

POLLUTION METER WITH DIGITAL DASHBOARD

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ABSTRACT

The level of pollution has increased with times by lot of factors like the increase in population, increased vehicle use, industrialization and urbanization which results in harmful effects on human wellbeing by directly affecting health of population exposed to it. In order to monitor quality of air, a Wireless sensor network(WSN)based new framework is proposed which is based on data acquisition and transmission. The parameters of the environment to be monitored are chosen as temperature, humidity, volume of CO, volume of CO₂, detection of leakage of any gas -smoke, alcohol, LPG. The values of these parameters are transmitted by using Zigbee Pro (S-2) to a base station where they are being monitored. The value of temperature and humidity are transmitted over Bluetooth also so that every person in the range of the system can check it over their smart phones and laptops as these parameters hold importance to everyone. CO, a dangerous parameter is monitored with an extra precaution. A text message is sent to the base station through GSM module whenever its volume exceeds a particular safe limit intended for a particular application. Main components – Arduino Uno, Gas sensor MQ135, Temperature and Humidity sensor DHT11. Developing software which will act as a Digital dashboard. It will display the PM, date, temperature, humidity, light intensity etc. Server- Firebase (second priority – Blynk Software and server).

Keywords: Wireless Sensor network, Zigbee Pro, Arduino Uno, Blynk Software

I INTRODUCTION

Air pollution is the biggest problem of every nation, whether it is developed or developing. Health problems have been growing at faster rate especially in urban areas of developing countries where industrialization and growing number of vehicles leads to release of lot of gaseous pollutants. Harmful effects of pollution include mild allergic reactions such as irritation of the throat, eyes and nose as well as some serious problems like bronchitis, heart diseases, pneumonia, lung and aggravated asthma. According to a survey, due to air pollution 50,000 to 100,000 premature deaths per year occur in the U.S. alone whereas in EU number reaches to 300,000 and over 3,000,000 worldwide . Various kinds of anthropogenic emissions named as primary pollutants are pumped into the atmosphere that undergoes chemical reaction and further leads to the formation of new pollutants normally called as secondary pollutants. For instance, according to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), nearly all climate-altering pollutants either directly or indirectly (by contributing to secondary pollutants in the atmosphere) are responsible for health problems . Almost every citizen spends 90% of their time in indoor air . Outdoor air quality of the cities of developed countries improved considerably in recent decades. In contrast to this, indoor air quality degraded during this same period because of many factors like reduced ventilation, energy conservation and the introduction to new sources and new materials that cause indoor pollution . The design of buildings for lower power consumption

resulted in decrease of ventilation which further decreases the quality of air inside the building. This increases the need for indoor air quality (IAQ) monitoring Due to this fact and use of new building materials, IAQ often reaches to unacceptable levels.

II PROPOSED WORK

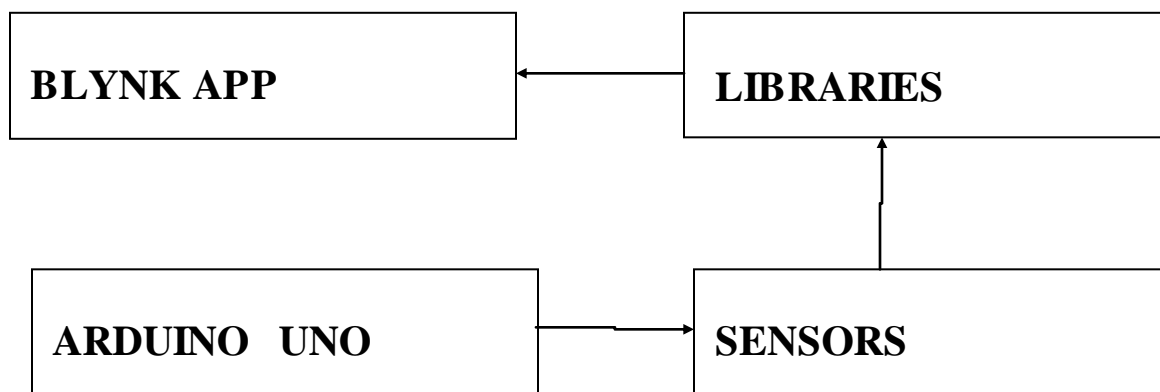
2.1 Working of Pollution Meter

Arduino Uno is used as a control and measuring unit for connection to the Blynk Cloud. The sensors include Gas sensor MQ135 and Temperature and Humidity sensor DHT11. Particle Pollution also called particulate matter(or PM),is a mixture of solid particles and liquid droplets floating in the air. Some particles are released directly from a specific source, while others are formed in chemical reactions in the atmosphere.

