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IOT Based Smart Air Purifier

Tazin Shaikh¹, Sameer Pathan², Sururahemad Shaikh³, Dr. J. N. Shinde⁴

^{1, 2, 3, 4}Al-Ameen College of Engineering

Abstract: Now days we hear about the diseases increasing due to the impure air. One of the problems, and that to a huge one is air pollution. India is one of the most polluted countries in the world are prone to air borne diseases like asthma, chronic obstructive pulmonary disease (COPD) and these diseases causing mainly to the aged people who suffers through these diseases. In this we report the architecture of the air purifier which operates on low power so that the power consumption will be less. For the prevention of the air pollution this system Air purifier is the better option than the others. As we can carry this system everywhere as it's portable for the people.

I. INTRODUCTION

A. Overview

In the 21st century due to the improvement in technology the pollutions have also increased to a greater extent, hence we had taken up the responsibility to create a pollution free environment. But reducing air pollution completely is impossible, hence something should be used so that we stay away from the diseases which we may face due to air pollution. IOT Based Smart Air Purifier is a great option to this. There were many existing air purifiers which were residential but the amount of air pollution outdoor is too much than the amount of indoor pollution hence we have designed a purifier which is portable.

B. Central Purposes of Air Purifiers

The air pollution increasing mainly due to the individuals spreads the large amount of pollution. So that our group took that responsibility of reducing the air pollution using the advancement of the technology.

- 1) *Reduced Establishment Costs:* First and important, establishment costs are completely decreased because cabling is not important. Wired arrangements require cabling, hence it becomes costly.
- 2) *Adaptable System and Simple Augmentation:* Designing a remote system has many advantages over the normal systems. It becomes very beneficial.
- 3) *Portability:* As it is wireless it helps to make the system completely portable, that means it can be carried anywhere and everywhere.
- 4) *Integration of cell Phones:* With remote systems, PDAs and Smart phones the system can be controlled by humans just at a click (as long as the gadget is in reach of the system).

II. RELATED WORK

A. Khalid A. Fakeeh, PhD King Abdullaziz University Jeddah, Saudi Arabia

This paper proposes a method to reduce the wastage of power in technical universities by the power distribution agencies across the world. The system consists of thermal sensing and IOT enabled microcontrollers for the working. The present IOT based power management systems using image processing is very costly, hence the paper proposes a cheap method to regulate the wastage of power. But the energy consumption is increasing rapidly, and the energy is not sufficient enough to meet the rising demand. Many of the countries have renewable energy source, but are not utilizing it. The usage of hydroelectric power which was the major source of energy in the twentieth century is now being replaced by nuclear energy. Since nuclear plants have many security issues. This increases the installation cost of the reactor.

B. EPA Technical Document Residential Air Cleaners

Indoor air pollution is among the top five environmental health risks. The best way to address this risk is to control or eliminate the sources of pollutants, and to ventilate a home with clean outdoor air. The ventilation method may, however, be limited by weather conditions or undesirable levels of contaminants in outdoor air. If these measures are insufficient, an air cleaning device may be useful. Portable air cleaners generally contain a fan to circulate the air and use one or more of the air-cleaning technologies discussed above. They may be an option if a home is not equipped with a furnace or a central air-conditioning system. Many portable air cleaners have moderate to large air delivery rates for small particles. However, most of the portable air cleaners on the market do not have high enough air delivery rates to remove large particles such as pollen and particles that contain dust mite and

cockroach allergens from typical-size rooms. If the usual methods of dealing with indoor air pollutants are insufficient, air-cleaning devices may be useful. Air filters and other air-cleaning devices are designed to remove pollutants from indoor air. They can be installed in the ductwork of most home heating, ventilating, and air-conditioning (HVAC) systems to clean the air in the entire house, or the same technology can be used in portable air cleaners that clean the air in single rooms or specific areas. Most air-cleaning devices are designed to remove particles or gases, but some destroy contaminants that pass through them.

C. Kan Zheng1, (Senior Member, Ieee), Shaohang Zhao1, Zhe Yang1, Xiong Xiong1, And Wei Xiang2

In this paper a new method to implement the air quality monitoring system based on state-of-the-art Internet-of-Things (IoT) techniques has been proposed. In this system, portable sensors collect the air quality information timely, which is transmitted through a low power wide area network.

All air quality data are processed and analyzed in the IoT cloud. This paper proposes an air quality monitoring system based upon LPWA networks. Firstly, we briefly present the architecture of the proposed system. Then, the hardware and software designs are discussed in detail. The LPWA access point (AP) is implemented on an open-source soft-defined radio (SDR) platform.

