FOREST FIRE DETECTION

Activity Overview

Forest fires are usually caused due to wildfires wiping out large areas of forest land. WIldfires are usually caused because of:

- Lightning Strikes
- People lighting fires carelessly
- Volcano Eruptions
- Heatwaves etc

In this project we shall learn how to detect forest fires and alert the officials so they can control it before it spreads across large areas.

SUBJECTS

Science Computing

TIME REQUIRED

2 Hours

AGE LEVEL

11 - 18 Years

What Shall We Learn?

- How to detect forest fires by monitoring CO levels in forests.
- How to monitor the temperatures using DHT22 Temperature- Humidity sensors.
- How to transmit data collected from the sensors through a Genuino 101 board.

Activity Objective

The aim is to detect forest fires by monitoring Temperature and CO levels in the forest. We have to design a simple device which can be installed in the forests and monitor the temperature and CO, whenever there's an increase in either of them it should notify the officials.

DID YOU KNOW?

Forest fires cause heavy emission of Carbon Monoxide (CO) and Carbon Dioxide(CO_2) in the atmosphere.

Components Needed

For this activity we need the following components :

Temperature-Humidity Sensor(DHT22)

It detects the temperature and Humidity levels and sends data to our Genuino 101.

CO2 Sensor

It detects the acidic density of the water and provides the values based on it to the Arduino 101.

Buzzer

The buzzer will beep when the Genuino 101 alerts it that the CO2 and Temperature levels have crossed the threshold.

Breadboard

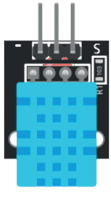
Breadboard is used to connect all the wires to make a circuit for our sensors and Genuino 101.

Genuino 101

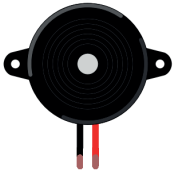
The brain of our device. It shall be programmed so that it can take values from DHT22 sensor and the CO2 sensor and buzz the buzzer when the levels cross a threshold limit.

Power Supply

It provides energy to our controllers and sensors.

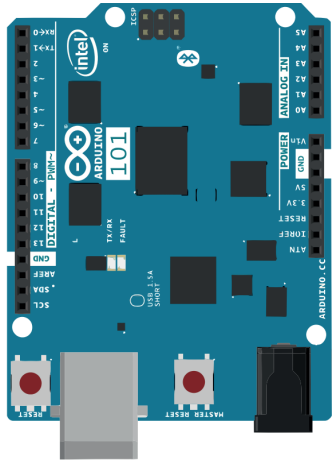


DHT22



BUZZER

POWER SUPPLY



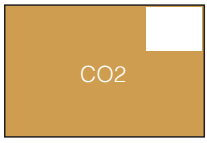
GENUINO 101

Understanding Sensors

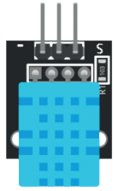
Whenever there's a fire there is high emissions of CO2 and because of the heat produced from the fire the temperatures increase drastically.

The CO2 sensors are measured using NDIR (Nondispersive Infrared) An infrared (IR) lamp directs waves of light through a tube filled with air toward an IR light detector, which measures the amount of IR light that hits it. The remaining light hits an optical filter that absorbs every wavelength of light except the exact wavelength absorbed by CO2. This wavelength value is calculated and transmitted to the Genuino 101 controller.

The temperature and humidity are measured using DHT22 sensors. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data which is then transmitted to the Genuino 101.



CO2 SENSOR



DHT22

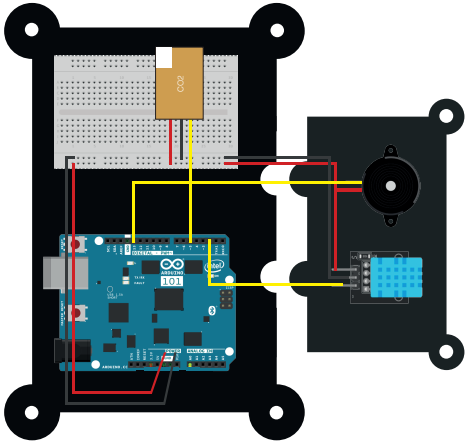
Connecting Your Sensors

Let us begin by connecting the Genuino 101 to the CO2 sensor as shown in figure.

