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AIR POLLUTION MONITORING CUM CONTROLLING DEVICE

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Abstract:
The purpose of the device designed here is to measure air quality in accordance with aqi standards for use in indoor applications. The system immediately activates the fresh air pumping fan and simultaneously activates the exhaust fan to pump out the polluted air if the air quality is poor, which indicates a value greater than 150 due to smoke or any other toxic gases in the air. The air quality index (aqi), which is designed to measure temperatures between 0 and 500 degrees celsius, is used to measure air quality. However, the aqi is a method for displaying changes in air pollution levels. A measure of air quality is how clean or dirty the air is. The measurement of air quality is typically expressed in terms of parts per million (ppm), or micrograms per cubic meter. Typically, the concentration of pollution in the air is used to measure its quantity. The convergence of a poison in air might be characterized regarding the extent of the complete volume..
Mq135 is utilized as air quality contamination sensor and its result as factor dc voltage will be shifted by the air contamination. For instance, if air pollution is higher, the sensor will produce more output. The appropriate aqi is created based on the sensor's voltage, and its value will be displayed on an lcd. The simple information procured from the sensor will changed over in to computerized utilizing adc and this advanced information is taken care of to the implanted framework. With the assistance of a lcd connected with installed framework, dirtied air level will be shown. According to the aqi standards, the system will remove the polluted air and bring in clean air if the level of pollution is greater than 150.
Keywords: indoor air quality monitoring system, pollutant classification, iot, wireless sensor network, air pollution monitoring system, gps, cloud, distributed systems, android; sensors, air-pollution safe route, air quality index

Introduction:

Because it poses serious threats to human health and the well-being of our planet as a whole, air pollution has emerged as a significant environmental issue. Observing and controlling air contamination is critical to relieve its unfavorable impacts and establish a better and supportable living climate. We investigate the implementation of a comprehensive system for controlling and monitoring air pollution in this report. In order to facilitate efficient pollution control measures and provide real-time data on air quality, the system includes gas sensors, dust sensors, two fans, and a temperature sensor. This report aims to emphasize the significance of such a system and its potential for protecting public health and the environment.
As the need for effective monitoring and control of air pollution continues to grow, the scope of this project in the future looks promising. The following are some potential routes for further growth and development:
The latest in sensor technology: air pollution monitoring systems can become more accurate and sensitive as a result of ongoing advances in sensor technology. The project may incorporate cutting-edge sensors that are capable of detecting a wider variety of pollutants with increased precision in subsequent iterations. Integration of the internet of things (iot): remote monitoring, data visualization, and proactive pollution control measures would all be made easier by this.

Literature review

Various limitations characterize the current state of air pollution monitoring and control systems. Time-consuming and susceptible to human error, manual data collection methods are common in

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traditional systems. Additionally, they rarely have real-time monitoring capabilities, making it difficult to quickly identify and respond to air pollution events. The shortfall of computerized control systems further ruins compelling contamination moderation. In addition, the scope of comprehensive data analysis and decision-making is constrained by the absence of connectivity and data-sharing capabilities. As a result, the goal of the proposed project is to fix these problems by making use of cutting-edge sensors, automation, and wireless connectivity to make a system that monitors and controls air pollution that is more effective and responsive.

In order to monitor and control air pollution, the proposed system combines a number of components. The gas sensor assumes an essential part in identifying and measuring different toxins present in the air. It provides precise data for evaluating the quality of the air and locating the sources of pollution by continuously monitoring the concentrations of gases like carbon monoxide, nitrogen dioxide, sulfur dioxide, and ozone.

