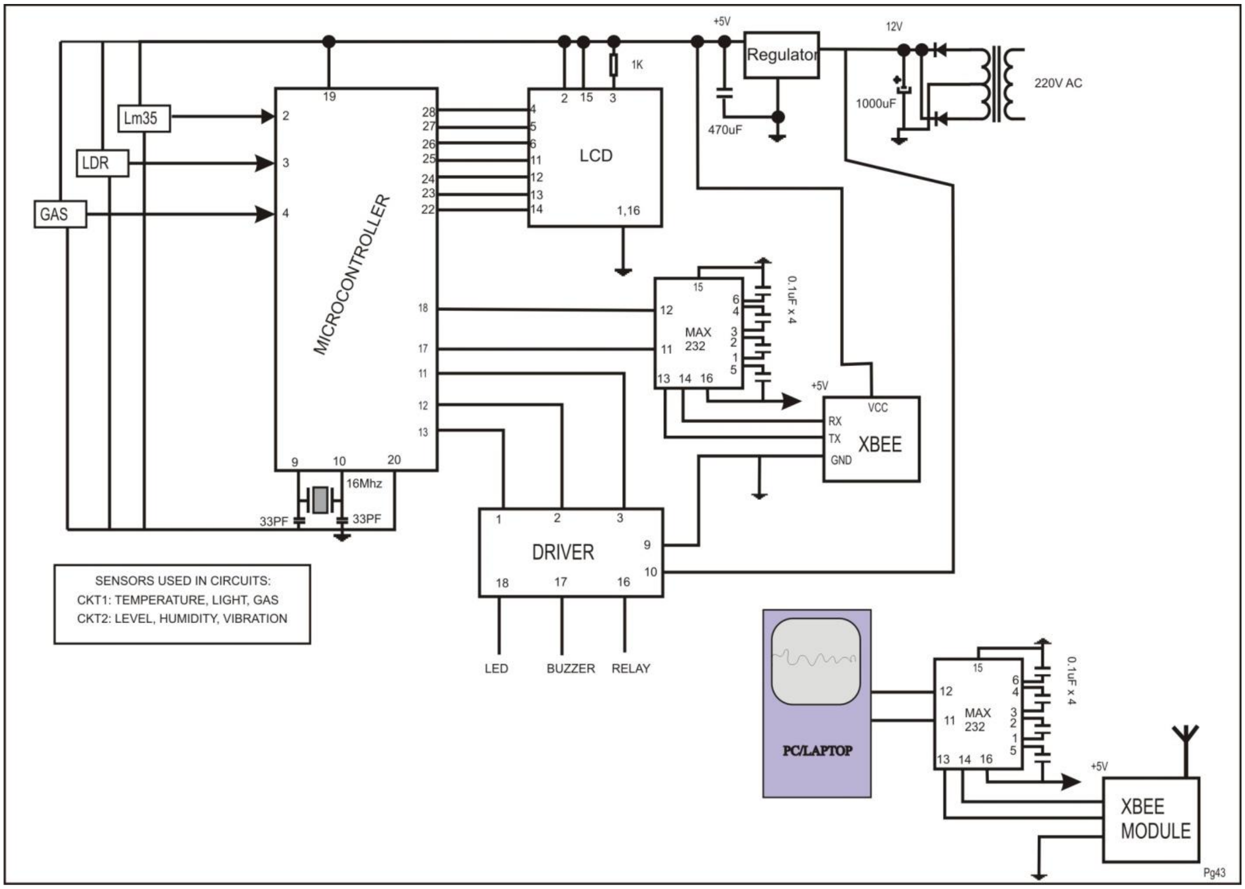

Fig. 1. Circuit Diagram of Early Detection and Prevention System for Forest Fire

3.2 SYSTEM DESCRIPTION

The following diagram represents the block diagram of the project. The physical design of our project includes five main parts :