The air quality monitoring node consists of sensors, microcontroller unit (MCU), battery and so on, which are developed by ourselves. In order to process and analyze the sensed data, the IoT cloud with different types of servers has been established. The users can access the air quality information either through a website or a mobile application (APP).

D. Barn PK, Elliott CT, Allen RW, Kosatsky T, Rideout K, Henderson

The main aim of this paper is to create portable air cleaners for wildfire smoke for complex mixture of air pollutants, including small particles that can cause irritation and inflammation when inhaled. Although wildfire smoke is generated outdoors, it can travel indoors through windows, doors, vents, and other openings in the building envelope. Smoke from wildfires poses a health risk to the public (Elliott, 2014).

While some communities in Yukon do have existing emergency measures plans which may include forest fire response elements, there is no plan in place on how to mitigate and prevent exposure to wildfire smoke for the general public. It is prudent to both advise the public of the potential health risk as well as provide resources on how the population can manage their individual health. The decision to order an evacuation or partial evacuation of a community should be considered a last resort measure, as there are less intrusive protective health measures that can be taken first.

Evacuation can have a significant psycho-social impact to evacuees and may create additional stressors when individuals are away from support systems and resources (Elliott, 2014).

Furthermore wildfire smoke can have impacts on health care facilities by increasing patient loads, to mitigate this stress on the health system well-planned communications and prevention strategies may reduce this potential burden.

III. FRAMEWORK ANALYSIS

A. Issue Definition

The main aim of building this project is to reduce the problems or diseases causing to human beings. So that we have built a project which is capable of doing it.

The project is designed in a manner which could be useful and very easy to operate from everywhere, this is one of the main advantage of the project is.

Here we have used Internet of Things which helps to make this system more advance with the use of this very less energy will be used as we can control it from anywhere, this makes it more convenient to use. Just with a click on your mobile phone the system can be controlled easily, hence this system proves to be a great work.

B. Implemented System Feature

The proposed framework is a conveyed air purifier framework, comprises of server, sensors. Through the internet we can control the on or off of the fan effortlessly.

The Microcontroller ATMEGA328, worked with Wi-Fi module to which the module is Embedded, goes about as web server. Due to this functionality we can operate the system through any mobile phone or a PC from anywhere and its portability makes it more convenient.

IV. SYSTEM DESIGN AND IMPLEMENTATION

A. Implemented IOT Based Smart Air Purifier

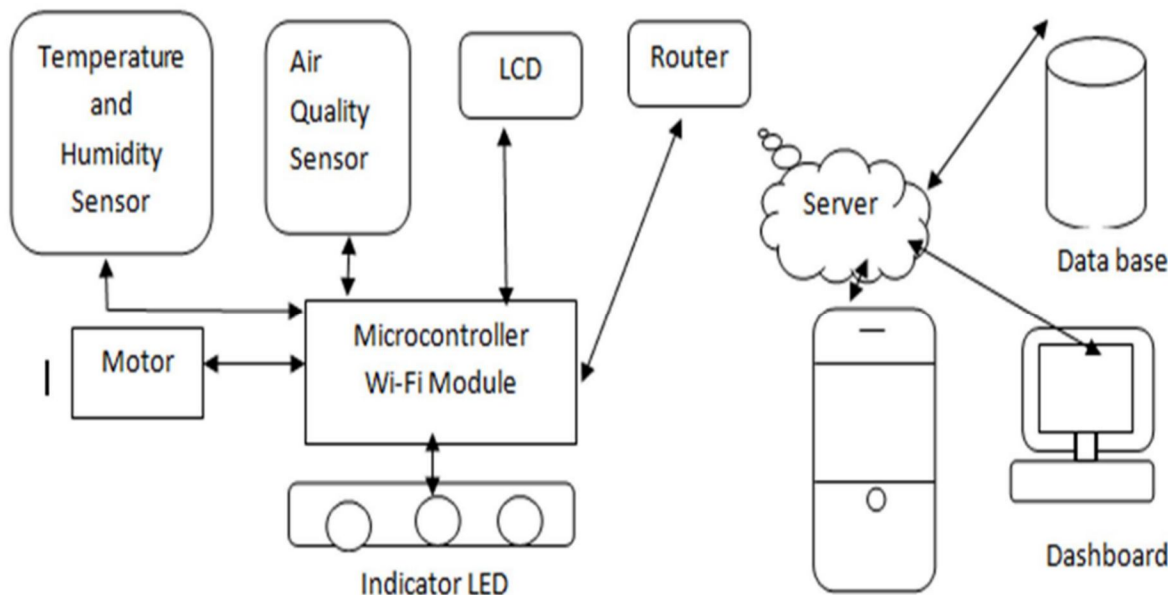


Figure:-Proposed model of IOT Based Smart Air Purifier model

Nowadays use of IOT has been increasing day by day; the importance and usage is on tremendous demand. There is lots of research going into IOT based power management systems. The increase in power requirement has made the researchers and industrialist to design low power systems. The wastage of energy is a very serious issue; this paper proposes a method to reduce the wastage of power.

