



# FOREST FIRE AND SMOKE DETECTION BY USING WIRELESS SENSOR SYSTEM

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**Abstract:** - Wireless sensor networks are widely used in environmental applications, like forest fire detection. In this paper microcontroller based wireless sensor forest fire and smoke detection system are explained neatly. Sensors are used to detect the fault, Transmitter and receiver circuit are mainly used to transmit the type of faults, the speaker and displays are used to intimate the forest fire.

**Keywords:** Forest fire detection, sensor network, Transmitter, Receiver, display

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## 1. INTRODUCTION

Wireless sensor networks (WSN), sometimes called wireless sensor and actuator networks (WSAN), are spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, sound, pressure, etc. and to cooperatively pass their data through the network to a main location. The more modern networks are bi-directional, also enabling control of sensor activity.

### 1.1 Applications of wireless sensor network

- Area monitoring
- Health care monitoring
- Environmental/Earth sensing
- Air pollution monitoring
- Forest fire detection
- Landslide detection
- Water quality monitoring
- Natural disaster prevention

## 2. BLOCK DIAGRAM DESCRIPTION

### 2.1 Fire Sensing Circuit

The LM35 is used as a sensor to detect the FIRE. For sampling the zone temperature we used a linear voltage out semi-conductor based LM35 temperature sensor. The output from the LM35 temperature sensor is fed to the amplifier through potential divider circuit. The amplifier o/p is fed to the comparator circuit (op. amplifier IC 741). This output is fed to the microcontroller.

### 2.2 Smoke Sensing Circuit

The MQ6 is used as a sensor to detect the SMOKE. The output from the LM35 smoke sensor is fed to the amplifier through potential divider circuit. The amplifier o/p is fed to the comparator circuit (op. amplifier IC 741). This output is fed to the microcontroller.

### 2.3 RF Transmitter

This block consists of HT12E and 433.92 MHz and 315MHz based transmitter module to transmit the data. The programmed addresses/data are transmitted together with the header bits via an RF transmission medium upon receipt of a trigger signal. The capability to select a TE trigger on the HT12E further enhances the application flexibility of the 212 series of encoders.features:2.4V~12V for the HT12E. Low power and high noise immunity CMOS technology. Low standby current: 0.1\_A (typ.) at VDD=5V. 18-pin DIP/20-pin SOP package.

### 2.4 RF Receiver

This block consists of HT12D and 433.92 MHz and 315MHz based receiver module to receive the data from dedicated receiver module. . The decoders receive serial addresses and data from a Programmed 212 series of encoders that are transmitted by a carrier using an RF. They compare the serial input data three times continuously with their local addresses. If no error or unmatched codes are found, the input data codes are decoded and then transferred to the output pins. The VT pin also goes high to indicate a valid transmission.

### 2.5 MICROCONTROLLER

Microcontroller used here is an ATMEL 89C51. The AT89C51 is a low power high performance CMOS 8 bit microcomputer with 4K bytes of flash programmable and erasable read only memory. The on-chip flash allows the program memory to be reprogrammed in system or by a conventional non-volatile memory programmer.

### 2.6 LCD Display

LCD is mainly used for display the information. Here we are using 2x16 LCD. Operation of the LCD is the declining prices of LCDs. The ability to display numbers, characters, and graphics. This is in contrast to LEDs, which are limited to numbers and characters. The LCDs are light weight with only a few millimeters thickness. Since the LCDs consume less power, they are compatible with low power electronic circuits, and can be powered for long durations. The LCDs don't generate light and so light is needed to read the display. By using backlighting, reading is possible in the dark. The LCDs have long life and a wide operating temperature rang.

### 2.7 Voice Module Circuit

Here the IC APR 33 is used as the voice bank. The prerecorded messages can be stored in any location. This can be replayed by selecting the respective signal. The output of this IC is given to the LM386 power amplifier circuit. It is connected to the speaker.

## 2.8 Power Supply

A power supply circuit is very essential in any project. This power supply circuit is designed to get regulated output DC voltage. The 12-0-12 volt transformer, step down the main voltage (230v) into 12 volts. The secondary voltage of transformer is rectified using bridge rectifier. The rectified unidirectional DC is smoothed by 1000mf filter capacitor. The smooth DC is then fed to the three terminal +ve regulator called 7805 to get 5v DC supply. -ve regulator called 7905 to get -5v DC supply. Positive power supply section is used for microcontroller unit. Dual supply is used for fire and smoke measurement circuit.

## 3. CIRCUIT DIAGRAM AND WORKING PRINCIPLE

The advanced electronic field makes our life style very easy and compact. Remote sensing is one of the very fast growing fields in the world. To inform EMERGENCY situation of a FIRE to remote location using remote signal is very interesting one. There is lot of techniques available in remote control field to transmit the signal from one point to another point. The following figure 1 shows the main circuit diagram.