By measuring the air's concentration of particulate matter, the dust sensor works in tandem with the gas sensor. It sorts particles of various sizes, including pm2.5 and pm10, empowering an extensive evaluation of air quality. This data enables prompt interventions when pollution levels exceed acceptable thresholds and help evaluate the effectiveness of pollution control measures. The temperature sensor keeps an eye on the surrounding temperature to make sure the system works in the right range. Additionally, it provides additional environmental data for establishing a correlation with levels of air pollution. Accurate pollution control methods are made easier to implement when we know how temperature affects pollutant dispersion.
Referred papers:
-> smart indoor air quality monitoring system
International journal of recent technology and engineering (ijrte) issn: 2277-3878, volume-8, issue-2s6, july 2019
-> mobile - air pollution monitoring system using internet of things (iot)
Issn: 2455-2631 © november 2019 ijsdr | volume 4, issue 11
Wi-fi module and iot

The wi-fi module coordinated very high contamination observing and controlling framework empowers remote correspondence, remote checking, and control of the framework. It uses wi-fi innovation, which depends on the ieee 802.11 convention suite, to lay out a neighborhood (lan) association and interface the framework to a devoted gadget or organization.

The wi-fi module goes about as an entryway between the air contamination observing framework and the ui. Through a safe wi-fi connection, it enables the transmission of real- time data from the sensors to a remote device, such as a smartphone, tablet, or computer. This permits clients to screen air quality, get alarms, and control the framework from any place with a web association.

The communication protocols and data transmission are typically handled by a system-on-chip (soc) or microcontroller in the module. It lays out a two-way correspondence channel, permitting the framework to send sensor information to the ui and get orders or design refreshes from the client.

Additionally, the wi-fi module makes it possible to connect other iot devices and services to create a smart device network that is interconnected. This connectivity improves collaboration and data sharing for a more comprehensive approach to air pollution monitoring and control by allowing seamless integration with smart home systems, environmental monitoring networks, or public health authorities.

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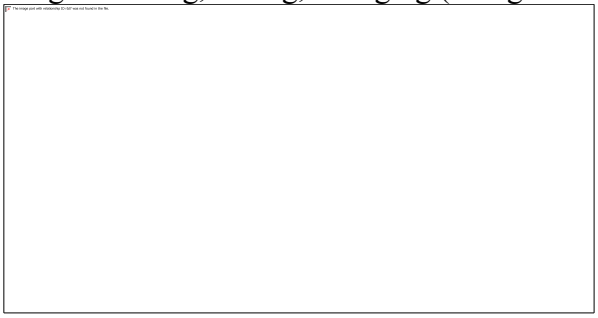
In conclusion, gas and dust sensors make it possible to monitor air quality in real-time taking precise measurements of the concentrations of air pollutants and particulate matter. By connecting the system to a user interface and making it possible to visualize data, the wi-fi module makes wireless communication, remote system control, and monitoring and monitoring possible. The system includes two fans to keep the indoor environment healthier. The exhaust fan removes contaminated air from the checked region, while the admission fan gets natural air from outside. This active ventilation reduces exposure to harmful pollutants by ensuring a continuous flow of clean air.

The wi-fi module empowers continuous checking and control of the framework. It facilitates remote access and data visualization by establishing a connection between the air pollution monitoring system and a specific device or network. Through a user-friendly interface, users can control the system, receive alerts, and monitor air quality. Users are able to make decisions based on accurate information and take prompt action to reduce air pollution with real-time data.

Design of hardware
This chapter briefly explains thehardware.

ARDUINO UNO:
Arduino uno is an open-source microcontroller displayed in the figure that is cheap, effectively programmable by understudies, specialists, and experts, eradicated and reinvented at any moment of time to establish gadgets that cooperate with their current circumstance utilizing sensors and actuators. Table 3.1 displays the technical specifications of the arduino uno. Similar to other microcontrollers, it can also function as a mini-computer by receiving inputs and controlling the outputs of a variety of electronic devices.

