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Smart Exhaust Fan using BoltIoT

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Abstract – The project that follows explains how Internet of Things (IoT) technology can be used to determine the amount of smoke in a certain room Nowadays, smoke is produced in a variety of ways, including by burning trash, papers, and plastics, as well as by forest fires (in forested areas) and cigarette smoke. Smoking has been linked to numerous health issues, including respiratory issues. There are particles that can quickly enter your lungs. They may result in issues including eye burning, runny nose, and heart and lung issues. Many scientists and experts think that this problem needs to be solved in some way.

A rapidly expanding technology in use today is the Internet of Things (IoT). It is a technology that must be used in Industry 4.0. By altering the range of activities to make them more practical, clever, efficient, and artificially intelligent, this technology raises the quality of life. Smart exhaust technology is a rising field of study due to its effectiveness and affordability, therefore this is the technology.

The primary goal of this project is to introduce an Internet of Things (IoT)-based exhaust fan that will help the user access the live smoke level and intelligently turn the exhaust ON/OFF in accordance with the data obtained from the sensor. This will monitor the smoke level and preserve the air quality in the space. This study suggests an Internet of Things-based smart exhaust fan that makes use of sensors, Arduino technology, and a Wi-Fi module.

***Key Words*:** Smart Exhaust fan, IoT-based fan, Arduino tech, smoke monitoring, Health, Air Quality

1. INTRODUCTION:

As is well known, the amount of smoke is rising every day in some way. We created a system as a result of this issue. Today, smoke is a major issue, particularly in communities where waste is burned in the property. Waste, such as tree branches that have fallen or other waste, fundamentally increases and affects the air quality.

By utilizing the components available, almost all smoke can be blowed out of the room at a very low cost. This basically decreases your work of manually switching ON/OFF the switch. This reduces the chances of diseases like cough, phlegm, wheezing and difficulty breathing etc. Almost all the things are now automated, why this can't be?

Therefore, using this framework, we provide an answer to this issue by introducing automatic and methodical exhaust strategies that would let the user stop worrying about smoke in his immediate environment. Smoke removal is certain even with these minor components, and it is especially helpful in rooms. The objective is to develop a model that operates effectively even in highly smoky environments, providing the user with accurate readings and automatically switching. As a result, the usage of internet and electronic technologies will be encouraged even more for research objectives.

The primary objective of this research is to measure the smoke level using the expensive and sparse resources at hand. Utilizing them to the utmost extent possible as a result. The conditions of a room can change depending on where it is, whether it is a single room or a home (dust and pollens). Since the project's primary goal is to eliminate both smoke and undesirable odors, the key factors that contribute to smoke should also be taken into account. These factors make the sector more complex, prompting the development of fresh strategies to deal with it. Technology is highly recommended these days in a variety of methods to reduce errors and produce better results. It is a modern tool that everyone uses too.

Further are the main objective of this project:-

1. To provide a user, to use the technology to its fullest.
2. To reduce the manual work of the user.
3. Create a model and send an alerting message and link it to the cloud server.

2. LITERATURE SURVEY:

This method intends to reduce smoke level by using computerization and Internet of Things (IoT), which uses sensors-based systems to perform works like checking the smoke level, reducing it, and alerting user incase of further complications.

We want to make smoke detection and reduction successful so that users won't have to worry about the quality of the air in their homes. This project's smart fan is constructed using Arduino technology, a small breadboard connected to sensors, and a BoltIoT Wi-Fi module.

The installation of several sensors for detecting smoke and offensive odours is the main goal of this project. We have utilised an Arduino, a BoltIoT module, and a number of sensors to carry out this complete operation. In addition to gathering real-time data on smoke and using software to send alert messages, this system allows users to choose the most sensible options. This gadget can measure the amount of smoke and carbon dioxide ($C0_2$) in a room where it is installed. Additionally, a threshold value will be present for detection and alerting purposes. Basically, an SMS is delivered to the user and the exhaust fan is turned on whenever the threshold value is exceeded by the real value. Tests have been done on the suggested system, and also monitors the readings to give satisfactory results, allowing the system to be highly beneficial as smart tech.

We make use of an Arduino, a relay-connected gear motor, a MQ-135 sensor, and a BoltIoT module microcontroller. Readings of the smoke level are produced using the BoltIot and Arduino boards and a specific time delay is implemented. This information from the Arduino board is transmitted to the Wi-Fi module, followed by SMS and the motor's ON/OFF switch. The user's phone receives a typical SMS with the value of the threshold crossed.