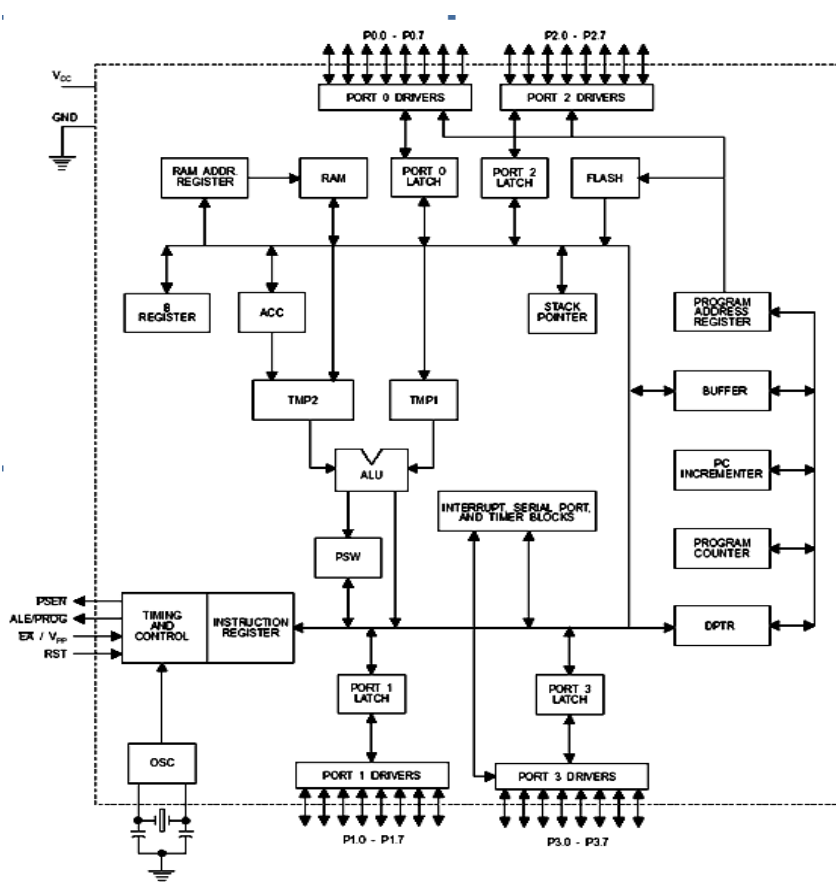


Figure 1 Block Diagram

We are developing a project to inform about the place of emergency condition of FIRE and SMOKE at remote place. Here we are frequently checking the condition of fire and smoke using a measurement circuit. The output of that measurement circuit is given to RF transmitter.

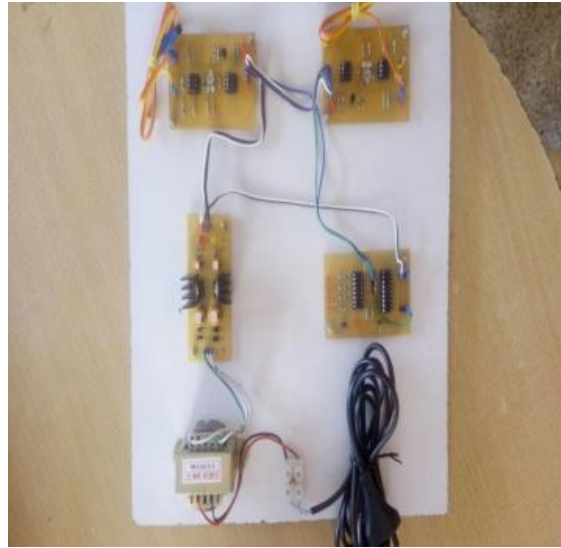


Figure 4 Transmitter circuit

The code will be transmitted through carrier wave ISM (Industrial Scientific & Medicine) based transmitter & receiver module. It generates carrier wave at 433.92MHz. At transmitter side, HT12E used as an encoder to generate operation codes, and these codes are transmitted through ISM based transmitter.

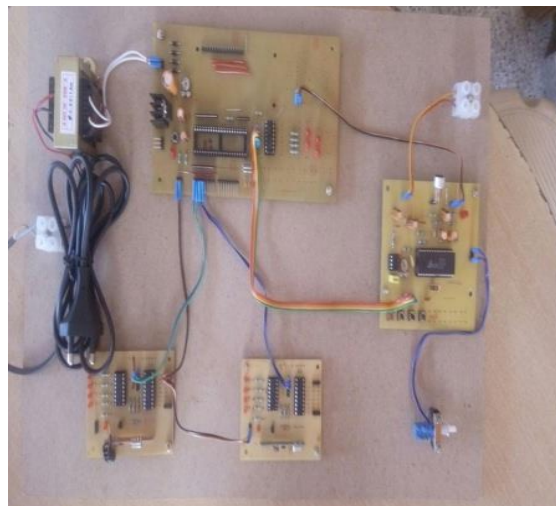


Figure 3 Receiver circuit

In the receiver side, to receive the operation code ISM based receiver is used. HT12D decodes the received data. The decoding data is taken to microcontroller. Here we are using ATMEEL 89C51. The AT89C51 is a low power high performance CMOS 8 bit microcomputer with 4K bytes of flash programmable and erasable read only memory. The on-chip flash allows the program memory to be reprogrammed in system or by a conventional non-volatile memory programmer. This microcontroller gives the output to voice chip, which provides voice signal output to amplifier circuit.

#### **4. ADVANTAGES OF WIRELESS SENSOR SYSTEM**

- Safe guard the equipments.
- Simple in construction.
- Unidirectional system
- Secured data transmission
- Not easily affected by external noise.
- Reliability of operation.
- Less maintenance.
- Cheaper.
- There is no need to maintain the direction.
- There is no chance to error operation because of formatted data system using PIC.
- This system is not disturbing already existing frequency.

#### **5. CONCLUSION**

In this paper microcontroller based wireless sensor based forest fire and smoke detection were explained neatly. In this work the transmitter and receiver play important role and display the fir forest and smoke result through the speaker and display.

#### **REFERENCE**

- [1] CMOS circuit manual, r.m. mariston, a newness circuit manual- 1996
- [2] Microprocessor data hand book, bpb publication – 1990
- [3] Up to date CMOS data and comparison tables, bpb publication – 1998
- [4] Electronic principles sixth edition, Malvino
- [5] Electronic devices and circuits, jacob millman, christos c.halkias
- [6] Digital electronics an introduction to theory and practice, William h. gothmann
- [7] Pulse and switching circuit action, veatch