An Arm And Bluetooth Based Efficient And Low-Cost Air Quality Detection Device With Automation For Homes

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Abstract- *Now a days, with the increasing technology we are polluting the entire world in different ways. In that we have air pollution, noise pollution, soil pollution, water pollution etc., in our project we are coming up with a new device which can monitor the air pollution levels, Temperature and humidity levels in our homes using the air quality sensor (mq135), temperature and humidity sensor can continuously monitor the home and if we got the changes in the air, temperature and humidity values it will intimate to us through indication led or sends the data to the owner using Bluetooth device.*

And also, we are adding a new feature to this device i.e., Artificial Intelligence (AI). It can easily detect the human presence in the house using PIR sensor. When the standard values of air detection sensor, temperature and humidity goes high or low then it will automatically turn on/off the Fan/AC and other devices also. It will do the action only when the human is present inside the home and when the human being is not there it will send the alert message through Bluetooth and can indicate by at that place by using led attached to it. If fire accident occurs at that place the sensors values go high and it will intimate to the user using Bluetooth.

Keywords- Air Quality, Bluetooth, device, Artificial Intelligence, Humans, Power controlling.

I. INTRODUCTION

The advanced world consists of full of automated devices and these devices can operated along their own. Whenever they are working these causes the pollution different ways. And we are facing an important problem is air pollution. This air pollution can cause different types of diseases like lung infections, heart problems, and brain related issues. So we are implementing a compact device which can helpful to the people to identify the pollution levels at any place

Now a days, with the increasing technology we are polluting the entire world in different ways. In that we have air pollution, noise pollution, soil pollution, water pollution etc., in our project we are coming up with a new device which can monitor the air pollution levels, Temperature and humidity levels in our homes using the air quality sensor (mq135), temperature and humidity sensor can continuously monitor the home and if we got the changes in the air, temperature and humidity values it will intimate to us through indication led or sends the data to the owner using Bluetooth device.

And also, we are adding a new feature to this device i.e., Artificial Intelligence (AI). It can easily detect the human presence in the house using PIR sensor. When the standard values of air detection sensor, temperature and humidity goes high or low then it will automatically turn on/off the Fan/AC and other devices also. It will do the action only when the human is present inside the home and when the human being is not there it will send the alert message through Bluetooth and can indicate by at that place by using led attached to it. If fire accident occurs at that place the sensors values go high and it will intimate to the user using Bluetooth.

In the implementation of device, we can use different microcontrollers or microprocessor for this application. In this I am choosing the arm cortex 32-bit device for my project to work more efficient in less time.

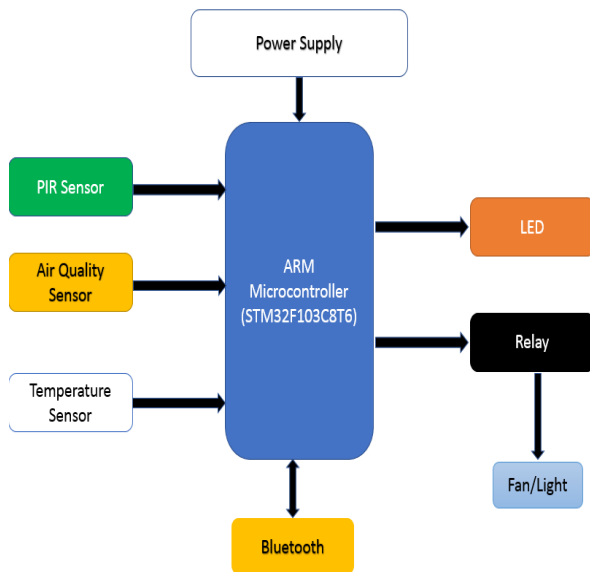## II. EASE OF USE

I. Block Diagram:

Fig 1: Block Diagram

In this project we are adding the different modules to collect the different amounts of data based on that data the device will operate the device on independently. In this the power supply will be 5v which is utilized by the all the devices through microcontroller. In this device we are using the MQ103 air quality sensor to detect the air quality present inside the home. When the threshold values will increase inside the home it will indicate the danger light with alerting the user by using Bluetooth device. If person is present inside the home it will automatically detect the user by using PIR Sensor and turn on the light and fan. Whenever the human is not present there it will intimate the surroundings using led.
We can also have a smart home technology we can operate any device using the Bluetooth at that place.