Power management is an important aspect towards the development of the nation. With the help of IOT in the purifier we can utilize the power efficiently and carrier it anywhere due to its portability.

B. Implemented Air Purifier system Functions

The working of IOT Based Smart AIR Purifier is discussed here. It basically consists of two modes and they are as follows:-

- 1) **Automatic Mode:** In Automatic mode of system continuously checks the surrounding temperature, humidity and Air Quality condition by the taking the values from DHT11 sensor and Air Quality sensor attached to the ESP8266. And triggers the Motor for fragrance purpose
- 2) **IOT Mode:** In IOT Mode user can set the particular time to trigger the System and makes system works without the sensors or by making the immediate trigger for motor control by a web based application.

C. Software Design

- 1) **Front End Design:** HTML is a format that defined a computer how to display a web page. The documents themselves are plain text files with special "tags" or codes that a web browser uses to interpret and display information on your computer screen. HTML stands for Hyper Text markup Language; an HTML file is a text file containing small markup tags. The markup tags tell the Web browser how to display the page. An HTML files must have an htm or html file extension.
- 2) **Cloud Storage:** Distributed computing is the act of utilizing remote servers on the web to oversee, store and process information as opposed to utilizing a PC. Distributed computing is a general term that is better isolated into three classifications: Infrastructure-as-a-Service, Platform-a-Service, and Software-as-a-Service. IaaS (or utility figuring) takes after a conventional utilities display, furnishing servers and capacity on request with the shopper paying in like manner. PaaS takes into account the development of utilizations inside a supplier's system, similar to Google's App Engine. SaaS empowers clients to utilize an application on request by means of a program. A typical case of 9distributed computing is web server, where you can get to your put away information from any PC with web get to. Here we are utilizing web server for the capacity of the information.