The ports on the controller are arranged as follows: alf and vegard created the risc processor.) These single-chip microcontrollers have 8 bits and a modified harvard design.
• general-purpose i/o ports with switchable built-in pull-up resistors that operate in both directions.
Spi: (spi (serial peripheral interface) has four pins that enable synchronous data transfer. • mosi, or master-out, slave-in, is as follows: line transmits data to the spi-controlled devices from our arduino.
• master-in, slave-out (miso): line conveys information from the spi-controlled device(s) back to the arduino.
• slave-select ss: communicates our desire to communicate with the bus device.
A distinct ss line from the arduino to each spi device is required.
• serial clock, or sck
i2c: (• the arduino and genuino boards can communicate with one another and share information.
• data is sent and received over two lines with the i2c protocol
•utilized for obtaining simple outcomes with the computerized signal as arduino doesn't have an inbuilt advanced to the simple converter.
Intr: hinder
•advanced pins 2 and 3 are the two outside intrudes.
•these can be arranged to distinguish rising, falling, changing (rising or falling) edges, or low levels.



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Microcontrollers :

There is currently no machine or instrument that can function without a micro controller. Micro controllers are now included in every instrument. The controller is left with many tedious, simple, or specialized tasks to solve. The atmel 89c51 microcontroller used in this project basically belongs to the 8051 family. The 8051 has four ports with eight input and output lines each. After allowing other manufacturers to produce and sell any variant of the 8051 they wanted, as long as the code was still compatible with the 8051, this ic gained a lot of popularity.. The atmel 89c51 only has 4k bytes on the chip, whereas the original intel 8051 can hold up to 64k bytes of rom. The atmel 89c52 has 8k of memory, and the atmel company offers chips with up to 20k bites.

Power supply unit:

The power is an essential prerequisite for the undertaking work. We must first determine how much current is needed to drive the entire circuit before designing a power supply. To meet the necessary power levels for the whole circuit to be working that requires dc power supply and this is gotten from the mains supply. Since the traffic signals and the entire circuit use nearly 600 milliamperes of current, a secondary transformer with a rating of 1000 milliamperes should be used to be on the safe side.

The dc voltage that comes from the supply is unregulated. At no load, the voltage is initially around 18v dc, but when the load is connected, it drops to about 12v, which is enough to drive the entire circuit. The main problem with this unregulated supply is that it changes based on the line voltage. Since a micro controller needs a +5v, a positive voltage regulator is used to get a constant voltage source of +5v. When the device's body temperature rises above 100 degrees celsius, the output automatically drops to zero to prevent the regulator from burning.

A diode can be utilized as rectifier. Diodes come in many different varieties. Yet, semiconductor diodes are prevalently utilized as rectifiers. An electron collector or anode and an electron emitter or cathode make up a semiconductor diode.

For dc smoothing, the rectified output is filtered with a suitable capacitor based on the power supply's current rating; typically, a 1000 microfarad capacitor is used in the filter circuit for power supplies with a rating of 500 milliamps; when the supply rating is higher, a heavier capacitor is used.. The air conditioner can go through a capacitor however dc can't, the waves are in this manner restricted and the result becomes smoothed. As a result, the output voltage fluctuation is significantly reduced.

Liquid crystal display(LCD)

lcds are more popular than leds because they can show alphabets, numbers, and some special symbols, while leds (seven-segment displays) can only show numbers. These lcd shows are exceptionally valuable for showing client data and correspondence. Different formats are available for lcd displays. The most normal is 2 x 16, which are two lines with 16 alphanumeric

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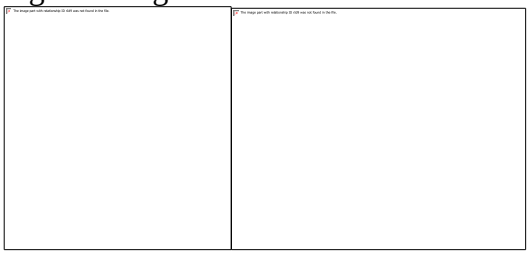
characters.3x16, 2x40, 3x40, and so on are additional formats;

Because of its ability to display numbers, characters, and graphics, lcd displays have become increasingly popular in recent years and are replacing leds. Another benefit is, due to its
Conservativeness and simplicity of programming for characters and designs, more data as instant messages or illustrations can be shown. Apart from the 8-bit data bus, most lcd modules have an 8-bit interface; there are a few more control lines on the interface. The 8-digit information transport is associated with port '0' and the control lines are associated with port '2'. Although only four of the eight data lines are required to communicate with the lcd module, the default data transfer rate between the lcd module and an external device is 8 bits. The r/w line is associated with ground and consequently, the processor can't peruse any status data from the lcd module, however, can compose information to the lcd.