Sensitive material of the sensor is tin-dioxide, whose conductivity increases with the concentration of gas. Change in conductivity is converted into output voltage signal, which varies corresponding to the concentration of combustible gas. MQ135 is highly sensitive to ammonia, sulphide and benzene steams, smoke and other harmful gases. It is a low-cost sensor, suitable for different applications. Output of the gas sensor is connected to analogue input pin A3 of Arduino Uno board through connector CON2.

MQ135 Semiconductor Sensor for Air Quality Control Sensitive material of MQ135 gas sensor is SnO₂, which with lower conductivity in clean air. When the target combustible gas exist, The sensor's conductivity is more higher along with the gas concentration rising. Please use simple electronic circuit, Convert change of conductivity to correspond output signal of gas concentration. MQ135 gas sensor has high sensitivity to Ammonia, Sulfide and Benzene steam, also sensitive to smoke and other harmful gases. It is with low cost and suitable for different application.

2.2 BLOCK DIAGRAM

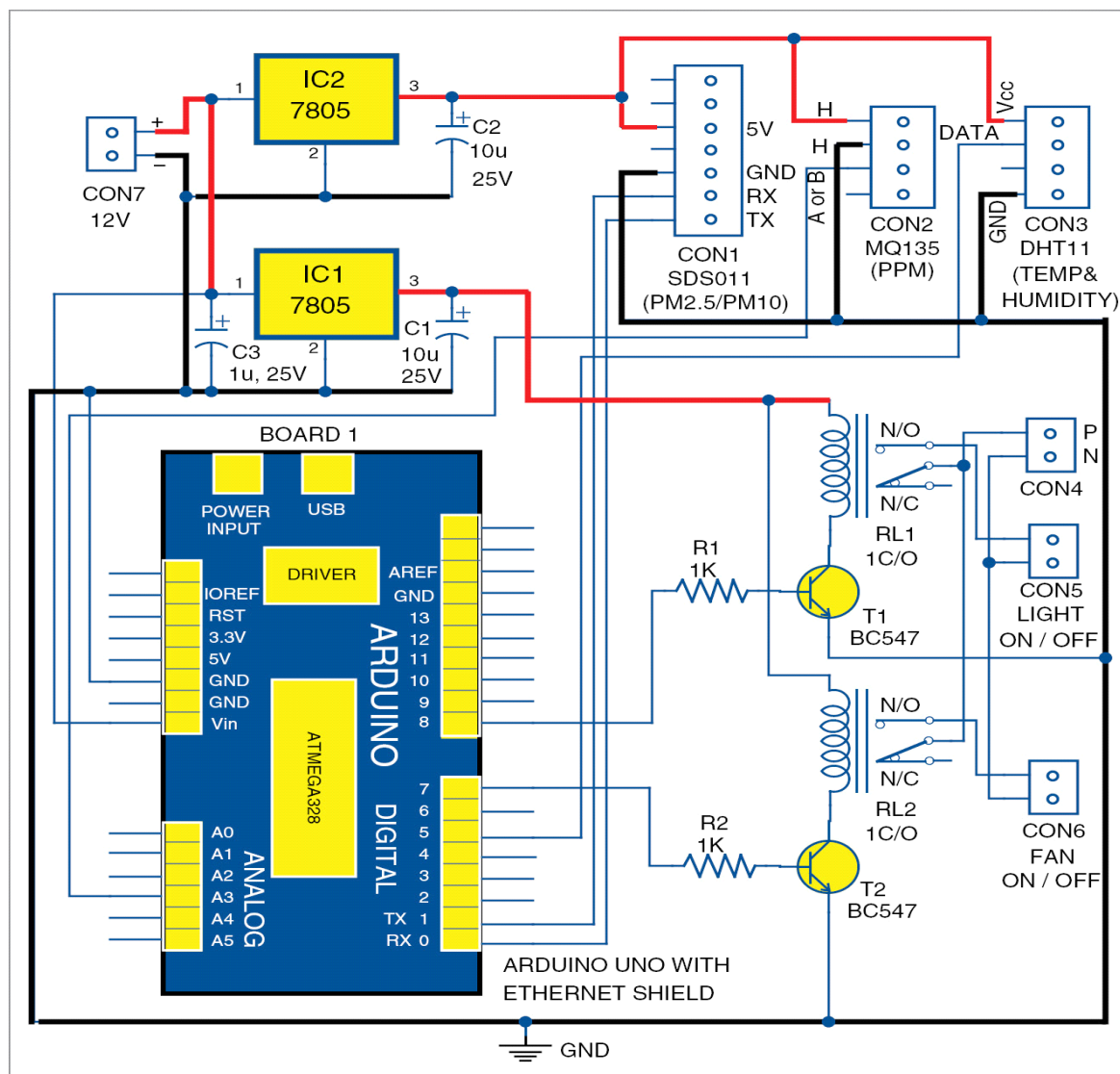


Blynk library should be installed manually. Follow the instructions:

1. Download the latest release .zip file.
2. Unzip it. You will notice that archive contains several folders and several libraries.
