

# Dynamic Fire Detection System Based on Android Using Zigbee

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**Abstract-** *DYNAMIC FIRE DETECTION SYSTEM BASED ON ANDROID USING ZIGBEE is a system that detects fire and issues a notification on a android devices to alert nearby people that there is a potential of fire. The system can detect fire in their early stages and give you those precious minutes to leave premise safely. It is a ZigBee-based wireless sensor network for detection of fire based on android technology. A temperature sensor and smoke detector are devices that detects heat and smoke and transmit data to centralized device this device then analyzes the data and issues a alarm to alert embedded system and notify nearby people that there is a detection of fire. Wireless communication enables transfer of data or signals over part of the entire communication network. Wireless implementation of sensor network ensures safety in terms of saving lives and property. The sensor node is composed of a temperature sensors, smoke sensor and a transceiver operated at a 2.4-GHz. The heat sensors are designed to have a cutoff at particular threshold value and convert the sensors data and send it to intermediate zigbee nodes. Including mixed signal processing and ZigBee transmission.*

*During the fire, DFD system notifies the administrator by ringing alarm on android phone and then admin can notify other users by sending text messages. Along with ringing fire alarm it can also determine the locations and severity of fire.*

**Keywords-** Android, Arduino, Embedded system, IoT, Wireless sensor network, Distributed Systems, Sensor node/Base station, Zigbee node.

## I. INTRODUCTION

FIRE is considered as one of the serious threats in our daily life. Safety and security of any living or working place is one of the most primary concerns. The increasing risk of fire accidents have made it crucial to enhance safety as well as security through the use of new technologies. Low cost, reliable, and wide coverage fire alarm systems are need to be designed. The damage can be reduced if fire is detected as soon as possible. The most commonly used fire detection system are offline i.e it cannot track fire in real time. Hence we came up with the idea that the system

should be dynamic. The damage can be mitigated if fire is detected as soon as possible. The most commonly used fire detector in the fire safety sector is the smoke detector even if they always have false alarms. Current fire detection systems are not able to track and detect fire in real time, and they are unable to analyze the fire. The current Systems are not able to notify people in premise. There is a need to build systems, which can sense and track surrounding and do analysis continuously. The systems that can analyze the fire in real time and notify the people or inform the administrator so the administrator can take appropriate action to reduce destruction cause by the fire, such systems are need to be developed.

## II. LITERATURE SURVEY

There are many concerns in automatic fire detection, of which the most important ones are about different sensor combinations and appropriate techniques for quick and noise-tolerant fire detection. Researchers have been studying fires taking place in various places such as residential area (Milke and McAvoy 2004), forest (Yu, Wang et al. 2010; Bagheri 2008) and mines (Tan, Wang et al. 2008) to find some solutions for fire monitoring. An important issue in automatic fire detection is separation of fire sources from noise sources. For the residential fires, being flaming or non-flaming (smouldering smoke fires), the general trend is to focus either on the sensor and sensor combinations or detection techniques. In another word, researchers have focused either on identifying the best set of sensors which collaboratively can detect fire using simple techniques (Milke and McAvoy 2008; Milke 2008; Cestari, Worrell et al. 2005) or on designing complex detection techniques that use single or at best very small set of simple sensors.

Compared to the above techniques and approaches stated before our system, detection of fire is more accurate and effective to handle deceptive fire scenarios. It is also effective for early fire hazard occurrence detection.

## III. METHODOLOGY

### 1. Arduino UNO

Arduino is an Italian technology. It is a brain or central processing unit of home automation system. Sensor's data processing, action triggered by android application will process on and performed by Arduinoboard. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. We are going to use Arduino. Main advantage of Arduino is cost of board it less as compared to other platforms, programming language is very simple and easily understandable for new learner and easy to implement.

The Arduino Uno is a microcontroller board. It is used for building digital devices and interactive objects that can sense and control the physical world. It is open source interfacing platform which comes with cross platform IDE.



Figure 1: Arduinouno

## 2. Android

Android is widely used open source operating system. Main advantages of android are widely used, less costly and complex as compared to iOS, User friendly GUI, custom ROM. Android operating system is based on Linux family and uses Java programming language. Android have features like Bluetooth, WIFI so using different modules we can interface android with Arduino.