The lcd board utilized in this undertaking work is having 14 pins. On the following page, a table and description of each pin's function are provided:
Vcc, vss, and vee: while vcc and vss respectively provide ground and +5v; the lcd contrast is controlled by vee.
Relays are electromagnetic switches that can either make or break a circuit. At the microcontroller's output, three relays are connected, enabling or de-energizing the electrical appliances independently. The hand-off utilized here is having just a single bunch of changing over contact, when this transfer is empowered ordinarily open contact gets shut and supply is given to the electrical gadget. At the point when a similar transfer is de-empowered, regularly open contact stays in open condition and supply is disengaged to the gadget. The relay has a contact rating of 1.5 amps; so that current cannot flow through the contact at less than 1.5 amps. Assuming any weightyburden gadget is utilized, a higher rating hand-off should be chosen as needs



Schematicof the relaywithcontact

The terminals and hand-off connections are installed on a shielded board. When there is no current flowing through the relay coil, the contact arm, or pole, positioned on the armature, touches the "top" (n/c) contact. When current flows through the coil, the contact arm assembly and armature slide lower, touching the "bottom" (n/o) contact. At the point when an electric flow is coursing through a transfer curl, it is supposed to be empowered, and when the flow stream stops, the hand-off is

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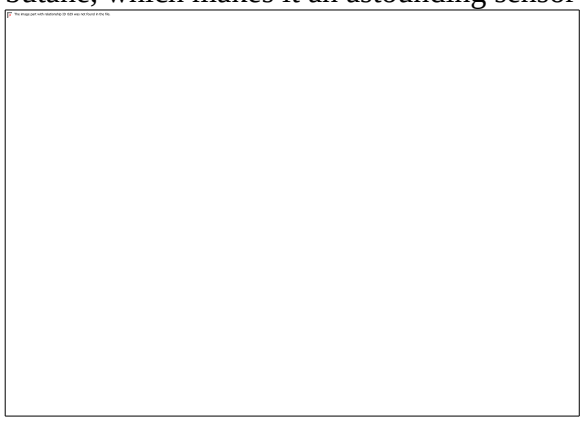
supposed to be de-invigorated. When the electromagnet pulls the armature in, all of their parallel contacts are pulled in. On being empowered, whether a hand-off makes contact(s) or breaks them relies upon the plan of contact game plans.

Gas sensor

This circuit transmits the information to the controller via an optical sensor when it detects the release of any hazardous gases. The gas sensor's general description can be found here.

A universal gas sensor is a general-purpose sensor with good sensitivity to a wide range of gases. This gadget is intended to work with a settled 5v radiator supply and a circuit voltage depends up the plan. The most reasonable application for the sensor is the discovery of methane, propane and butane, which makes it an astounding sensor for homegrown gas, spill locators.



Basic measuring circuit with mq2 sensor:

By implication, the variance against the mq2 sensors is calculated as a change in the voltage seen across the sum resistor rl. When combustible gases like propane, methane, or others are present and come into contact with the surface of the sensor, the resistance of the sensor falls proportionately to the gas concentration, but the current that runs in series between the sensor and the rl remains constant in clean air. When vc and vh are supplied by ac or dc sources, the voltage shift across rl is equal. In view of the ease of calculating the generated signal, one might believe that this circuit is typically appropriate for evaluating the gas sensor execution.