3. Copy all these libraries to **your_sketchbook_folder** of **Arduino IDE**. To find the location of **your_sketchbook_folder**, go to top menu in Arduino IDE: *File -> Preferences* (if you are using Mac OS - go to *Arduino -> Preferences*)

2.3 HARDWARE IMPLEMENTATION

CIRCUIT DIAGRAM



2.4 SOFTWARE IMPLEMENTATION

Presented here is an air pollution meter to monitor air quality on your smartphone using Blynk application and Arduino board. Blynk is an Internet of Things (IoT) platform to control Arduino, Raspberry Pi and the like over the Internet. In this project Blynk provides a digital dashboard on your smartphone that displays real-time air quality readings for the immediate surroundings.

Blynk is not meant for a specific board or shield. It will get you online and ready for the IoT, irrespective of whether Arduino or Raspberry Pi is linked to the Internet over Wi-Fi, Ethernet or an ESP8266 chip.

2.5 SOFTWARE USED

How Blynk works?

[Blynk](#) can control hardware remotely. It can display sensor data, store and visualise it, among other cool things. There are three major components in the platform as given below:

Blynk app

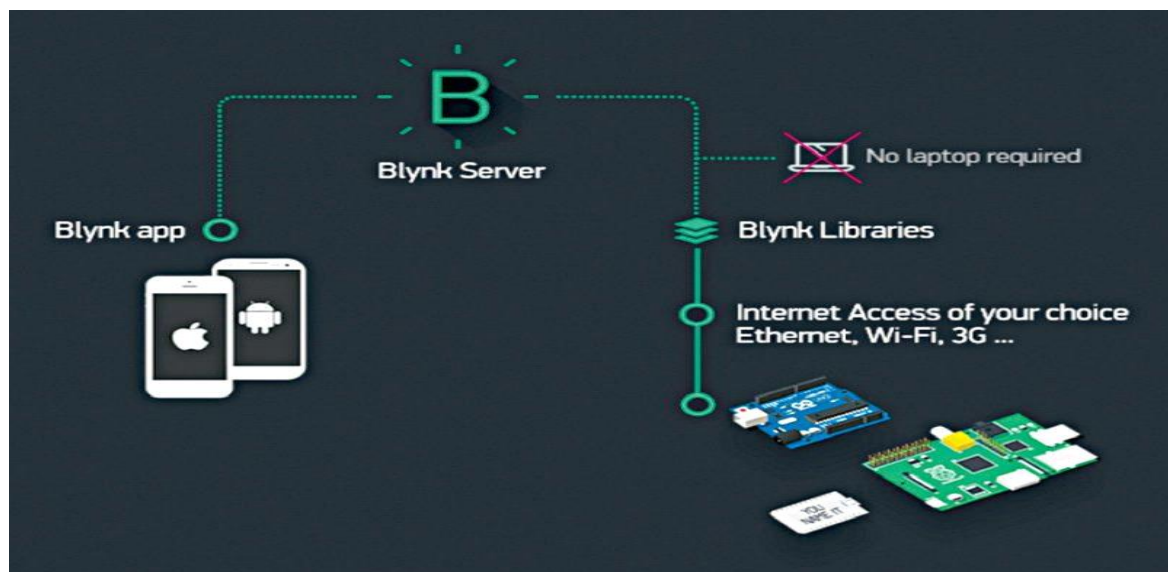
It allows you to create amazing interfaces for your projects using various widgets.