II. Input Section

In this project some devices are acts as an input device for the project. In that PIR Sensor, Air quality sensor, Temperature sensor and Bluetooth devices.
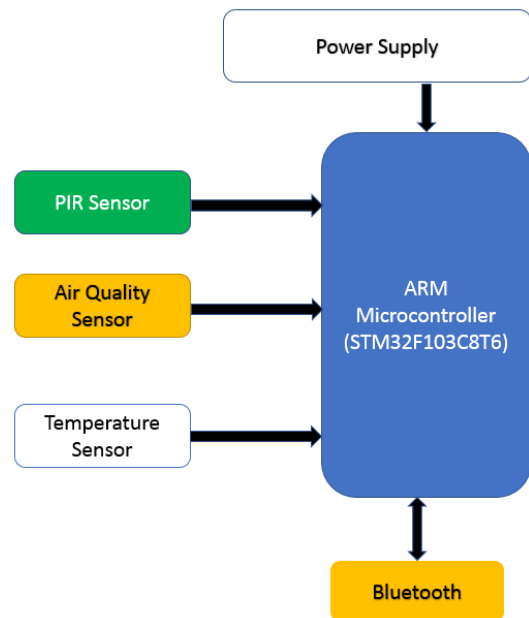

Fig 2: Input Section

In this the total device is operated based on the DC voltage and it will be connected to all the devices.

In this the air quality sensor continuously monitors the amount of gases present inside the home based on the heater coil temperature. The air quality sensor consists metal oxide layer on the heater coil. The heater coil circuit continuously heats by taking the supplying voltage. Whenever the gases present inside the room will be incident on the heater coil it will change the temperature of the coil. Based on the phenomena the sensor will work. In this we are valuating the air sensor values in the form of ppm.

Generally, the gases like CO2, CO and methane, butane and etc., present inside the home. When these values are increased more than 30-50ppm we will fell uneasy and uncomfortable. Whenever these values are changing the temperature also increased. We will see these values in Bluetooth device attached to it.

Whenever, the person presents inside the home it will automatically detected by the PIR Sensor module this can be detect the range up to 10-50m based on the power and turn on the Fan/Light and also gives the indication through led. Whenever the human being is present then only the light/ fan will turn on.

In this we added an advanced feature that the person can also turn on/off any device using Bluetooth methodology.
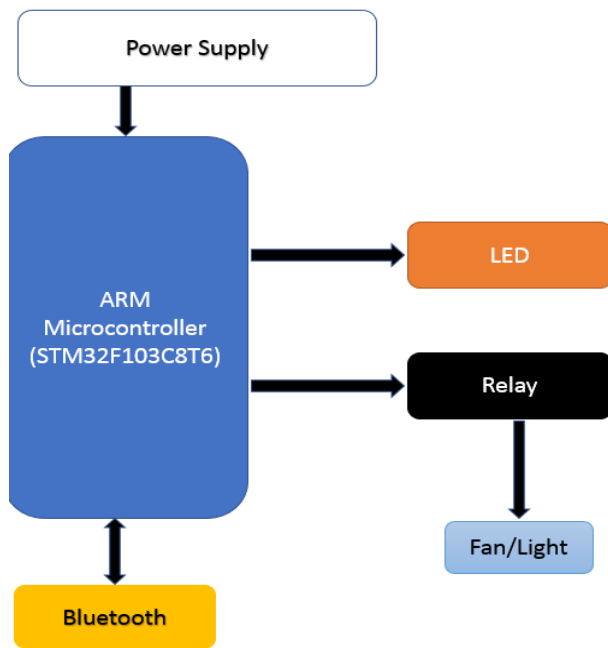
III. Output Section

Fig 3: Output Section

In the output section we are connected the indication led which alert to the persons present at the surroundings. And also we can see the temperature, humidity, air quality values through Bluetooth module.

Whenever the human being is present there it will turn on/off the fan/light attached to the relay device.

The relay device is operated based on the PIR Sensor input and air quality measurement values are checked by the micro controller.