1. Input part
2. The controller part
3. The power supply
4. LCD display
5. Output part

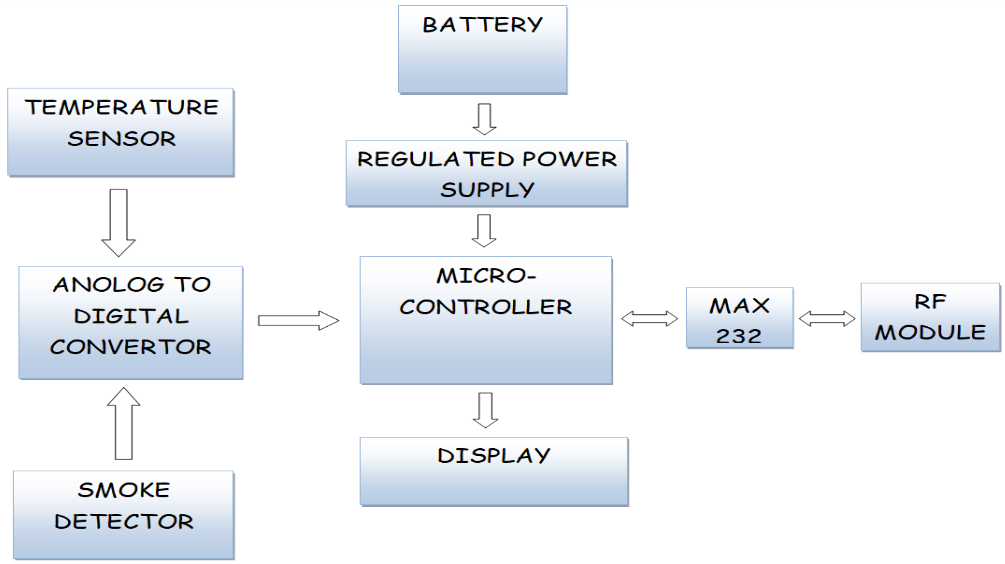

Fig. 2. Block Diagram of Early Detection and Prevention System for Forest Fire

3.3 DESCRIPTION

The block diagram shows the working and it gives the overview of how the project works . The main part in the project is microcontroller. Two sensor that is smoke detector and temperature sensor are connected to the controller part LCD is also connected to get the output from microcontroller and display information on LCD . Power supply is given to the controller part . The controller is connected to MAX 232 IC and to driver IC .The water sprinkler is connected to driver IC. The MAX 232 IC is connected to one RF module .We are using RF module to establish wireless communication. Another RF module is connected to the host computer.

Detection is the major part our project. The detection system consists of smoke detector, temperature sensor, microcontroller, LCD display, regulated power supply, RF module, USB to TTL and host computer. The sensors are use to detect analog parameters such as smoke and temperature. These data signals are then transmits to microcontroller. The microcontroller is supplied by 12V regulated power supply. LCD is used to display temperature and smoke. The data from microcontroller Is then transmitted to host computer through RF module. As soon as the data receive by RF module of host computer the value of temperature of different zones are display on computer screen. As soon as we get the temperature value rise above the threshold temperature we can immediately take action to get control over forest fire.

