

IOT Enabled Air Pollution Meter with Digital Dashboard

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DOI: 10.29322/IJSRP.8.10.2018.p8276
<http://dx.doi.org/10.29322/IJSRP.8.10.2018.p8276>

Abstract- This project explains the depiction and execution of an Air Pollution Meter. The innovation grasped here, is a hands-on execution of the idea of Internet of Things. This specific work is an exploration of the probabilities of utilization of this innovation, in this world, where natural well-being is turning into a genuine risk. The work is actualized utilizing Android, iOS and microcontroller board of Arduino. A couple of sensors are likewise utilized, for example, temperature and humidity sensors and a couple of gas sensors to screen changes.

Index Terms- air quality; pollution; pollution detector; Arduino Uno;

I. INTRODUCTION

The changes in weather in nature around us is an evident reality. It is gradually yet unquestionably having unfavorable consequences on our lives and the things around us. With the ongoing increment in industrialization, release of harmful substances have expanded complex. The levels of lethal gases noticeable all around is disturbing. These are causing an irreversible change.

As indicated by rehashed studies and reports around the world it has been inferred that:

- Degradation in Air Quality costs the worldwide economy \$5 trillion yearly.
- 1 out of 8 deaths around the globe is linked to air contamination.
- 92% of total populace lives with hazardous air contamination.

Under these conditions it is very much important for everybody to have the capacity to keep a check on the circumstance of Air Pollution and Air Quality around us. Asian countries have a portion of the most exceedingly bad Air Qualities around the globe, with the centralizations of noxious and combustible gases having reliably high fixations. In India the circumstance is ending up to be more disgusting day by day. Our capital has been most awfully hit via Air Pollution, with 2016 winter recording a portion of the most astounding numbers ever.

Current air contamination systems comprise on few stations instrumented with exorbitant air quality screens, which give exact information yet just in couple of static areas, and which are additionally supplemented with scattering models.

The most recent in the field of correspondence innovation is the Internet of Things (IoT). By utilizing IoT one can remotely computerize and speak with various machines and gadgets over the Internet. This type of correspondence can utilize Bluetooth, LAN or WLAN for correspondence. In this manner, a pragmatic acknowledgment of utilizing Internet of Things by means of Blynk App has been endeavored here.

In the light of the present rates of industrialization and unfortunate contamination levels, observing the air quality is important to guarantee preventive measures and better nature of living.

Here a convenient model is introduced that will join Blynk and a couple of condition sensors to screen gas levels. The thought behind this work is to address the upcoming difficulties and to encourage our successors with magnificent thoughts that should clear their idea about remote correspondence and control framework. There will be examples where a wired association between a remote machine/gadget and the control unit probably won't be plausible because of auxiliary issues. In such cases a remote association is a superior alternative.

II. LITERATURE SURVEY

[1]Design of Air Quality Meter and Pollution Detector (Arunava Mukhopadhyay). This work describes the design and implementation of a Air Quality Meter and Air Pollution Detector. The innovation embraced is a pragmatic usage of the idea of Internet of Things.

[2]Smart Vehicle Monitoring System for Air Pollution Detection using Wsn (Suganya E, Vijayashaarathi S). This proposed studies concentrates on measuring the fuel level of air contamination across the cities and reduces the man energy and likewise builds the general adaptability of sender and collector. The primary objective of the proposed system for the moving cars is to monitor the NO₂, Humidity, Temperature, CO ranges of air contamination via using NO₂ sensor, Moistness, Temperature and CO sensor.

[3]Automated Control System for Air Pollution Detection in Vehicles (Siva Shankar Chandrasekaran). This paper interests at the utilization of the semi-conductor sensors on the outflow retailers of vehicles which recognizes the level of contamination and furthermore shows this level with a meter.

[4]A method for the monitoring of the air pollution in the operating room caused by anaesthesia agents (B. Spyropoulos). A fuel chromatographic technique using a frequency modulated ECD and a hilass Spectrometer (1-two hundred AMU) had been

used for the dedication of Nitrous Oxide, Halothan and Isofluran lines in Operating Theatre environment.

III. PROPOSED SYSTEM

This task is an IoT enabled air tainting meter to screen air quality on your mobile phone using Blynk application and Arduino board. Blynk is an Internet of Things (IoT) stage generally used, to control Arduino.