In this the total device is working based on the closed loop structure. In closed loop it consists of feedbacking mechanism. Whenever the human is not present it will simply indicate to surroundings through led whenever the person is detected it will turn on the fan/light.

$$\frac{OUTPUT}{INPUT} = \frac{G}{1+GH}$$

Here: G- Open loop gain
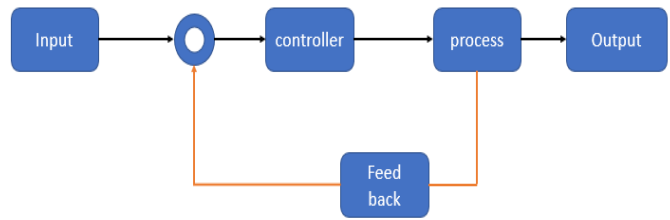   H- Gain

Fig 4: closed loop system block diagram

Until the human being is present it will monitor the air pollution levels and send to the Bluetooth only whenever the person is present it will turn on/off the fan/light.

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III. DEVICE FUNCTIONALITY

Our system consists of different sensors can monitor the home for continuous time to detect the unwanted gases present inside the home.
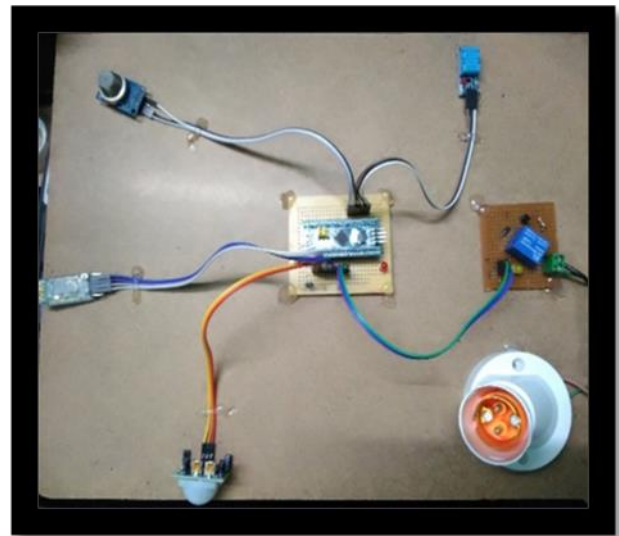

Fig 5: Project Image

This device can continuously monitor the gases present inside the home using MQ103 Sensor. The sensor is highly reliable, reactive, and low-cost sensor having more life time. In addition, with this we are adding a humidity and temperature sensor (DHT11). Which have a more capturing power to detect the temperature and humidity with the low power supply.
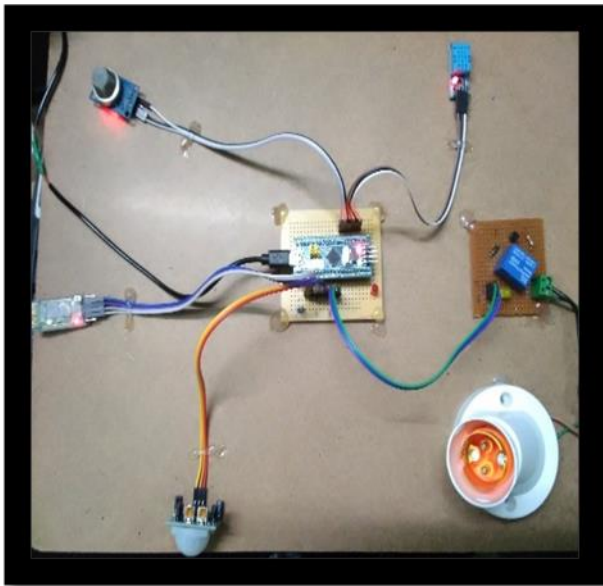
Fig 6: Device is in on condition

When the device is in on condition it will continuously detect the air quality values in terms of ppm. We can see those values using the Bluetooth module attached to it.
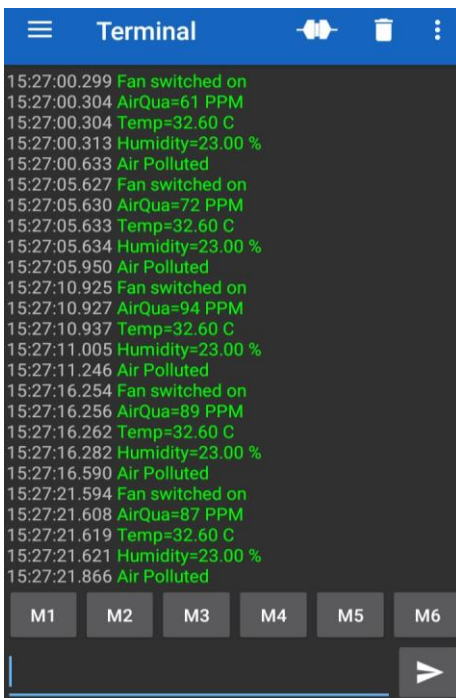

