Wireless Technology for Fire Detection System

Priyanka Patil, Arun Patil, Usha Surendra

Abstract: Protection of the environment is the need of the hour. In order to save the environment from the natural hazards, a work has been carried out to detect the early warning of the fire and controlling its spread in forest and industries to avoid damage to the ecosystem using wireless technology. The alarm system has been introduced as a caution of the fire so that people can vacate and prompt action can be taken to reduce the effect of fire by using water pump and buzzer. Wireless sensors are used for collecting the atmospheric parameters like temperature humidity, smoke and then transmit the data to the control room. The solar circuits are used to feed the supply to the sensors. Radio frequency technology has been used for transmitting the signal between transmitter and receiver section. Arduino programming method has been used in both transmitting and receiving section. Appropriate placing and packaging of the transmitter module will be a challenging task for reliable operation of this module in order to protect our environment from these type of hazards .The developed prototype module tested for the various parameters like temperature, humidity, etc and the results found to be satisfied. The fire detection technology can be used in forests to protect the environment and also in public places to the human life.

Index Terms: Sensors, Solar PV panel, Wireless communication .

I. INTRODUCTION

Fire is an undesirable event. It is essential to encounter these kinds of fire as soon as possible so as to avoid the destruction from it to environmental system. Most victims of heat flames capitulate to the smoke and harmful gases .Fire yields harmful gases that can increase rapidly and distant from the fire itself to claim victims who are asleep and not even aware of the fire. Regardless of whether the resident, the effects of risk to these gases can blur their reasoning and reduce their reactions so that they cannot prepare their rescue [1]. The Human Life is crucial so it is quick to have suitable decision so that everybody is rescued before the fire turns threatening. In extension, more than half of inevitable fires in resident take place when people are asleep. The remote fire detection system should meet the present prerequisites, simple to introduce, quick and easy, with simple versatility. This is one of the current flame disasters that shudder India. Kamala plants fire mishap is one of the most remarkably worst disasters of 2017. The reason of the fire is believed to be from a hookah. This shows that these fires create a great loss to societal wealth as well as personal life. So there is a serious demand of the hour to establish a system that could encounter and alert the concerned authorities about the fire as soon as possible. The fire detection system suggested in this paper incorporates the use of economical equipments, and wireless communication.

II. INDIAN SCENARIO

The nationwide crime Report Commission statistics illustrate that a total of 1, 13,961 people lost their lives due to Fire hazard from 2010 to 2014. This is an average of 62 deaths a day. Maharashtra alone regarded for 24293 deaths or 21.3% of all deaths due to fire hazards. The NCRB (National Crime Records Bureau) gathers this statistics in its annual report. According to the report between 2010 to 2014, a total of 1.21 Lakh fire incidents of various types took place in the country.
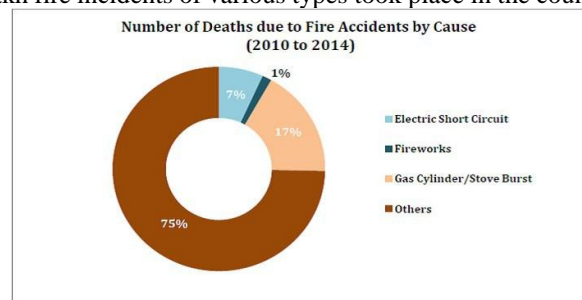

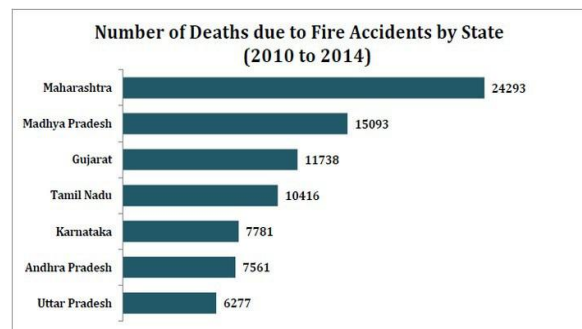**Fig.1 Represents cause due to fire accidents.**

Fig.2 Represents deaths due to fire accidents by state.