Here, Blynk gives a computerized dashboard on your cell phone that showcases continuous air quality readings for your surroundings.

Blynk isn't intended for a particular board or shield. It will prepare you on the web and for the IoT, independent of whether Arduino or Raspberry Pi is connected to the Internet over Wi-Fi, Ethernet or an ESP8266 chip.

IV. SYSTEM ARCHITECTURE

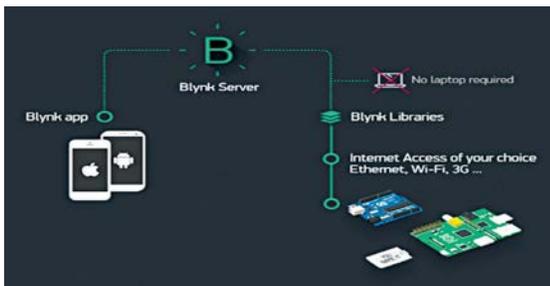


Fig 1: System Architecture

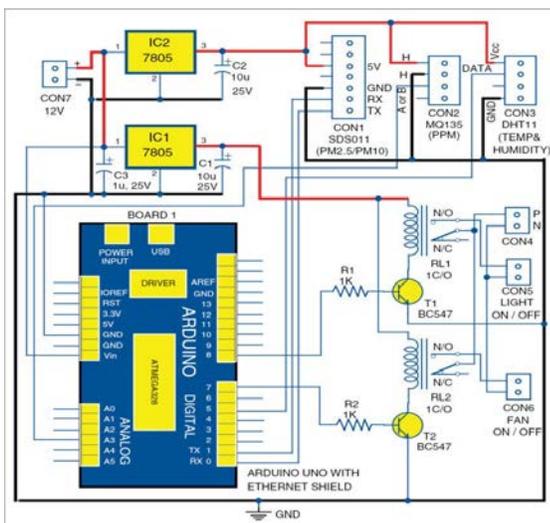


Fig 2: Internal Architecture

V. MODULE IDENTIFICATION

The various modules of this particular project is described as follows:

- i. PM2.5/PM10 sensor (SDS011)

Particulate matter (or PM), is a blend of strong particles and fluid beads skimming noticeable all around. A few particles are discharged specifically from a particular source, while others are shaped in convoluted concoction responses in the climate.

The PM2.5/PM10 sensor associated crosswise over CON1 was created by INOVAFIT, which is an upshot off from University of Jinan, China. It utilizes the principle of laser disseminating, and can recognize suspended particulate issue fixation running from 0.3 to 10 microns. Information gathered by the sensor is steady and dependable. SDS011 sensor is associated with UART port (TX and RX) of Arduino Uno board.

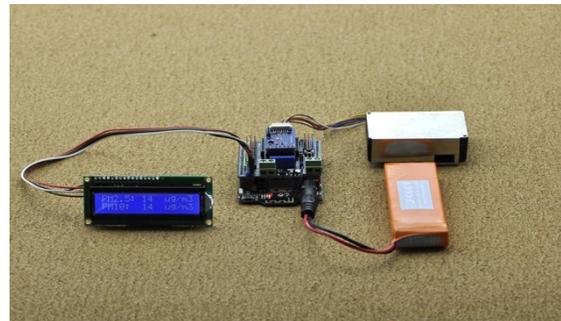


Fig 3: PM Nova Sensor

- ii. Temperature and humidity sensor (DHT11)

This composite sensor contains aligned advanced flag yields of temperature and dampness. Related with connector CON3, it joins a resistive-type moisture estimation part and a NTC temperature-estimation device. Its output pin is associated to digital pin 5 of Arduino Uno board. It is generally pocket-friendly as compared to its execution.

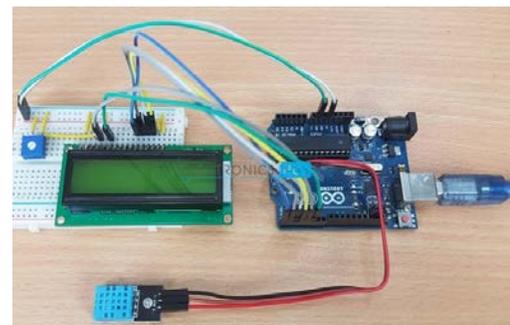


Fig 4: Temperature and Humidity Sensor

- iii. Power Supply

A 12V battery or supply is associated with connector CON7, which is regulated to 5V utilizing 7805 controllers (IC1 and IC2). At the point when the framework is controlled on, the gadget takes one moment to preheat the gas sensor before it is prepared for task. The entire sensor circuit can be fueled by 9V or 12V connector or battery. Here, IC1 and IC2 have been utilized for driving different parts of the circuit.