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3.4 Flow Chart:-

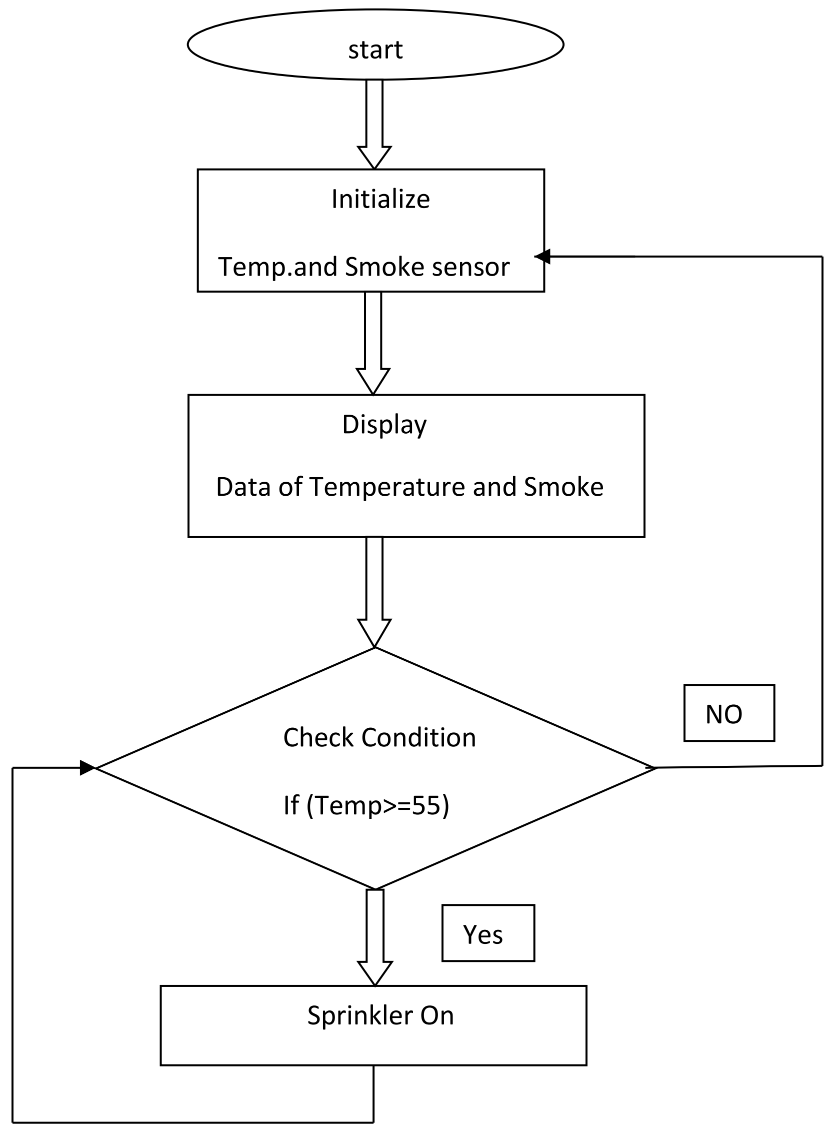

Fig. 3. Flow Chart of the System

3.5 SYSTEM DESIGN

Mainly this project contains 8 major components:

1) Smoke detector
2) Temperature sensor
3) Microcontroller

4) LCD Display
5) RF module
6) USB to TTL
7) Water sprinklers
8) Host computer

3.6 DESCRIPTION OF PARAMETERS

3.6.1. SMOKE DETECTOR

The Grove - Gas Sensor(MQ2) module is useful for gas leakage detection (home and industry).
It is suitable for detecting H2, LPG, CH4, CO, Alcohol, Smoke or Propane.[5] Due to its high sensitivity and fast response time, measurement can be taken as soon as possible. The sensitivity of the sensor can be adjusted by potentiometer.

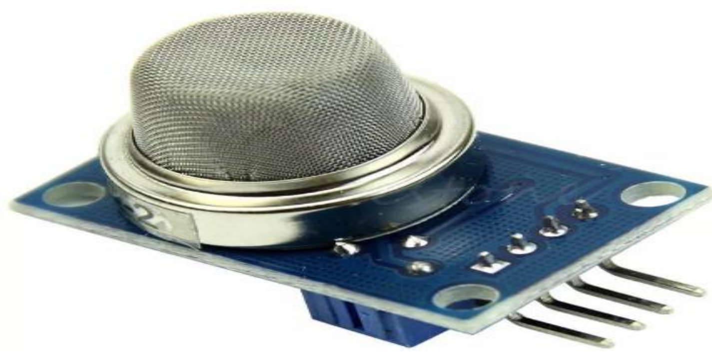

Fig.4. Smoke Detector

Table 1. Electrical Characteristics of Smoke detector (MQ6)

Item	Parameter	Min	Typical	Max	Unit
VCC	Working Voltage	4.9	5	5.1	V
PH	Heating consumption	0.5	-	800	mW
RL	Load resistance		adjustable		
RH	Heater resistance	-	33	-	Ω
Rs	Sensing Resistance	3	-	30	kΩ

3.6.2. LM35 TEMPERATURE SENSOR

The LM35 series are precision integrated-circuit temperature sensors, with an output voltage linearly proportional to the Centigrade temperature. [8]Thus the LM35 has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55°C to +150°C temperature range.

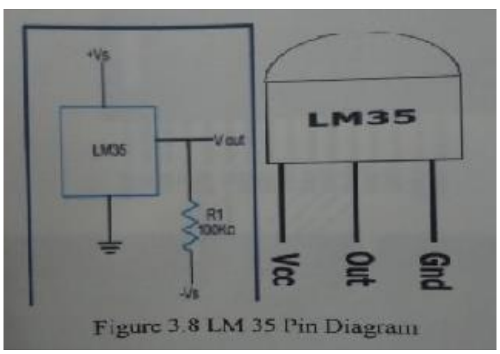

Fig..5. PIN Diagram of LM 35

Fig.6. LM 35 Temperature Sensor

FEATURES

- Calibrated Directly in ° Celsius (Centigrade)
- Linear + 10 mV/°C Scale Factor
- 0.5°C Ensured Accuracy (at +25°C)
- Rated for Full −55°C to +150°C Range
- Suitable for Remote Applications
- Low Cost Due to Wafer-Level Trimming
- Operates from 4 to 30 V