## 3. Bluetooth HC-05

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. It comes with integrated antenna. It has enhanced data rate of 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. In proposed system have used Bluetooth module using Bluetooth interfacing.. For interfacing we have used Bluetooth Device, Bluetooth Adaptor, Bluetooth Connect methods in android programming

## 4. Xbee Shield

ZigBee is a specification for a suite of high-level communication protocols used to create personal area network built from small, low-power digital radio. It is based on IEEE 802.15.4 standard. Its communication range is 10-100 meters. Its data transfer rate is upto 250 kb/s. Xbee shield is used to mount xbee pro module RF antenna. It acts as an interface between Arduino board and Xbee pro module.



## 5. Xbee pro module

Xbee pro modules are embedded solutions providing wireless end to end connectivity to devices. These module uses IEEE 802.15.4 networking protocol for fast peer-to-peer networking. Xbee pro module operates within a range from 868 MHz to 2.4GHz.



## 6. Sensors Used

- DHT11 (Temperature and humidity sensor)
- MQ2 (Smoke sensor)
- LM393 (Flame detector)

## A. Software Design

Android application shows continuous data collected from sensors deployed in the environment. Application

provides connectivity between Android device and Wireless sensor network. The application also provides a functionality through which we can send SMS to notify people.

#### IV. BLOCK DIAGRAM

##### System Consists -

1. ArduinoUno- It is a central processing unit. Programming of Arduino will be done on Arduino IDE.
2. Android - Android is a host controller which is used to trigger or performs some actions.
3. Sensors - We are going to use different sensors like ,DHT11, LM393,MQ2
4. Relay Board - Relay board is going to use for volt conversion.
5. Cables - For connecting purpose.
6. HC-05– For interfacing between android and Arduino

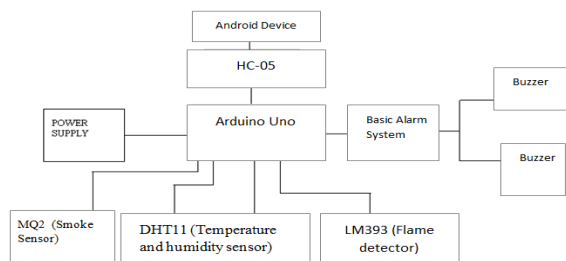


Figure: Block Diagram of DYNAMIC FIRE DETECTION SYSTEM BASED ON ANDROID USING ZIGBEE

Following are the modules of DYNAMIC FIRE DETECTION SYSTEM BASED ON ANDROID USING ZIGBEE

1. Temperature and humidity display
2. Flame detection
3. Smoke Detection
4. Fire alarm system
5. SMS module

#### V. FUTURE WORK

Areas which we are going to work in future –

1. Currently the system uses android platform but in future it will also have iOS support.
2. Deploying the system with advanced sensors.
3. More flexibility.
4. Admin can access the system from remote location also.
5. Improvisation of hardware reliability.

#### VI. CONCLUSION

There is extreme need of a Fire detection system which is robust, consistent, reliable and real time, which can assure public safety.

We have presented a low cost, low power, Zigbee Based Dynamic WSN System for the Fire Detection Contributing to the Fire Safety of people. The output of The System Is a System which can sense and track surroundings and do analysis continuously and transmit the analysed data to the administrator of the system and as per the data received, administrator will take actions.

Hence, this system can be used in various architectures like buildings, hospitals, universities etc.to protect lives and assets from fire and assure safety.

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#### REFERENCES

- [1] A ZigBee-Based Wireless Sensor Network Node for Ultraviolet Detection of Flame(IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS, VOL. 58, NO. 11, NOVEMBER 2011)
- [2] International Journal of Research in Management, Science and Technology (E-ISSN: 2321-3264) Vol. 3, No. 2, April 2015.
- [3] Projected Beam Smoke Detectors More Than Just a Substitute for Spot Detectors, NEMA Supplement in Fire Protection Engineering, Summer 2014.
- [4] Alarm, Trouble and Supervisory Degrees of Conditions, Signals and Responses,NEMA Supplement in Fire Protection Engineering, 4th Quarter 2011.
- [5] Wenping Zhang, Chunping Li, Yunming Ye, Wenjie Li and Eric W.T. Ngai, "Performance Analysis of Wireless

Sensor Network Based on OPNET,,"textit 1541-1672/15/31.00 2015 IEEE.

- [6] Debadrita Banerjee," Autonomous re-detection system using adaptive sensory fusion for intelligent security robot",2014 2nd International Journal of Control Theory and Computer Modelling (IJCTCM) Vol.2, No.3, May 2012..