Encase the entire sensor circuit in an appropriate box, which ought to be set where you need to screen air quality or pollution.

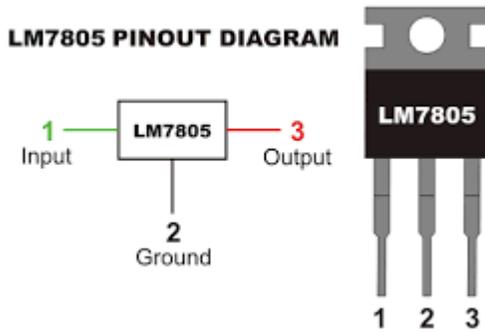


Fig 5: Power Supply

iv. Ethernet shield

Arduino Ethernet shield enables you to effortlessly associate Arduino to the Internet. This shield empowers Arduino on the planet, with an Interto send and get information from anyplace that has net connection.



Fig 6: Ethernet Shield

v. Blynk App

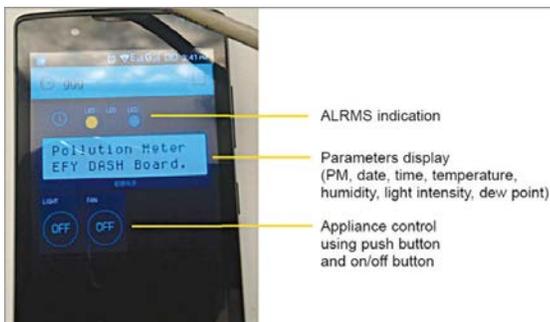


Fig 7: Blynk App

Blynk can control equipment remotely. It can show sensor information, store and imagine it, among other unique things. There are three noteworthy segments in the stage as given underneath:

- Blynk application

It enables you to make astonishing interfaces for your activities utilizing different gadgets.

- Blynk server

It is in charge of all correspondence between the cell phone and equipment. You can utilize Blynk Cloud or run your private Blynk server locally. It is open source, and can deal with a large number of gadgets. It can likewise be propelled on Raspberry Pi.

- Blynk libraries

Libraries are accessible for all mainstream equipment stages. The libraries empower correspondence with the server, and process all approaching and active commands. When you press a catch on Blynk application on the telephone, the flag goes to the Blynk Cloud, where it discovers its way to the equipment. It works on a similar route the other way, and everything occurs in a squint of an eye.

VI. WORKING PRINCIPLE

Stage 1: Mount Ethernet shield on Arduino Uno and interface Board1 to PC utilizing a USB link.

Stage 2: Change the IP address in IPAddress IP (your IP address) in Arduino portray ethernetclient.ino. This outline/program code can be downloaded from the finish of the article.

Assemble and transfer the code into Arduino Uno from Arduino IDE. This code demonstrates to you industry standards to make a HTTP ask for utilizing an Ethernet shield. It restores a Google scan for the word Arduino. Aftereffects of this inquiry are distinguishable as HTML through Arduino's serial window.

Stage 3: Compile ethernetserver.ino portray and transfer it to Arduino Uno board. Change your IP address in IPAddress IP (your IP address) in the draw. In this point of reference, use your Ethernet shield and Arduino board to make a clear Web server. Using the Ethernet library, your contraction will have the ability to answer a HTTP request with the Ethernet shield.

Subsequent to exploring to the Ethernet shield's IP address, Arduino will react through HTML program and will be prepared to acknowledge input esteems from simple pins [A0 through A5] of Board-1.

Stage 4: Connect your adaptable with Wi-Fi. Download and present Blynk application from Google Play store. At that point, make another Blynk account. This record is separate from the records utilized for Blynk Forums, on the off chance that you as of now have one.