The Arduino board supplies 5V of power to the MQ-135 for it to operate. With the aid of the exo-skeleton situated on the sensor's body, it collects data on the necessary gas. Additionally, the TX-RX pins on the BoltIoT module and Arduino board are used to connect the two devices. A MQ-135 is also attached to the Arduino's ports VCC, GND, A0, and D2 pins, and all are powered. Both a serial monitor and a Wi-Fi module monitor can be used to read the sensor's values.

A specific time delay is used to gather data from the sensor, so the sensor value is taken after 2-3 minutes (as per time required).

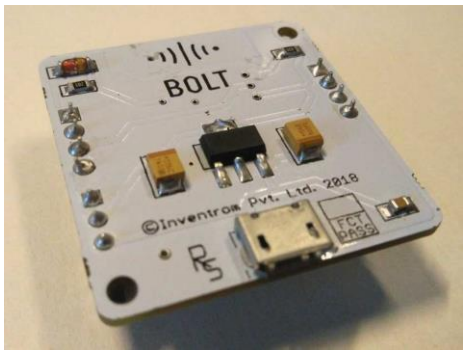
The system creates and sends an SMS to the registered phone number stating "The current level is **" when the smoke level in a room exceeds the defined threshold value. When the smoke level drops below the threshold level, the relay turns OFF, turning the motor OFF automatically. The opposite occurs when the smoke level rises over the threshold level and the cycle continues...

3. DESCRIPTION OF COMPONENTS:

3.1 Arduino Uno:

Based on the Microchip ATmega328P microprocessor, Arduino.cc developed the open-source Arduino Uno microcontroller board. A number of sensors can be interfaced with Arduino as per one's requirement. There are 14 digital output pins on this microcontroller. 5V is the operating voltage, while 7V to 20V is the input voltage. Programming language required is 'C Language', which is typed in Arduino IDE (Integrated development environment) via a B type cable.

3.2 BoltIoT Wi-fi Module:



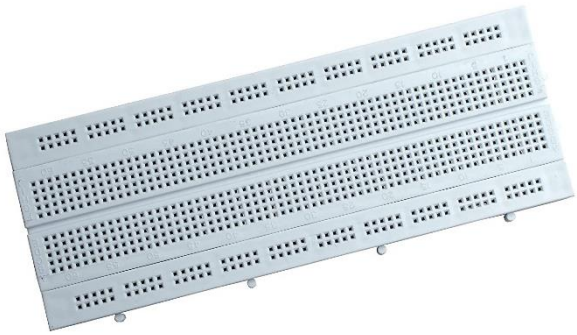
BoltIoT module is basically termed as ESP8266 with custom firmware. Operating voltage of this module is 3.3V. It comes with 4 Digital Output pins, TX-RX pins, and supply pins (5V, 3.3V and GND) pins and 0 and A0 as its analog pins. In this system, this module is used to communicate with the Arduino uno to transfer data between them. Data is transferred, read through this module. It is also used for communicating with the messaging software, and messages are sent to the user.

3.3 MQ-135:

The MQ-135 Gas Sensor can identify dangerous gases and smoke, including ammonia (NH_3), sulphur (S), benzene (C_6H_6), and Carbon- dioxide (CO_2). The MQ-135 sensor has digital and analog pins in order to fetch the data. Certain action takes place with each and every sensor when it crosses predetermined threshold value. The potentiometer on the body of the sensor can be used to adjust this threshold value without using any programming language. An analog signal that is produced by the analogue output pin can be used to determine the concentration of various gases in the atmosphere.

The MQ135 air quality sensor module requires about 150mA and runs at 5V. Prior to producing reliable findings, it needs to be preheated. This is the important sensor. If sensor value crosses the sensor value, then the pin goes high and this process goes on until and unless the user wants.

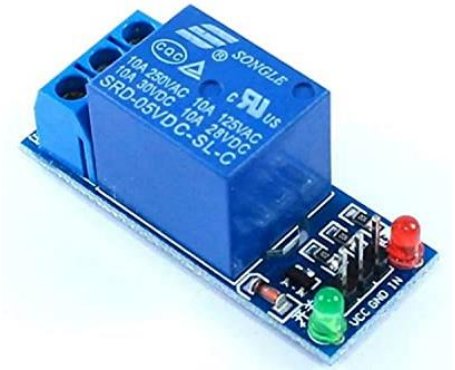
3.4 Breadboard:



An item of equipment known as a breadboard is used to connect integrated circuits and registers. It helps with circuit connection testing and building. Registers and IC chips are inserted into the breadboard's numerous holes (both horizontal and vertical).