Changes impact the sensitivity of the sensor. Surface constitute the sensor's detection principle. Since these responses are temperature ward and water fume tan be viewed as a gas, the impacts of temperature and moistness changes can't be wiped out from the sensor. These impacts tan anyway be decreased by circuit plan.

Two permit similarity among the information correspondence gear made by different producers; the electronics industries association (eia) established the rs232 interfacing is standard in 1960. Rs 232 is the standard characterized for the association of "information terminal hardware" (dte) to "information interchanges gear" (dce).

Dte (information terminal gear) is a conventional term for a thing which structures part of the "data handling" segments of a framework. Among them are: terminal, printer, and computer.

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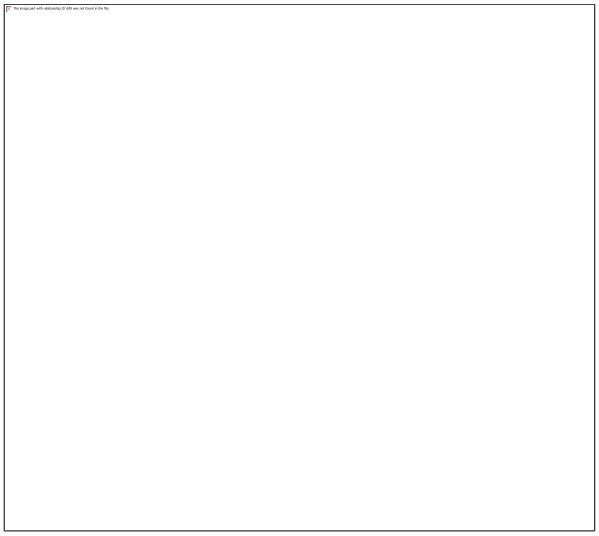

Pin 7 is used to "ground reference" all signals. Txd, rxd, and dte are the transmit and receive signals. Rts, or request to send, is from the dte. Cts, or clear to send, is from the dce. Dte, or data terminal ready, tells the modem that a dte is connected and enabled.

Conclusion and hardware arrangement

The integrated circuits (ics) and other important parts used in this project came from the hyderabad electronics market. The subtleties or information sheets of the ics are down-stacked from the web. Coming up next are the sites that can be perused for gathering the information sheets.

1. Www. Texas instruments.com
2. Www. National semiconductors.com
3. Www. Fairchild semiconductors.com

Coming up next are the parts utilized in the undertaking work:

1. Atmel 89c52 micro controller ic
2. Wifi module esp8266
3. Mq2 universal gas sensor
4. Voltage regulator ic (7805)
5. Bc 547 npn transistor
6. Relays

The sunrise circuits, kushaiguda industrial estate, hyderabad, fabricated the required pcbs (printed circuit boards) for the project work. The production of pcbs of an industrial grade is well-known at kushaiguda industrial estate.

The "air pollution monitoring cum controlling device" project work is successfully designed and developed. The prototype module is built for the purpose of demonstration, and the results are satisfactory. Preparing the software to carry out the tasks based on the inputs is the most important and significant task. The exhibition of the venture simply relies upon the product (code) we characterize in the regulator. The innovation used here is for fostering the model module as it were; it must be improved to form it into a genuine working framework.

We have presented the design and implementation of a wireless, flexible, and inexpensive method for controlling household appliances in this paper. The framework is gotten for access from any client or interloper. The clients are supposed to obtain matching secret words for the wifi module and the wireless to get to the home apparatuses. This increases security against unauthorized users. Any