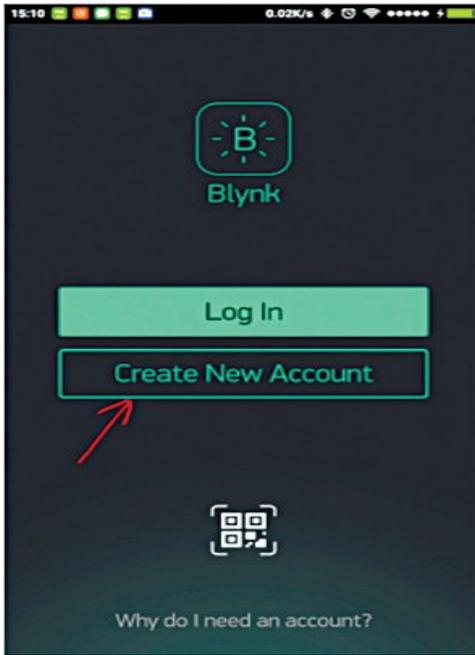


Fig 8: Making another record in Blynk

A record is expected to spare your ventures and approach these from different gadgets anyplace on the planet. It is additionally a safety effort.

Stage 5: After you have effectively signed into your record, begin by making another venture and give it a name.

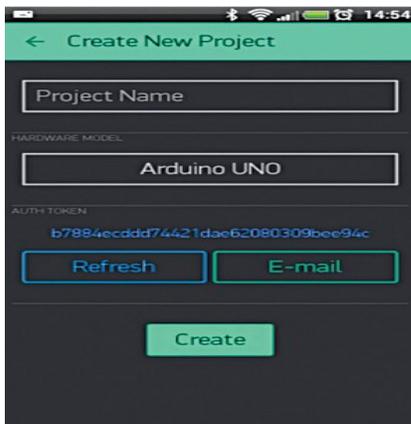


Fig 9: Creating a new project window

Stage 6: Select the equipment show you expect to utilize. For this situation it is Arduino Uno.

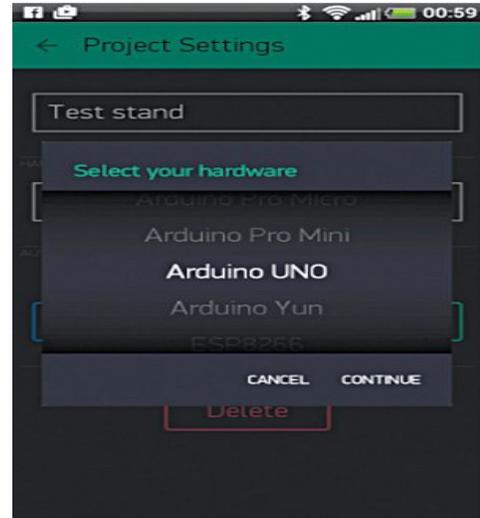


Fig 10: Selecting the hardware

Stage 7: Authorisation (or Auth) token is a unique identifier that is needed to connect the hardware to your smartphone. Each new venture you make will have its own Auth token. Snap email catch and the token will be sent to the email address you utilized for enrollment. Utilize this token in `auth[] = "your token"` in `pollution.ino` record.

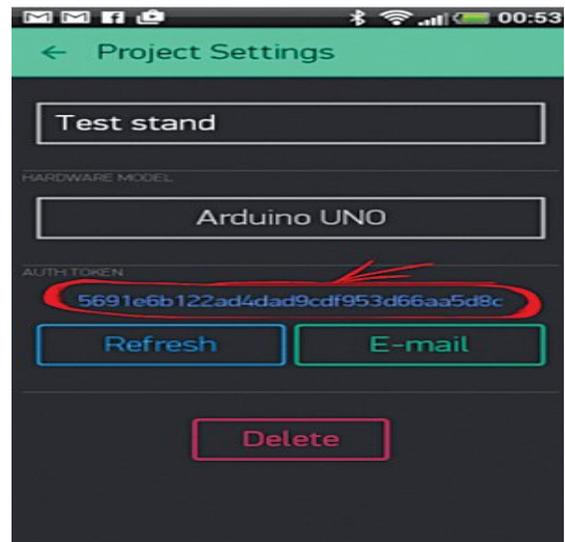


Fig 11: Typical authorisation token

Stage 8: Press Create

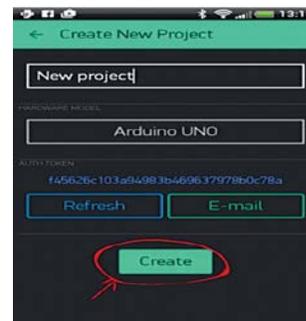


Fig 12: Create Button

Stage 9: The task canvas is vacant right now. Tap anyplace on the canvas to open the gadget box; every single accessible gadget is situated here.