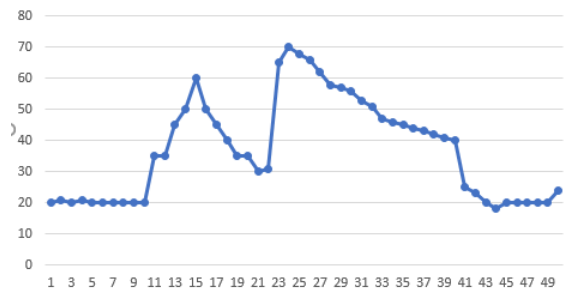Fig 7: Values on mobile having Bluetooth application

Fig 7: Values in the form of graphical representation for various gases

Whenever the values are greater than the threshold values the device will gives the indication led. If human us present there it can sense by using PIR Sensor and turn on the Relay as shown in bellow figure.
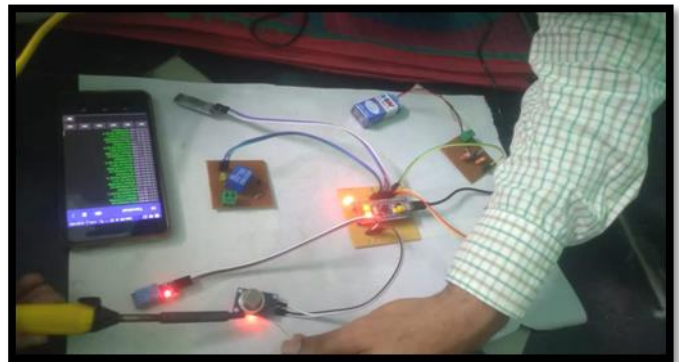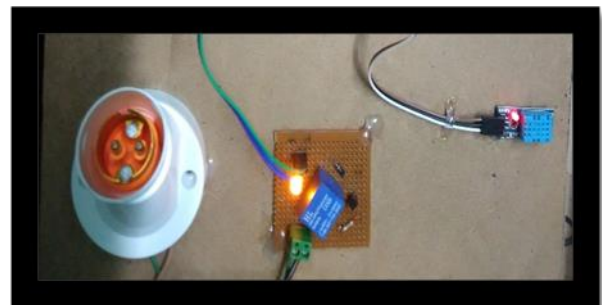