(2010-2014).

III. METHODOLOGIES

A. CONVENTIONAL METHODS

- Controlled fiery
- Fire weather calculation and measurement of fuel and moisture
- Watch towers
- Optical smoke disclosure
- Lightning detectors which detect the coordinates of the strike.
- Mobile/smart phone calls becoming increasingly common for detecting fires early
- Knowledge through Fire Watch or identical schemes for house holders.[2]

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B. PROBLEM DEFINITION

Whole year, thousands of fires across the world the origin of calamity is above measure and portrayal. This point has been the area of exploration for many years. Keeping the drawbacks into mind of the above mentioned conventional methods, this project is undertaken.

C. PROPOSED METHODOLOGY

There are total three units: namely
- Sensing Unit
- Controlling Unit
- Receiving Unit

SENSING UNIT: In this different sensors are used to sense the changes in the forest environment. They are temperature sensor, humidity sensor, CO sensor, Smoke sensor. These are supplied with power from solar cells.

CONTROLLING UNIT: After sensing the changes in the parameters the information is sent to the arduino which is supplied by a power supply and the data carried through the RF Transmitter and is data is encoded in the control room.

RECEIVING UNIT: The data is collected through the RF Receiver and is sent to the Aurdino and then decoded and the data is displayed on the LCD. Whenever the parameter exceeds the limit the buzzer is turned on.

IV. TRANSMITTER

Transmitter module is small computerized equipment which produces frequency waves with the help of antenna. A transmitter produces a frequency enforced to the antenna, which refuses radio wave. Antennas are occasionally known as receivers. A transmitter is a distinct antenna that does the contradictory duty of receiver. It converts electrical signal into frequency waves so that they propagate around thousands of kilometers around even into the space and back.

The Transmitter module includes sensors like humidity sensor, temperature sensor, and smoke sensor. These sensors are in turn connected to the arduino and then are given to the buffer and driver circuit which amplifies the signal [3] .The relay is connected to the buffer and driver circuit and is in turn connected to the RF transmitter module. When the respective LED's glow the immediate action is taken by switching on the buzzer and water pump.
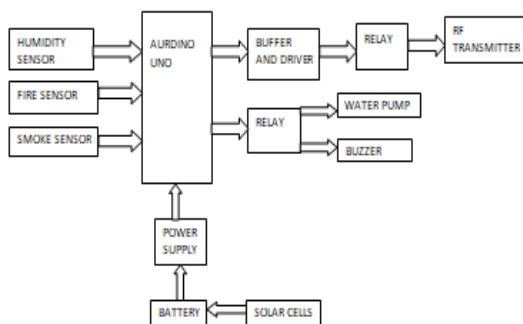

Fig.3 Transmitter block diagram.

V. RECEIVER

This module explains the Radio Frequency transmitter and receiver units used in this system to transmit code signal. The circuit operates on High Frequency wave with broad covering area. The frequency is 147 MHz and Data frequencies are 49.1 MHz, 49.2 MHz, & 49.3 MHz

An RF component (radio frequency module) is computerized equipment known to transfer frequency indicator in the middle of equipments. In an embedded structure it is generally covetable to contact with different equipment wirelessly [4]. This wireless transmission can be proficient over visual communication or through radiofrequency (RF) communication. RF transmission integrates a transmitting and receiving end. They are of different verities and area. Few can transfer up to 500 feet. RF component are extensively applied in computerized design owed to complication of a design transmission circuitry.
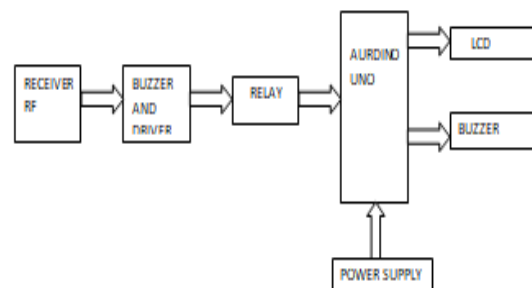

Fig.4 Receiver block diagram.