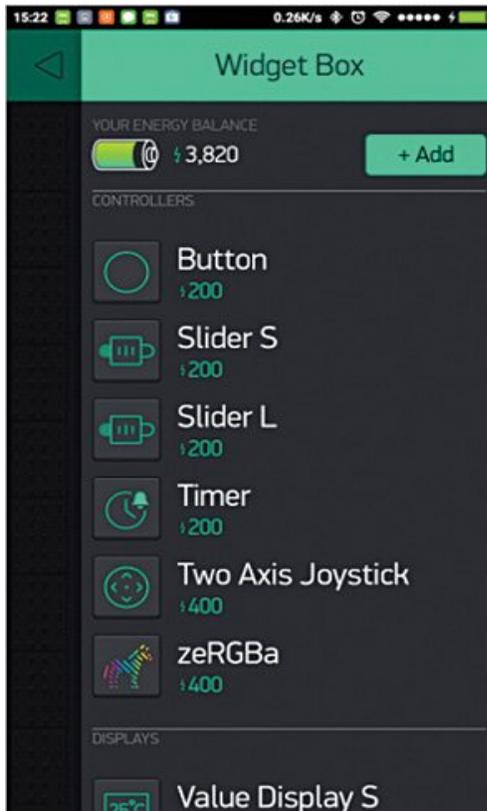


Fig 13: Widget Box

Add the following widgets in the settings and make the screen look like a digital dashboard as shown in. This incorporates including the LCD, LED, on/off switch, pushbuttons and RTC gadgets.



Fig 14: Including the widgets

Stage 10: Now, run the Blynk application program. When you are finished with the settings, squeeze Play. This will change the presentation from alter to play mode where you can communicate with the equipment. While in play mode, you won't have the capacity to drag or set up new gadgets. Press Stop and return to alter mode.

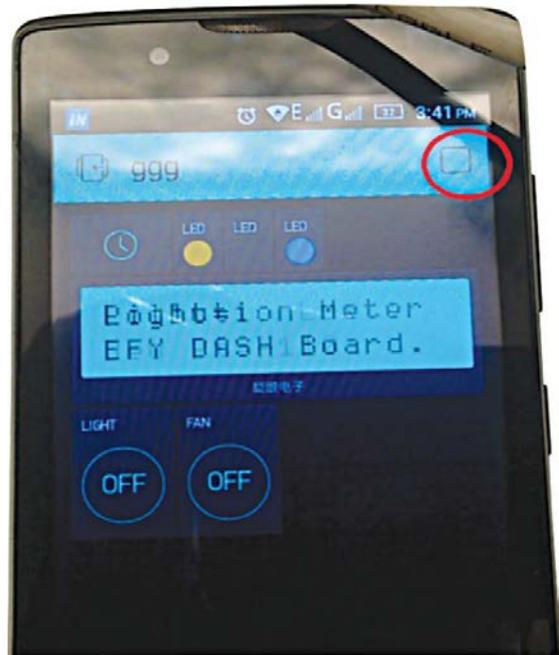


Fig 15: Run the Program.

VII. CONCLUSION

Air contamination is a mind boggling issue as far as toxicology and wellbeing hazard appraisal. There are a wide range of kinds of toxins which may offer ascent to consolidated impacts. To stop the contamination we have to spread mindfulness among individuals. They should know the current circumstance of the air and in what condition they are living. There is an immediate connection between the air quality of a surrounding and the strength of its inhabitants. It has been seen that on familiarity with the air contamination with real time data there have been changes in behavior that lead to healthier choices that are beneficial to the environment as well.

Here an endeavor has been made to assemble an air quality checking gadget, utilizing air contamination meter along with computerized dash board.

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- [3] Automated Control System for Air Pollution Detection in Vehicles (Siva Shankar Chandrasekaran, Sudharshan Muthukumar and Sabeshkumar Rajendran.)

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