Fig 8: Smoke Detected

Fig 9: Relay is in on condition

In this device we have added an advanced feature that we can control the home appliances using the Bluetooth module. If we will send the '1' from the mobile using the Bluetooth application it will turn on the relay at any condition. Whether the smoke is detection or not. We want to turn off any device we can simply send '0'. then the device will be in off condition those images are shown below
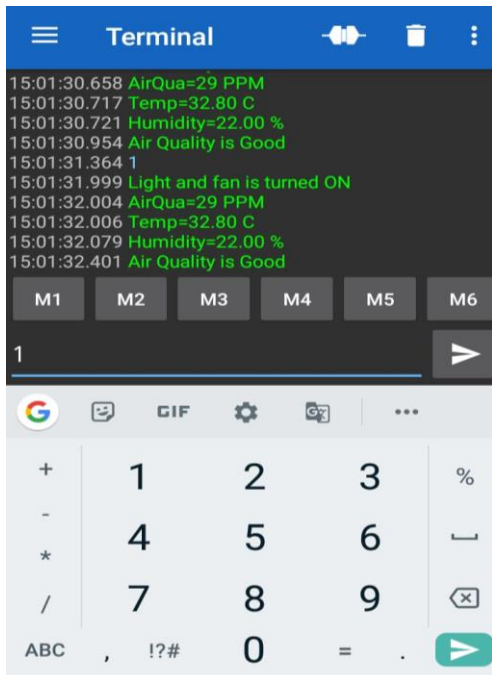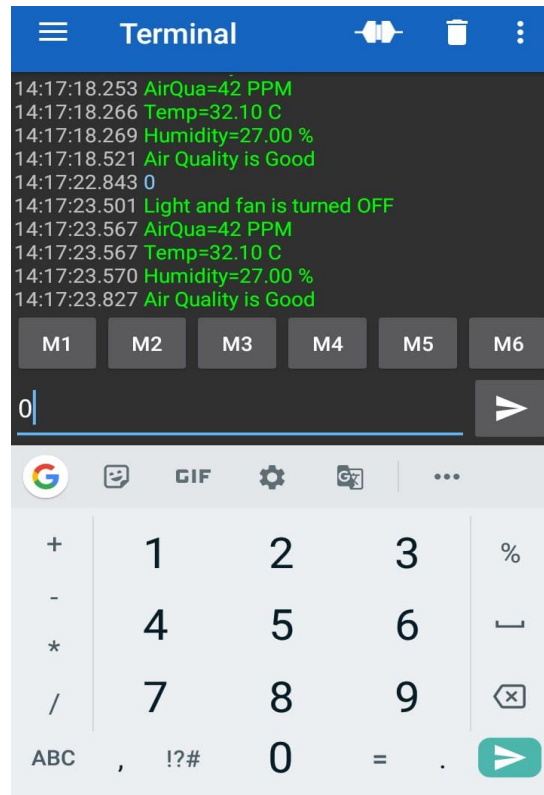
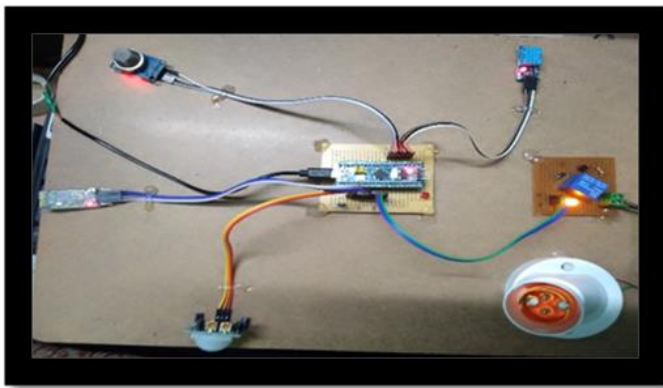Fig 10: Relay on by using Bluetooth command

Fig 11: Relay is in on condition by Bluetooth module
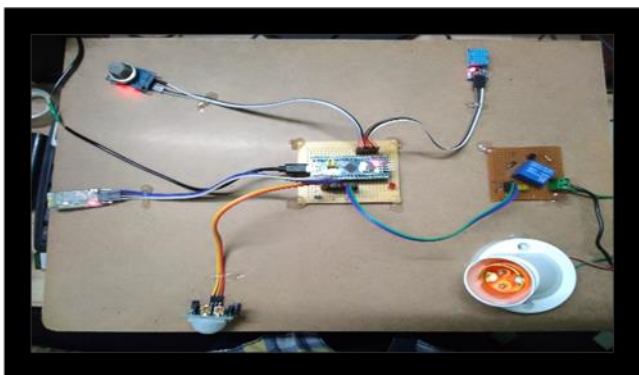

Fig 12: Relay is in off condition by Bluetooth module

Fig 13: Relay off by using Bluetooth command

By using our device, we can convert the home into smart and advanced air quality monitoring home. This is a very low-cost Arm cortex device. We can protect ourselves from the unwanted gases present inside the home to reduce the illness by air pollution. This device an also detect the fire accidents also whenever the temperature will goes high it will intimate by using led and Bluetooth device.

IV. APPLICATIONS

This project consists of wide range of applications.
  a. It can detect the unwanted gases present inside the home.
  b. Can detect Temperature and humidity values. when any fire accident occurs it will intimate using led and buzzer.
  c. Can be used for smart home automation.
  d. It can be useful for home and offices and industries also.
  e. It has a feature can control Power by unwanted turn on/ off lights and fans.

V. CONCLUSION AND FUTURE SCOPE

This device is at low cost and can be utilized for anywhere. If we add the GSM Module can see the values from

anywhere in the world. And we can also automate any device using GSM also.

In future implementation we will add the GPS device to it the we can have a chance to identify the location also.

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[3] Fahmy, Hossam Mahmoud Ahmad (2016). Wireless Sensor Networks: Concepts, Applications, Experimentation and Analysis. p. 108. ISBN 978-981-10-0412-4. The use of standardized, with open standards over proprietary protocols provides the industry with the freedom to choose between suppliers with guaranteed interoperability. Standardized solutions usually have a much longer lifespan than proprietary solutions.

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