The purpose of the breadboard is to make it simple for you to quickly connect parts like LEDs, capacitors, and resistors so that you may test your circuit before permanently glueing it together.

3.5 Relay Module:



A switch that is powered by electricity is called a relay. The device consists of a set of working contact terminals and a set of input terminals for one or more control signals. On the switch, there can be any number of connections in different contact configurations, such as combinations, create contacts, and break contacts.

Relays are electromechanical devices that use an electric current to open or close a switch's contact. Indicators that show whether the module is powered and if the relay is active or not are included in the single channel relay module, which is more than just a simple relay. These components make switching and connection easier.

3.6 TT Gear Motor:

These are motors used for exhaust fan in the project. It has a toy turbine in front of it and it works like a exhaust as described earlier. These gear motors have a gearbox ratio of 48:1, a voltage range of 3-6VDC, a no load current of less than 150mA at 3V, a stall torque of 0.8kg.cm at 6V, and 2 x 200mm wires with breadboard-friendly 0.1" male connections. Perfect for connecting to terminal blocks or a breadboard.

4. SOFTWARE REQUIREMENTS:

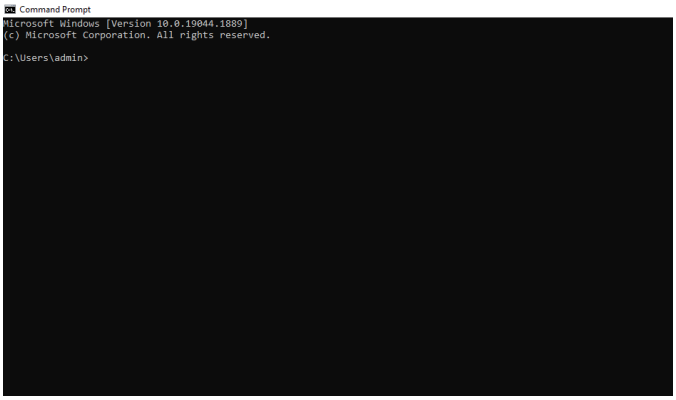
4.1 Setting up Arduino IDE:

For Windows, Mac OS X, and Linux, the Arduino Integrated Development Environment (IDE) is a cross-platform programme created in C and C++. It is used to write and upload programmes to third-party development boards from various sellers as well as Arduino comparable boards.

An editor and a compiler are the two main parts of the IDE environment. The necessary code is created in the editor, then it is compiled and uploaded to the right Arduino module using the compiler.

This environment supports both C and C++.

4.2 Setting up Command Prompt:



On a Windows computer, you may run commands using the software known as Command Prompt. This programme is useful for setting up automated processes in the Windows operating system or for troubleshooting. You may carry out system repairs, find your IP address, and carry out other sophisticated admin tasks with Command Prompt. Command prompt is utilised in this project for PYTHON programming and for readings, when an Arduino and a BoltIoT module are connected. Additionally, this is utilised to create software for messaging and mailing services.

4.3 Twilio- Messaging Software:

Twilio is an Programmable Communication Software, which is used for receiving calls, messages etc. This first needs to be signed up with your phone number/Google/Facebook account. Once you have signed in, Twilio provides you our personal API Key,

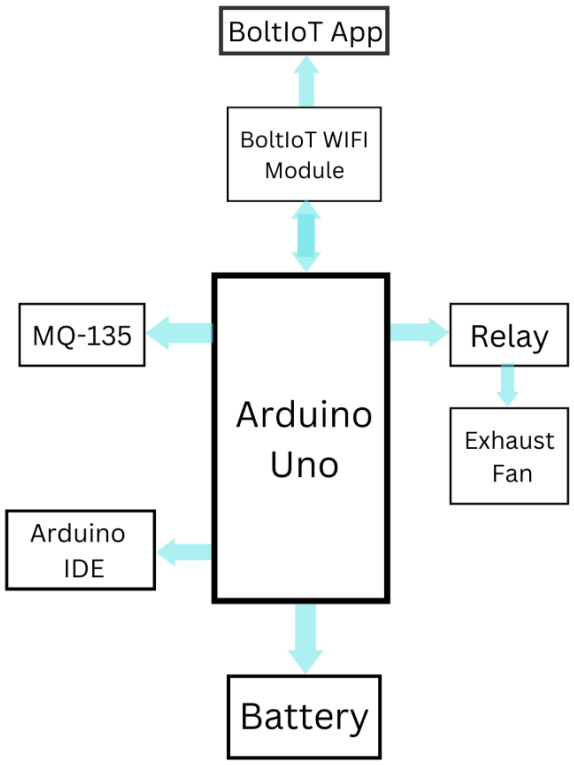
Authorization Token, Account SID and lastly a fake phone number, from which you'll receive calls/messages on your registered phone number. This software uses Python language as its programming language.

