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Implementation of FireDetection Systemusing Arduino Nano

Ayush Rai, Deepanshu Tyagi, Diksha Jha
Kumari Jyoti

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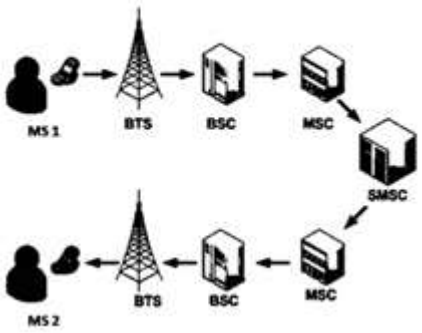
ABSTRACT
Present time thereare stillmany fires thatoccurred in forests and residential areas. One cause of this disaster is a negligence.Fire can cause of health problem like skin problem, lung disease and people sacrifice their life. The 1stindication of detection system is smoke and fire, or gases too. This paperpresents an application onthe fire detection system. This firesystem will use Arduino Nano as a microcontroller and theflame sensor to detect the fire. This systemholds2microcontrollersthat canhave differentwork functions.Thefirstmicrocontroller will be used as the serf that detects fires byusingfire detection system.Thesecondmicrocontroller will be used as a master of that functions as anentry controlpointandisusedto bedisplay the fire detection message on the 16*2 LCD display and an alarm voice (buzzer voice). This tool has been small in size and efficient to work and easy to use and has met the system that hasbeen designed without reducing the planning and forcefulness ofthe system. In this study, we will make the slave consist of3parts withdifferent working areas.

Keywords—Solderless Breadboard, Arduino nano, Flame Sensor, 16×2 LCD Display, 100R Resistor x 3, 4.7k Resistor, 1k Resistor, LED Green, LED Red, Buzzer, Male to Male Jumper Wires, Battery clip, Battery 9v.

INTRODUCTION

Fire is one of the incidents that often occur at any instance.Firecancausedamageto thehealth, lives and money loss.It'scausedbythelackofactiveprotectionandpassiveprotectionaboutthefirstindicationoffire.Thefirstindication of fire is smoke,flame and gases too. One ofthe passive protection systems detects the first indicationof fire uses wireless flame sensor. The wireless sensornetworkisthemainparttocollectinformationneededbytheinitializednetwork,whetherintheindustrial buildings, hospitals,orreal timesystem. Firedetectionproposedbytheauthortouseanembeddedsystemandwirelesssensornetwork.Themicroprocessor which we used in this is Arduino Nano. Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.x). It has some extra or some less and have the same functionality of the Arduino Duemilanove, but in a different package.Theuse ofArduinoNanoislook foraminorandmajoreffectivedesign.Arduinois anelectronicplatformopentothepublicbasedoneasy-to-usesoftware and hardware. This device is made so thateveryone can make a project. Arduino can be programmed byusing the Arduino Development Environment (ArduinoID). We find the Arduino Nano in the market easily and at low cost. A sensor which is almosta sensitive to a normal light is known as a flame sensor. Therefore, this sensor moduleis used in flame alarms. Flame Sensor detect the flame otherwise it will detect the wavelength within in the range 750nm-1100nm from a light source. It will easily damage at high temperature. So, this sensor placed certain distance from the flame. The output of this sensor is analog or digital signal. When the flame sensor works with a microcontroller unit then the pins are VCC pin (Voltage pin), GND (Ground pin), AOUT (Analog Output), DOUT (Digital Output).



The term LCDstands for Liquid Crystal Display. It one kind of electronic display module

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and it is used the parts in various applications like phones, calculator etc. In 16x2 LCD have two registers like data and command register. The register is mainly used to change from one to another. When the register is '0' then it is a command register and when the register is 'one' then it is a data register. LCD is preferred Arduino Nano. In LCD there are 16 pins are as follows: - 1). Ground Pin 2). VCC 3). V0/VEE 4). RegisterSelect5).Read/Write 6).Enable 7).7-14Data Pins 15). +ve LED 16). -ve LED/Ground. The word "BUZZER" comes from German word "SUMMEN"- to buzz. It is primarily a sound-emitting device routinely used as a signal device. There are two types of buzzers active and passive buzzer. Active buzzer is an easiest module to produce a sound of about 1.9 kHz andIn Passive Buzzer is an electromagnetic squeaker used to generate asound signal of different frequencies. The power supply voltage for the squeaker varies from 3.0 to 5V.