• Less than 60-µA Current Drain

• Low Self-Heating, 0.08°C in Still Air

• Nonlinearity Only ±¼°C Typical

• Low Impedance Output, 0.1 Ω for 1 mA Loa

Table 2. Electrical Characteristics of LM35 Temperature Sensor

PARAMETER	TEST CONDITIONS	LM35A			LM35CA			UNITS (MAX.)
		TYP	TESTED LIMIT(3)	DESIGN LIMIT(4)	TYP	TESTED LIMIT(3)	DESIGN LIMIT(4)	
Accuracy(5)	$T_A = 25°C$	±0.2	±0.5		±0.2	±0.5		°C
	$T_A = –10°C$	±0.3			±0.3		±1	
	$T_A = T_{MAX}$	±0.4	±1		±0.4	±1		
	$T_A = T_{MIN}$	±0.4	±1		±0.4		±1.5	
Nonlinearity(6)	$T_{MIN} \le T_A \le T_{MAX}$	**±0.18**		**±0.35**	**±0.15**		**±0.3**	°C
Sensor gain (average slope)	$T_{MIN} \le T_A \le T_{MAX}$	**+10**	**+9.9, +10.1**		**+10**		**+9.9, +10.1**	mV/°C
Load regulation(7) $0 \le I_L \le 1$ mA	$T_A = 25°C$	±0.4	±1		±0.4	±1		mV/mA
	$T_{MIN} \le T_A \le T_{MAX}$	**±0.5**		**±3**	**±0.5**		**±3**	
Line regulation(7)	$T_A = 25°C$	±0.01	±0.05		±0.01	±0.05		mV/V
	$4 V \le V_S \le 30 V$	**±0.02**		**±0.1**	**±0.02**		**±0.1**	

3.6.3. 16F886 MICROCONTROLLER

This powerful yet easy-to-program (only 35 single word instructions) CMOS FLASH-based 8-bit microcontroller packs Microchip's powerful PIC® architecture into a 28 pin package. The PIC16F886 features 256 bytes of EEPROM data memory, self-programming, an ICD, 2 Comparators, 11 channels of 10-bit Analog-to-Digital (A/D) converter, 1 capture/compare/PWM and 1 Enhanced capture/compare/PWM functions, a synchronous serial port that can be configured as either 3-wire Serial Peripheral Interface (SPI™) or the 2-wire Inter-Integrated Circuit (I²C™) bus and an Enhanced Universal Asynchronous Receiver Transmitter (EUSART). All of these features make it ideal for more advanced level A/D applications in automotive, industrial, appliances or consumer applications. [6]

Fig.7. PIC16F886 Microcontroller

Features:

- Factory calibrated to ±1%
- Software selectable frequency range of 8 MHz to 32 kHz
- Software tunable
- Two-Speed Start-Up mode
- Fail-safe clock monitoring for critical applications
- Clock mode switching during operation for low-power operation

3.6.4. LCD Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of application. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuit. These modules are preferred over seven segment and other multi segment LEDs. The reason being: LCDs are economical; easily programmable; have no limitation of displaying & even custom character (unlike in seven segment), animation and so on. [7]

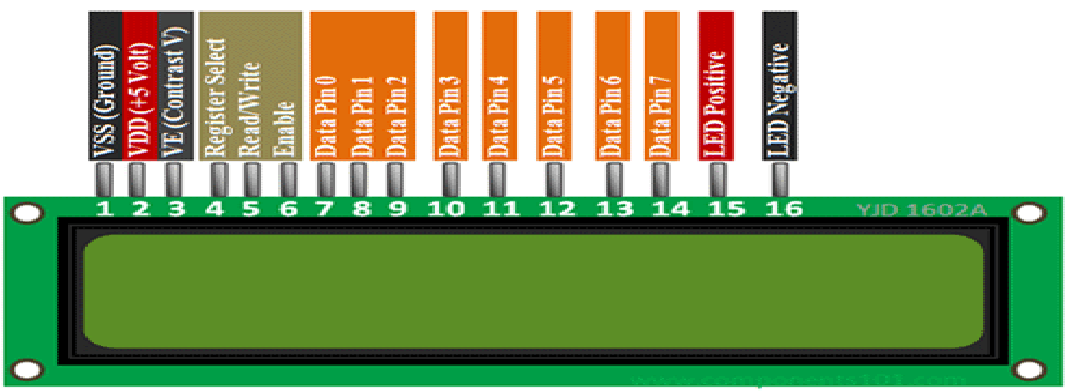

Fig.8. 16x2 LCD display

A 16x2 LCD means it can display 16 character per line and there are2 such lines. LCD each character is displayed in 5x7 pixel matrix. This LCD has two register, namely, command and Data. The command resistore store the command instruction given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data resistor stores the data to the display on the LCD. The data is the ASCII value of the character to be display on the LCD. Click to learn more about internal structure of a LCD.