4.4 BoltIoT Mobile Application:

This application is used for setting up your BoltIoT module. Further it gives you a unique API key and Module Access code which is used in python programming for this project.

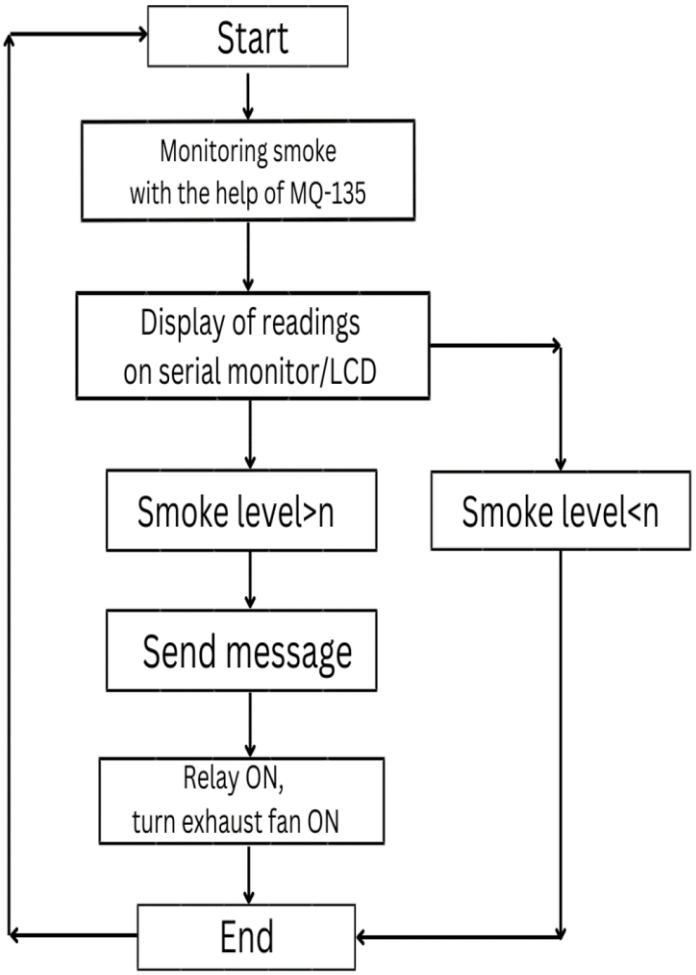
5. WORKING PRINCIPLE:

5.1 Block Diagram



When the smoke level crosses the threshold given, a SMS saying "The current smoke level is *, Turning the Fan ON" is sent to the registered user with the help of messaging software. It also sends a command to the relay, which closes, and the fan rotates until the smoke level is below the threshold or the smoke is less. Relay module is typically a open circuit which acts as a switch or closes whenever needed. The two essential programs needed to run this project are the Arduino IDE and Command prompt. The readings can also be read on a 16x2 LCD screen if a serial monitor is not being used. Here a Li-ion battery is used to power the motor through relay module. Once connected, each and every component works as explained above.

5.2 Flow Chart:



6. CONCLUSION:

We have so far identified a number of criteria in our study, such as smoke, carbon dioxide, ammonia, sulphur, benzene, etc. that motivate users to concentrate on advancing their technology. When it comes to retrieving real-time data, such as smoke level and carbon dioxide levels, the system offers a high level of efficiency and accuracy.

The technology presented in this research will help the user by managing the smoke level and also by maintaining their health by supplying precise live data about environmental temperature and smoke level with 98% accuracy.

Based on data from the climate repository and continuous data from the room, this system calculates air quality parameters. In the location that is connected to the internet, sensors are used.

7. ACKNOWLEDGEMENT:

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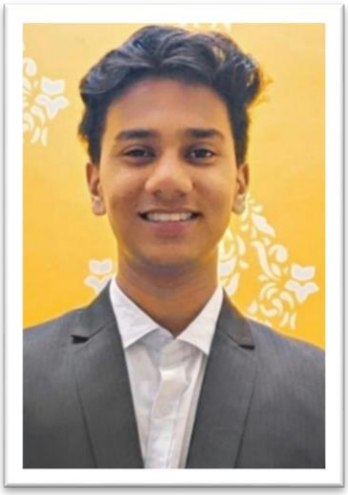

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