Gently plug the Genuino 101 into the CO2 sensor shield.

There are connectors which will perfectly fit your Genuino 101 into the shield.

- We shall begin by connecting our sensors to the breadboard. Plug both the sensors on the breadboard.
- After connecting the sensors we shall connect the VCC and Ground wire to the pins.
- Let us connect our Genuino board to the Breadboard, take the jumper wires and signal wires and connect it in the points as shown below.
- We will now connect the Buzzer which will act as an alert system when fire is detected.



TOP VIEW

After connecting the shield with the Genuino 101 we shall provide power using our laptop. Once the power is connected we shall begin with our programming.

Programming Your Sensors

Download and open the code from *bit.ly/ForestFireDetector* and now you will have to upload the code on your Genuino 101 Click the upload button and once your code has been uploaded your Fire detector is ready.

Yaay! You have successfully programmed your device.

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Upload Button
(Top Left)

Output

Let us try testing our device to see if it gives accurate results. After connecting the sensor with the board, try to increase CO2 level by breathing nearer to our model and increase temperature nearer to it (In the care of a guardian, you may fire something also to get accurate results). Now buzzer should start ringing.If the buzzer makes noise it means your Forest Fire Detection Model is working perfectly fine.

Model Creation

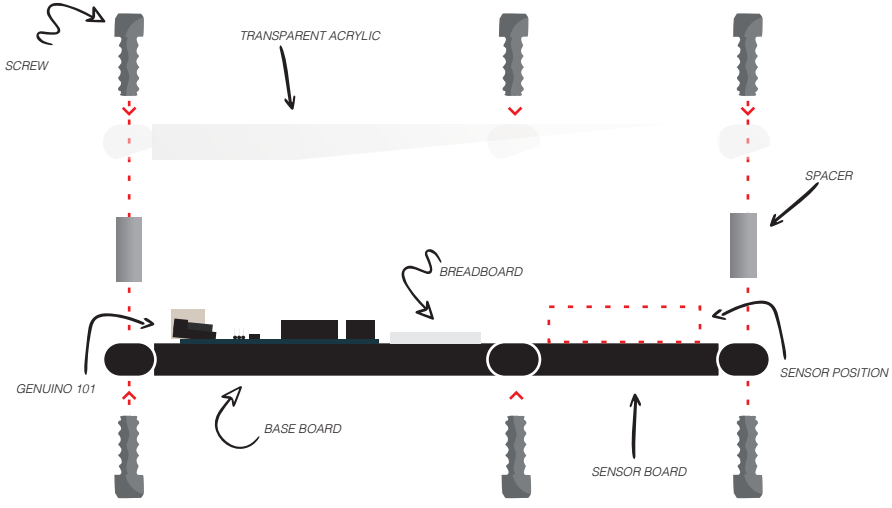
Before we begin with the model creation make sure you have:

- 4 Spacers
- 8 Screws
- Transparent acrylic board.

We will now arrange all the components in a case and make it look cool and easy to use. We will begin by connecting the CO2 sensor module to the base module. The breadboard and Genuino 101 are on the base module while your CO2 sensor is on the Gas sensor module.

Now insert the spacers on the cutouts which are given in the activity kit and tighten them using the screws provided to you. We have our modules attached and spacers set up, now
gently place the transparent acrylic board on the spacers and tighten it using the screw.

Once everything is ready, ensure all your screws are tightened and your modules are connected properly. It should look something like this :



SIDE VIEW

Impact Analysis

Indonesia is among the top countries that face forest fires. Imagine all the forest fires that could be controlled by installing such detectors in various parts of the forest.

Future Scope

Now we know how fire can be detected.We can use the same method and send SMS or Notification to forest authorities immediately using IoT networks. We may take real time data regularly and see in our smart phone or can be used for future data analysis.

Further we can accurately investigate cause of fire using flammable gases sensors in the system, which can be used in factories or commercial building.