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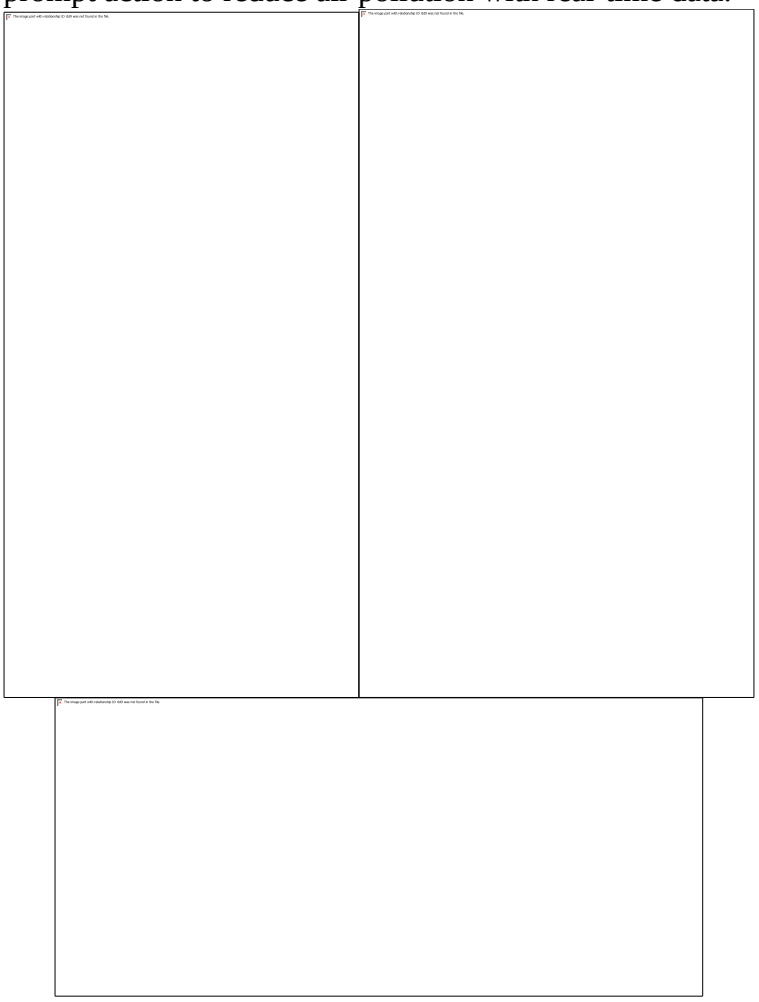
appliances that require on-off switching applications can be tested on this system without an internet connection.

The system includes two fans to keep the indoor environment healthier. The exhaust fan removes contaminated air from the checked region, while the admission fan gets natural air from outside. This active ventilation reduces exposure to harmful pollutants by ensuring a continuous flow of clean air.

The wi-fi module empowers continuous checking and control of the framework. It facilitates remote access and data visualization by establishing a connection between the air pollution monitoring system and a specific device or network. Through a user-friendly interface, users can control the system, receive alerts, and monitor air quality. Users are able to make decisions based on accurate information and take prompt action to reduce air pollution with real-time data.