The RF Receiver module consists of RF receiver antenna from where data is received and is transmitted to the buffer and driver circuit which amplifies the signal. This signal is given to the relay and in turn given to the arduino. When the respective parameters changes the buzzer is turned on and the parameters are displayed on the LCD.

I. EXPERIMRNATL RESULT

Sl.no	Parameters	limits	Output(LCD display)
1.	Temperature	35 degree Celsius	50degree Celsius(high temperature)
2.	Humidity	65 gms/cc	80 gms/cc(high humidity)

VI. RESULT

The temperature and humidity sensor are connected to the aurdino and the output of aurdino is send to the electromagnetic relay. The smoke sensor is directly connected to the relay. All the three parameters are displayed on the LCD. RF module (49.5 MHz) is used for transmitting the data from transmitter to receiver end.
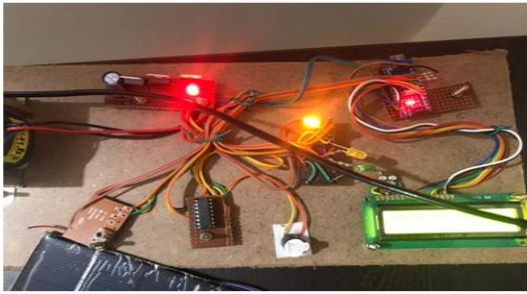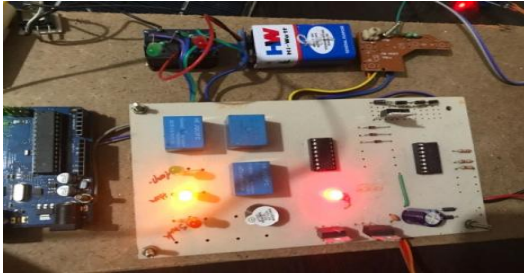
Figure5. Control room model.

Figure 6.Transmitter model.

VII. CONCLUSION AND FUTURE SCOPE

The arrangement presents the advancement of a fire detection scheme by adopting a wireless technology. This system abolishes the use of a human to regularly supervise the space. The regulation will be done with the use of sensors. Wireless sensors are widely applied in the field of natural and ecological control. Alarm signals are used to activate the enforced authorities. This system is economical, power efficient and based on the instruments that are dependable as well as lasting. Several future works are also achievable in this system design. This method of early detection of forest fire is very reliable, less cost, simple operation and needs less maintenance.

In future multiple nodes can be used for an individual receiver node, GPS system could also be used to locate the definite area of the fire. Extend to that the wind sensor can also be used to regulate the rate of fire movement and its direction. In order to avoid human intervention robotic fire extinguishing system could also be used along with the system in due course.

The module can be further featured with rain detector to measure the amount of rainfall, cameras can be installed with 360 degrees wide detection to calculate the extent of damage caused.

REFERENCES

1. The Indian Forest Fire Response and Assessment System (INFFRAS), IFFN contribution by M.S.R. Murthy, K.V.S.Badarinath, BiswadipGharai, G.Rajshekhar and P.S.Roy Forestry & Ecology Division
2. "Forest fire detection using watch towers" by R. Chandrasekharan, Ashiq M.I, Dr. V. Prakash.
3. Heinnemann W R,chandrakasan A, BalakrishnanH.An application specific protocol architechtre for wireless micro sensor networks,IEEE Transaction on Wireless Communications,2002.
4. ShijinDai,XiaorongJing,LeminLI.Research and analysis on routing protocols for wireless sensor network[A].2005 International Conference on Communication ,Circits and system,Volume ,1 May 2005.

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