Blynk server

It is responsible for all communication between the smartphone and hardware. You can use Blynk Cloud or run your private Blynk server locally. It is open source, and can handle thousands of devices. It can also be launched on Raspberry Pi.

Blynk libraries

Libraries are available for all popular hardware platforms. The libraries enable communication with the server, and process all incoming and outgoing commands. When you press a button on Blynk app on the phone, the signal travels to the Blynk Cloud, where it finds its way to the hardware. It works the same way in the opposite direction, and everything happens in a blink of an eye.



Controller and sensors

Arduino Uno is used as a control and measuring unit. The sensors include Gas sensor MQ135 and Temperature and [Humidity sensor](#) DHT11.

Smartphone and digital dashboard

Android phone is used as a smartmeter. Blynk app is a well-designed interface builder. It works on iOS and Android, and provides easy-to-use widgets for the LCD, push buttons, on/off buttons, LED indication, RTC and more. Using Blynk digital dashboard features in a smartphone helps reduce the cost of the project because traditional LCD display, mechanical buttons, LEDs, RTC and so on are not required.

Digital dashboard setup

Step 1. Mount Ethernet shield on Arduino Uno and connect Board1 to PC using a USB cable.

Step 2. Change the IP address in IPAddress IP (your IP address) in Arduino sketch ethernetclient.ino. This sketch/program code can be downloaded from the end of the article.

Compile and upload the code into Arduino Uno from Arduino IDE. This code shows you how to make an HTTP request using an Ethernet shield. It returns a Google search for the word Arduino. Results of this search are viewable as HTML through Arduino's serial window.

Step 3. Compile ethernetserver.ino sketch and upload it to Arduino Uno board. Change your IP address in IPAddress IP (your IP address) in the sketch. In this example, use your Ethernet shield and Arduino board to create a simple Web server. Using the Ethernet library, your device will be able to answer an HTTP request with the Ethernet shield.

After navigating to the Ethernet shield's IP address, Arduino will respond through HTML browser and will be ready to accept input values from analogue pins (A0 through A5) of Board1.

Step 4. Connect your mobile with Wi-Fi. Download and install Blynk app from Google Play store. Then, create a new Blynk account. This account is separate from the accounts used for Blynk Forums, in case you already have one.

An account is needed to save your projects and have access to these from multiple devices anywhere in the world. It is also a security measure. We recommend using a real email address because it will simplify things later.

Step 5. After you have successfully logged into your account, start by creating a new project (Fig. 5), and give it a name.

Step 6. Select the hardware model you intend to use. In this case it is Arduino Uno.

Step 7. Authorization (or Auth) token is a unique identifier that is needed to connect the hardware to your smartphone. Every new project you create will have its own Auth token (Fig. 7). Click email button and the token will be sent to the email address you used for registration. Use this token in auth[] = "your token" in pollution.ino file.

Step 8. Press Create.

Step 9. Your project canvas is empty at the moment. Tap anywhere on the canvas to open the widget box; all available widgets are located here. Add widgets.

Add the following widgets in the settings and make the screen look like a digital dashboard as shown in Fig. 2. This includes adding the LCD (Fig. 10), LED, on/off switch, pushbuttons and RTC widgets.

Step 10. Run the project. When you are done with the settings, press Play. This will switch the display from edit to play mode where you can interact with the hardware. While in play mode, you will not be able to drag or set up new widgets. Press Stop and get back to edit mode. In play mode, you will find the screen shown.

CONCLUSION

Air Pollution sensors can help people control their environments to a certain extent and increase awareness of the pollutants around them. If people are more aware of the contents of the environment, they can change their routines and habits in order to be less affected by Air Pollution. This can help increase the quality of life and overall health of people at Risk.

The system to monitor the air of environment using Arduino microcontroller, IOT Technology is proposed to improve quality of air. With the use of IOT technology enhances the process of monitoring various aspects of environment such as air quality monitoring issue proposed . Here using of MQ135 gas sensor gives the sense of different type of dangerous gas and Arduino is the heart of this project which control the entire process. Wifi module connects the whole process to internet and LCD is used for the visual Output.

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