Features:

- Operating Voltage is 4.7V to 5.3V
- Current consumption is 1mA without backlight
- Alphanumeric LCD display module, meaning can display alphabets and numbers
- Consists of two rows and each row can print 16 characters.
- Each character is built by a 5×8 pixel box
- Can work on both 8-bit and 4-bit mode
- It can also display any custom generated characters
- Available in Green and Blue Backlight

3.6.5. RF MODULE

An **RF module** (radio frequency module) is a (usually) small electronic device used to transmit and/or receive radio signals between two devices. In an embedded system it is often desirable to communicate with another device wirelessly. This wireless communication may be accomplished through optical communication or through radio frequency (RF) communication. For many applications the medium of choice is RF since it does not require line of sight. RF communications incorporate a transmitter and a receiver. They are of various types and ranges. Some can transmit up to 500 feet. RF modules are widely used in electronic design owing to the difficulty of designing radio circuitry.

Good electronic radio design is notoriously complex because of the sensitivity of radio circuits and the accuracy of components and layouts required to achieve operation on a specific frequency. In addition, reliable RF communication circuit requires careful monitoring of the manufacturing process to ensure that the RF performance is not adversely affected. Finally, radio circuits are usually subject to limits on radiated emissions, and require Conformance testing and certification by a standardization organization such as ETSI or the U.S. Federal Communications Commission (FCC). For these reasons, design engineers will often design a circuit for an application which requires radio communication and then "drop in" a pre-made radio module rather than attempt a discrete design, saving time and money on development.

RF modules are most often used in medium and low volume products for consumer applications such as garage door openers, wireless alarm or monitoring systems, industrial remote controls, smart sensor applications, and wireless home automation systems. They are sometimes used to replace older infra red communication designs as they have the advantage of not requiring line-of-sight operation.[10]

Several carrier frequencies are commonly used in commercially available RF modules, including those in the industrial, scientific and medical (ISM) radio bands such as 433.92 MHz, 915 MHz, and 2400 MHz. These frequencies are used because of national and international regulations governing the used of radio for communication. Short Range Devices may also use frequencies available for unlicensed such as 315 MHz and 868 MHz.

RF modules may comply with a defined protocol for RF communications such as Zigbee, Bluetooth low energy, or Wi-Fi, or they may implement a proprietary protocol.

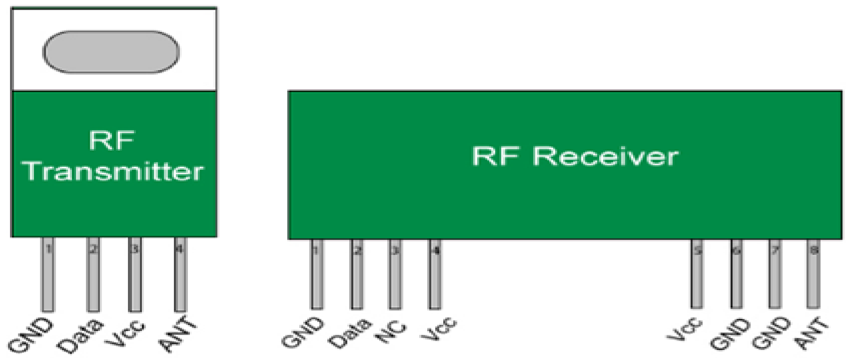

Fig.9. PIN Configuration of RF Module

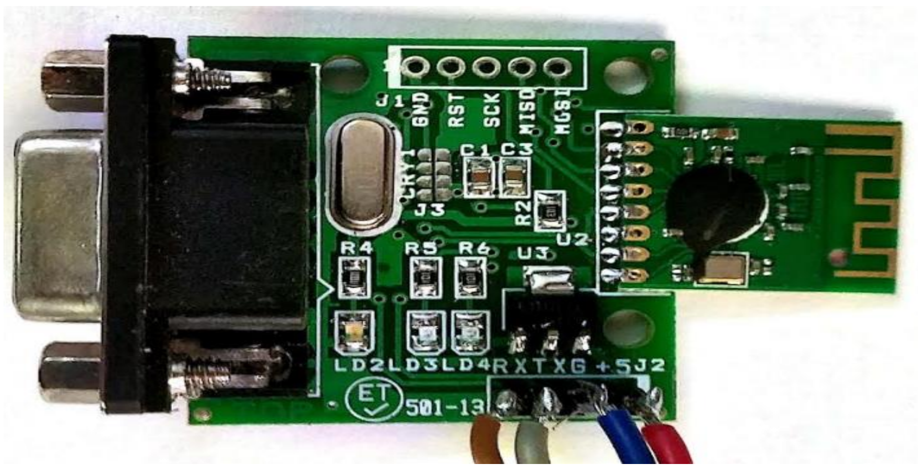

Fig.10. RF module (radio frequency module)