RELATED WORK

In this section, the current studies are evaluated thathavebeenappliedwiththis project work todetect thefireincident by Jusak and Farahan Arkan in their researchaboutthe wirelesssensornetwork.ZigbeeusesaWIFInetwork (Wi Fi) as the communication mediawith the frequency 2.4 GHz. On the other side, theresearchpaper aboutwirelesssensornetworkhasdonewitht h e Parallax445MHzusingradiofrequency.Therangeof that Parallax is 10 centimeters (NLOS / No Line of Sight)and 10 centimeters (LOS / Line of Sight).Ingeneral, all the related work is too hard for user togetthe data. During the last decade, the numbers of mobile phoneshasincreasedquicklyinthedevelopingworld.B yincreased, it would possible to use the smartphone'sfeature for many importance things, also as a communicationmedia for fire detectors. Communication system in mobilephonesisusingGSM(GlobalSystemforMobile Communication). The GSM (Global System for Mobile) is a digital telephone communication'stechnology. GSM'stechnologyiswidelyused inmobilecommunication,especiallythemobilestation .Inamobile station, there are some standards that can be used inGSM cellular communication's system, like SMS (ShortMessageService).SMScontaining25character smaximum. Figure 1 showing the technology standards ofthe GSM. Awirelesssensornetworkconsistsofthreemaincompo nents,node,gateway,andsoftware.Nodewill bedistributedthroughan interfacelikeasensordetectorenvironment.Datacollec tedwillbesentbywirelessthrough the gateway,where is free operated or connectedto the host system. In a host system, the data is collected,processed, and then displayed usingthe software.

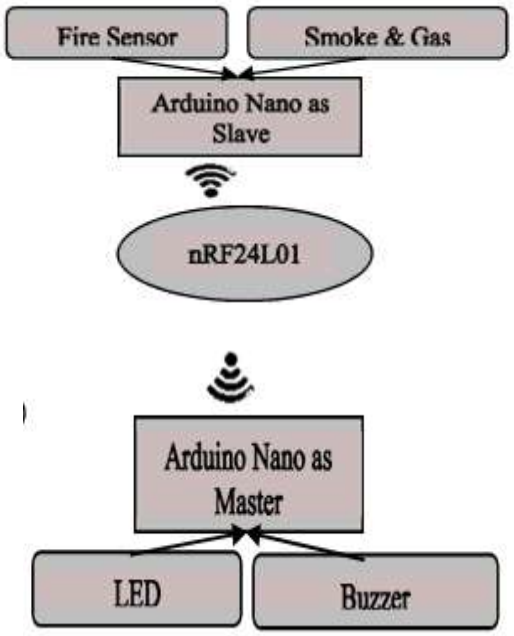

Fig1.CommunicationFlowofSMS

Figure 1 shows the communication movement of a SMSfrom the MS1 to MS2. When the user sends a SMS, thenthe SMS is transmitted to MSC by cellular network thatavailable.Then,MSCwilltransfertheSMSagainto a SMSCforsavingit.Ingeneral,communicationsystem for mobile phones is economical. The data can bequickly transferred between the users and the microcontrollerviatheSMSfeature.Thisfeaturewillbe usedasa communicationsysteminafiredetector. Furthermore, the Arduino Nano microcontroller will sendthis data to the Nano microcontroller that functions as amaster. Then the microcontroller will activate the alarm asasound indicationthroughabuzzer.

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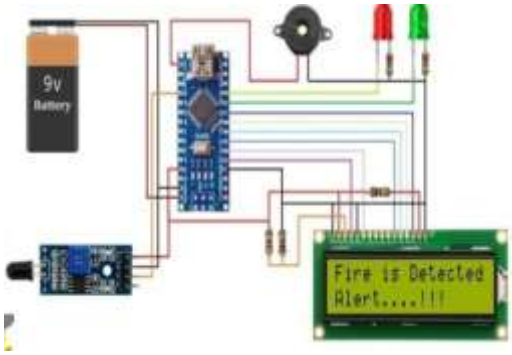


Fig.2. Block Diagram of the System

Fig .3. Output Screen

Figure5showstheFlowchart of the system would be a simulated. All the sensors will detect the sample space in real-time. When the sensor detects fire and smoke in near 10 cm at place 1, anotification will be sent and the buzzer start alarming the sound and the message to displayed on a LCD. When the sensor detects afire anda smokeat place 2,anotificationwillbesentand the buzzer start alarming sound and message will be displayed on an LCD at place 2.