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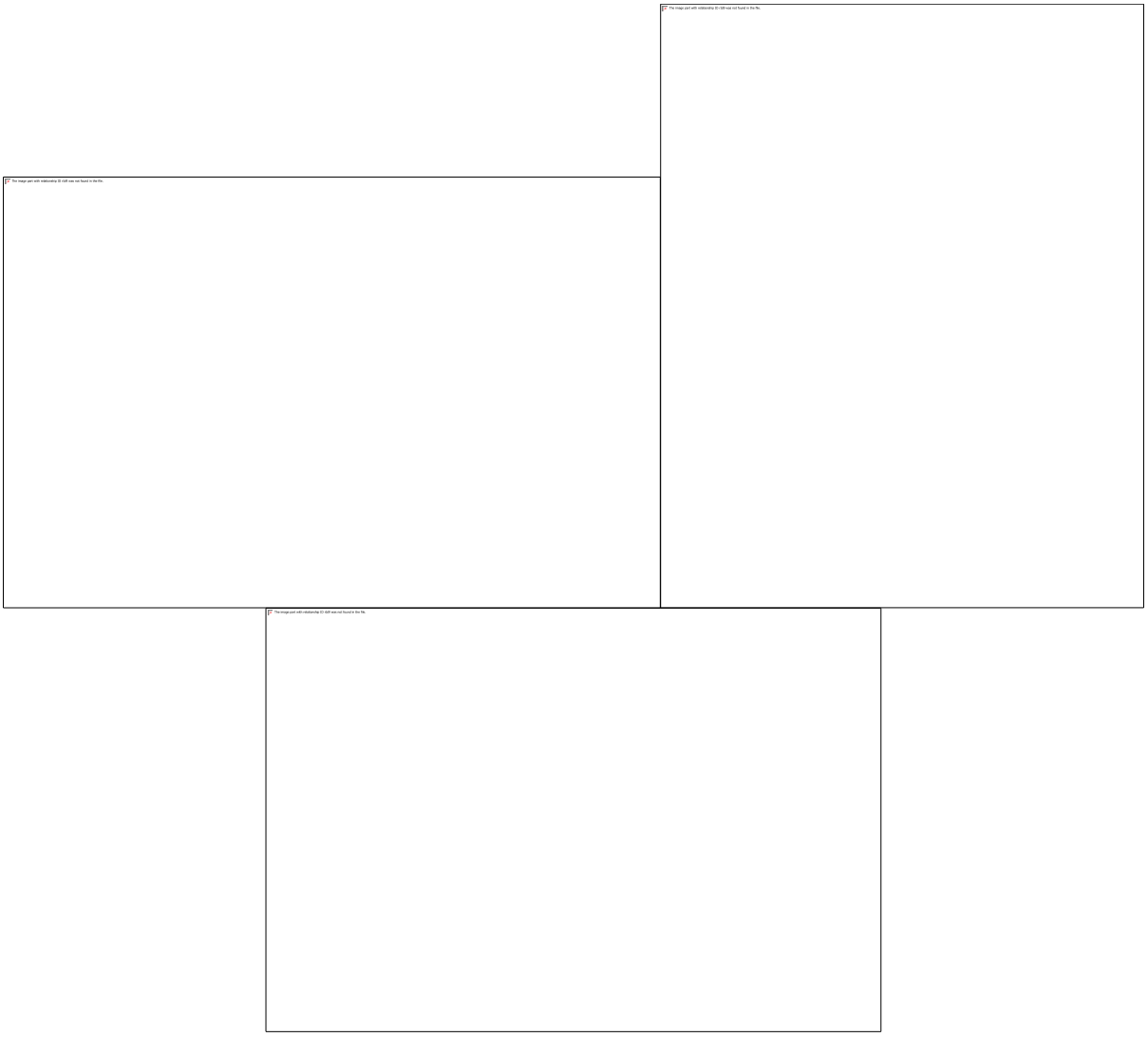

References

•https://en.wikipedia.org/wiki/arduino#/media/file:unoconnections.jpg
•http://www.circuitbasics.com/how-to-set-up-the-dht11-humidity-sensor-on-an-arduino/
•https://playground.arduino.cc/main/dht11lib
Https://www.robot-r-us.com/vmchk/sensor-temp/humid/dht11-temperature-and-humiditysensor.html
•https://electrosome.com/power-supply-design-5v-7805-voltage-regulator/
•https://www.epa.gov/air-research/air-monitoring-measuring-and-emissions-research
•http://howtomechatronics.com/tutorials/arduino/dht11-dht22-sensors-temperature-and-humiditytutorial-using-arduino/
•https://www.elprocus.com/ever-wondered-lcd-works/
•https://www.google.co.in/search?q=dht11&client=firefox-a&rls=org.mozilla:enus:official&channel=np&dcr=0&source=lnms&tbm=isch&sa=x&ved=0ahukewj8smu0opxahulty8khw8wb6kq_auicigb&biw=1366&bih=598
•https://en.wikipedia.org/wiki/environmental_monitoring