3.6.6. PL2303 PL2303HX USB TO TTL (SERIAL) CONVERTER MODULE:

This is PL2303 PL2303HX USB To TTL(Serial) Converter Module – 5 Pin. Adopt imported controller RS232 TTL, which can stabilize the flash with high-speed 500mA self-recovery fuse for protection.[4]

Two data transmission indicator can monitor data transfer status in real time. Reserve 3.3V and 5V pin interface, easy for DDWRT of different voltage system that needs power. The entire board is coated by a high quality transparent heat-shrinkable sleeve, making the PCB in insulation state from outside, so that the board won’t be burnt down by a material shortcut.

Fig.11. PL2303 PL2303HX USB To TTL (Serial) Converter Module

Features:

1) Adopt imported controller PL2303HX, which can stabilize the flash with high speed.

2) 500mA self-recovery fuses for protection.

3) Two data transmission indicator can monitor data transfer status in real time.

4) Reserve 3.3V and 5V pin interface, easy for the DDWRT of different voltage system that needs power.

5) The entire board is coated by the high quality transparent heat-shrinkable sleeve, making the PCB in insulation state from outside, so that the board won't be burnt down by material shortcut.

6) Electrostatic package ensures the board will not be damaged before use.

7) Support WIN7 system.

3.6.7. WATER SPRINKLER

Sprinkler irrigation is a method of applying irrigation water which is similar to natural rainfall. Water is distributed through a system of pipes usually by pumping. It is then sprayed into the air through sprinklers so that it breaks up into small water drops which fall to the ground. The pump supply system, sprinklers and operating conditions must be designed to enable a uniform application of water. [6]

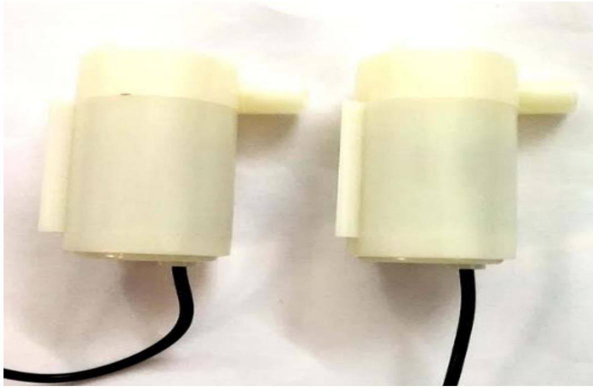

Fig.12. Motors use to pump water

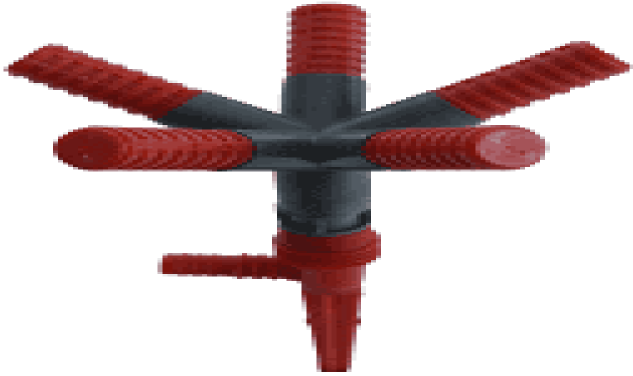

Fig.13. sprinklers

3.6.8. HOST COMPUTER:

The host computer is a network which shares multiple node connection .The host computer is able to collect all the data and information from different node regions.

In our project we are collecting data and information from the different forest zones and hence it is necessary to get the data in a cluster for simplification. To achieve this we are using multi-node system in which all the collective data from different zones are to be transmitted by RF module which is connected to controller part .This collected data from different zones are then receive by another RF module which is connected to host computer. Hence we can supervise all the data from different zones at one station by using host computer.