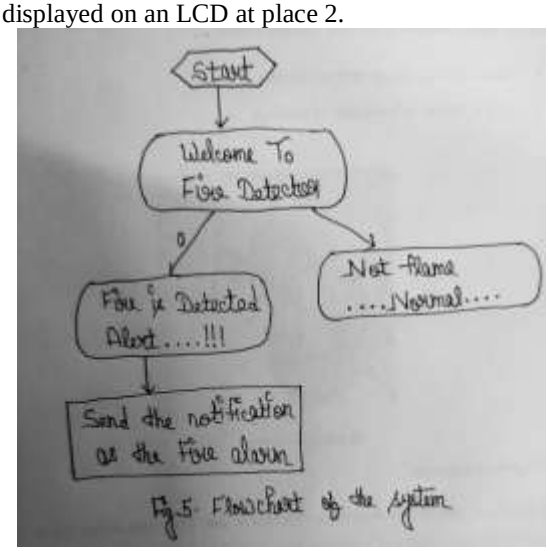


Fig5.TheFlowchartoftheSystem

RESULTAND ANALYSIS

Figure 6. shows a way to find out the level of the economistofthetoolisto becalibratedthesensor.Thissensorcalibrationis done by bringing fire, smoke or gas sources close to thesensor.Thesensoroutputintheformofananalogsign also that the output voltage value can be measurein using amulti-meter.

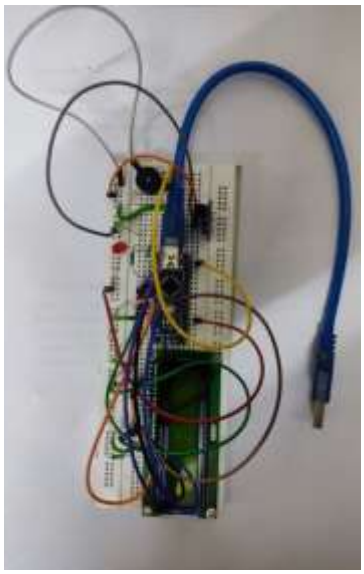


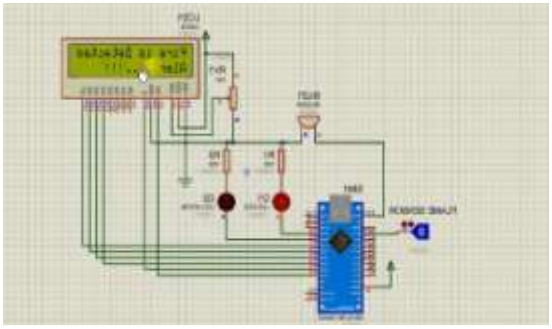
Fig.4. Hardware for Fire Detection

Fig6.SensorTesting

Testingsystemoutput:

1. Firesensor

Testing is done by providing a heat source such asfire right in front of the sensor receiver after the firesensor is connected to Arduino Nano. Figure 7 showsthe serial m



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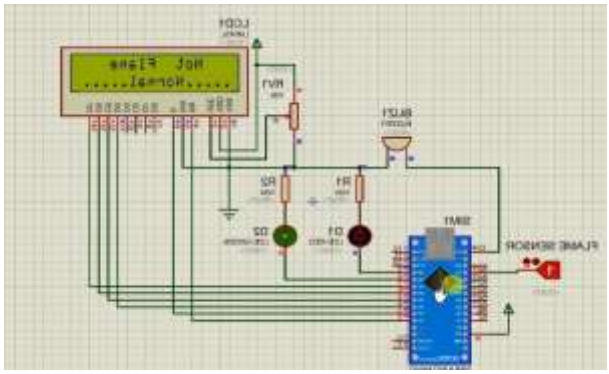

Arduino IDE software will beactivated so that the output voltage of the fire sensorcan be seen. This test.

TABLEI.FIRESENSOR

No	Distance	Voltage fromSerial Monitor	Voltage realusing
		ArduinoIDE	Multi-meter
1	1 cm	60	200mV
2	2 cm	72	0.92V
3	3 cm	80	1,34V
4	4 cm	93	3,45V
5	5 cm	108	4,21V
6	6 cm	200	4,38V

`From Table 1 the farther the distance from the heatsource to the sensor receiver, the value of voltagegeneratedwill decrease.

2.Gasandsmokesensors
Testing is done by giving smoke to the also measures the distance fromthe heat source to the sensor receiver. With the differentdistances and different voltages are produced. This table isa table of results of a voltage measurement from a serialmonitorsoftware.

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