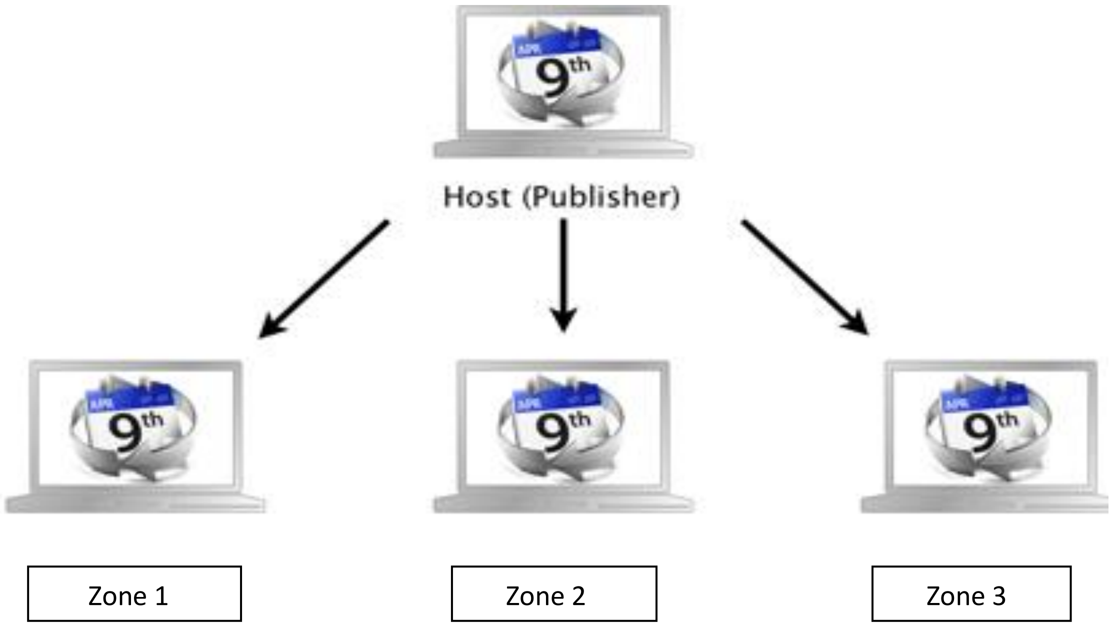

Fig.14. Node Networking Of Host Computer

3.7 WORKING METHODOLOGY

DETECTION

The parameters we are checking are smoke and temperature. For this we are using temperature sensors and smoke detectors. These sensors continuously sense the surrounding environment and continuously send their data to the microcontroller then this microcontroller send the respective data to the host computer through RF module. The system is installed at multiple forest zone which covers vast fire prone area. Thus our system monitors various zones at a single time. The information from all these zones is collected at a single host centre.

PREVENTION

For the preventive measures we are using water sprinkler. We have set the threshold values for all the sensors. All the parameters are checked and compared their values with the threshold values which we have set. If any of the parameters are giving value more than the threshold value which we have set then the preventive system gets started. The water tanks are to be built in order to store adequate water level. The water motors are use to pump out the water through sprinklers. Installation of water sprinkler can provide better assistance to the forest fire problem. As soon as temperature rises above threshold value the microcontroller transmits signal to driver IC and water sprinklers get started.

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CHAPTER 4:-RESULT AND DISCUSSION

4.1 RESULT AND DISCUSSION

This project is classified into two main sections. This classification can be done by the system working functionality. This two sections are

1. Detection

2. Preventive measure

1. Detection:

Detection is the major part our project. The detection system consist of smoke detector, temperature sensor, microcontroller, LCD display, regulated power supply, RF module, USB to TTL and host computer. The sensors are use to detect analog parameters such as smoke and temperature. These data signals are then transmits to microcontroller. The microcontroller is supplied by 12V regulated power supply. LCD is used to display temperature and smoke. The data from microcontroller Is then transmitted to host computer through RF module. As soon as the data receive by RF module of host computer the value of temperature of different zones are display on computer screen. As soon as we get the temperature value rise above the threshold temperature we can immediately take action to get control over forest fire.

2. Preventive Measure

Detection is not the only solution to get control over forest fire. To make the project effective it is necessary to implement preventive measure. Installation of water sprinkler can provide better assistance to the forest fire problem. As soon as temperature rises above threshold value the microcontroller transmits signal to driver IC and water sprinklers get started.

The below figures represent the output of the project

Fig15. Result on Display at Normal Condition

Fig.16. Results on Display after Smoke is Detected

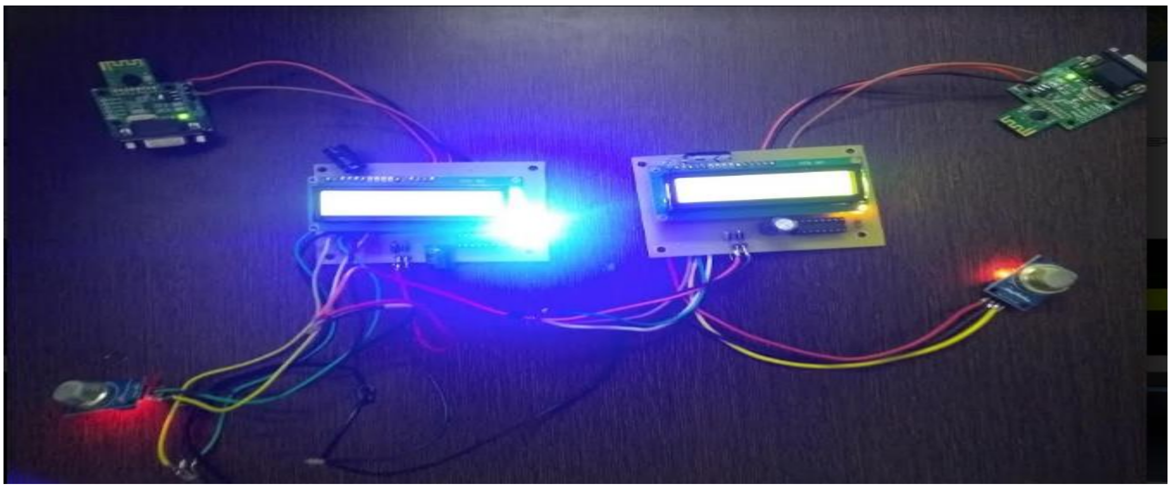
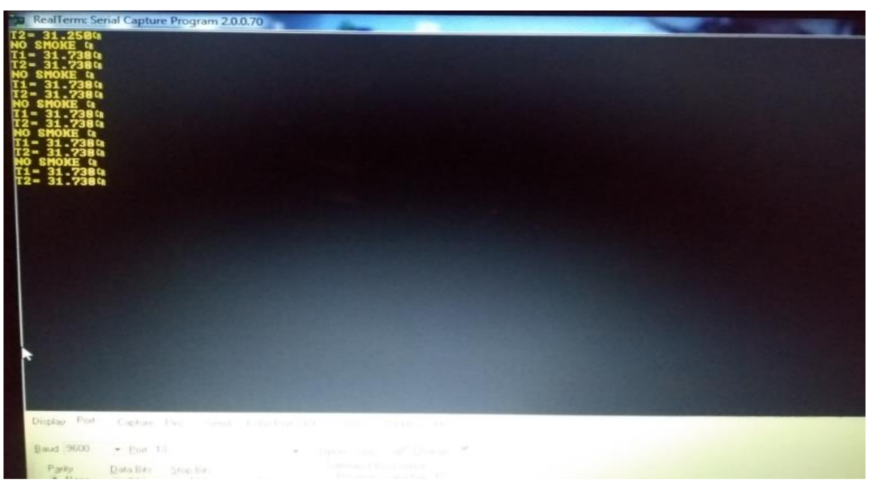


Fig.17. Fire Detection Circuit



Fig, 18. Value of temperature of multiple zones on Host Computer

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Chapter 5:-Conclusion and Future Scope

Conclusion and Future Scope

This concept is just a basic one. The further development of the project can be done in a larger configuration by using the better and reliable sensor not only a temperature sensing kind of sensor and which has multifunctional features which are embedded in/on the same component or an IC. These may be implemented in an operational scenario, once the concept is demonstrated.

The parameters we are checking are smoke and temperature. For this we are using temperature sensors and smoke detectors. These sensors continuously sense the surrounding environment and continuously send their data to the microcontroller then this microcontroller send the respective data to the host computer through RF module.

We have set the threshold values for all the sensors. All the parameters are checked and compared their values with the threshold values which we have set. If any of the parameters are giving value more than the threshold value which we have set then the preventive system gets started. In this we are using water sprinkler as a preventive system.

We can use Nano-satellite / Pico-satellite (small satellite) which is very small compared to normal satellite. A group/cluster of Pico satellites may be used to receive the data from the transmitter which is at the forest region and then transmitting to the ground station. When we are using cluster of small satellites, we may also consider using small satellites for different purposes like monitoring the forest fire, vegetation of the forest, for monitoring the climate changes of that particular area like this in low cost. Since the proposed project is easy for the installation due to the simple arrangements, the time frame for developing and integrating the sub-systems and installation process is less. Even for the demonstration purpose we can put up the fire manually in any plain land and we can test for the working of these components.

CHAPTER 6: LITERATURE CITED

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