D. Implementation Setup

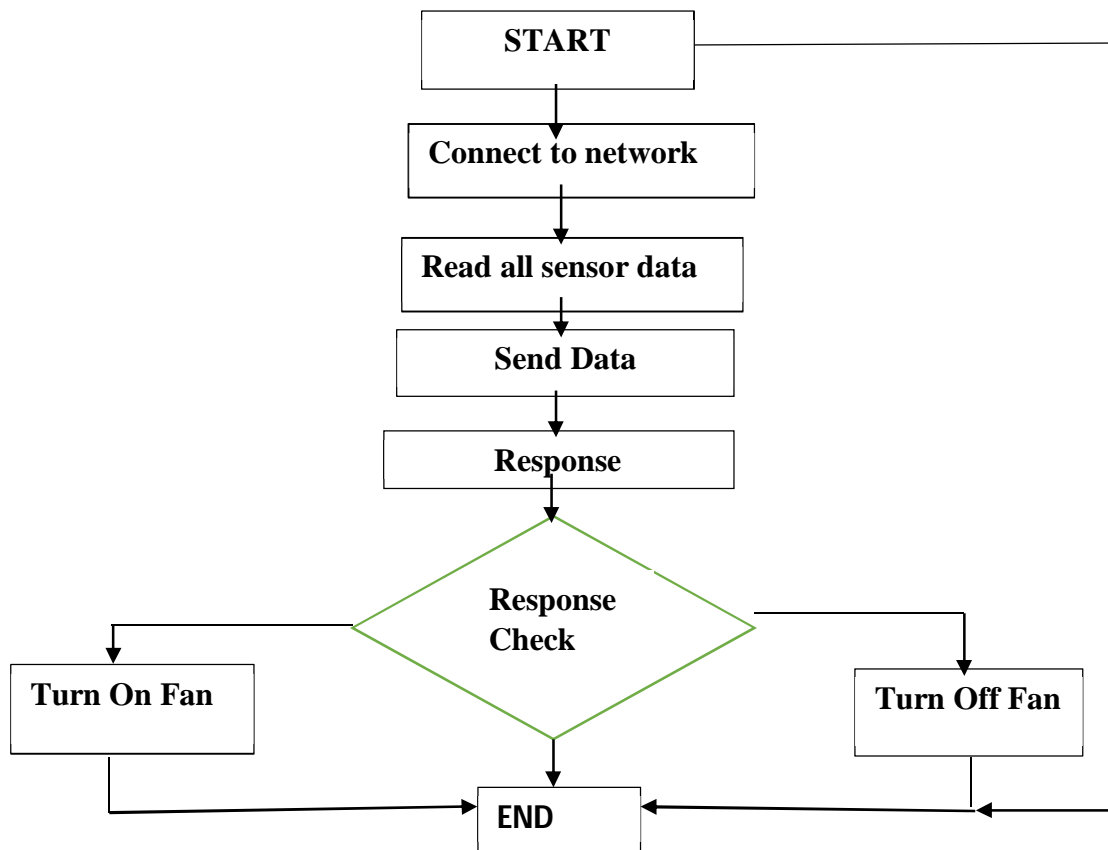


Figure2:- Sequence of activation of IOT Based Smart Air Purifier



Figure 3:- Experimental setup for IOT Based Smart Air Purifier

V. RESULTS

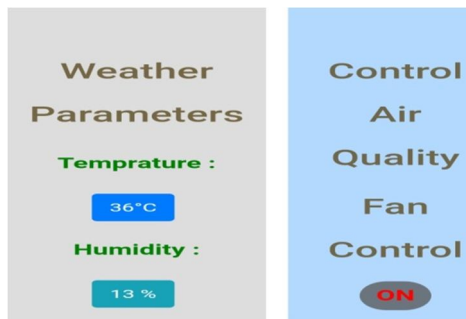


Figure 4:- Web server page

After the effective association with the server, the information of the web server are sent to the web server for checking of the framework. The figure 4 shows the web server page which will help us to control the purifier. By entering proper IP address this web page will be opened. The web server will give the data about the temperature and the quality of the air according to which we can ON/OFF the fan.

VI. COMPARISON WITH THE RELETE SYSTEM

Parameter	System A IOT Based smart Power Management System	System B Design and Implementation of LPWA-based Air Quality Monitoring System	System C Evaluating ozone spatial distribution in Portugal using passive samplers	System D IOT Based Smart Air Purifier (Our System)
Using of Internet of thing	Yes	No	No	Yes
Trainer kit	Arduino Mega ADK	ATMEGA128 Development Board		Arduino Uno Development Board
Communication Type	Serial communication	Serial communication	Serial communication	Serial communication
Controlling with the help of	android phone or tablet	android phone or tablet	android phone or tablet	Android mobile or pc, web link
Security	High	Low	Medium	High
Complexity	Medium	High	Highest	Low
Cost	Medium	High	Very high	Low
Special function	It controls the power of various equipments through the IoT enabled microcontroller	It depends on the LPWA technology which covers the larger area for air quality monitoring.	Combination of Active and passive monitoring system for the monitoring of air quality	It controls the air quality using IoT and web Link for ease of operation.

VII. COMPARISON RESULT WITH OTHER SYSTEM:

A. IOT Based smart Power Management System

In this system The Image Processing technology is used which is very costly so that the cost of the system will also increase while in our system of air purifier we uses Wi-Fi microcontroller module which operates on very low power so that the system we built is quite better than this system.

B. Design and Implementation of LPWA-based Air Quality Monitoring System

In this system LPWA (Low Power Wide Area) is used which means it works on a wide range of area like urban cities so the cost of this system is definitely higher than our system. As well as the performance of this system is better than our system as we have built a system which is suitable of small range of area.

C. Evaluating Ozone Spatial Distribution In Portugal Using Passive Samplers

Combination of passive monitoring (by using ozone diffusive samplers) and active monitoring (by using existing air quality monitoring stations and one mobile unit) has proved to be an efficient approach to address the question of how representative are the Portuguese rural background stations measurements. And in our system IOT is used for better and ease for operating to the users of the system.

VIII. CONCLUSION AND FUTURE WORK

A. Conclusion

The Air Purifier using Internet of Things has been experimentally proven to work satisfactorily by purifying the polluted air and it could be successfully controlled through internet. The designed system not only monitors the temperature, humidity and air quality but also actuates a process according to the requirement, for example we can give command of fan ON/OFF from anywhere just with a click. It also shows the sensor parameters on the internet. This will help the user to analyze the quality of the air.

B. Future Work

Utilizing this framework as structure, this framework can be extended to the choices like This Air Purifier will turn ON only in the presence of human being currently at the place otherwise it will be remained in OFF position. If the air quality is bad and there is no human is present there also at that time Air Purifier will be OFF. Due to this kind of scenario power consumption will be lesser. Just we have to add some of the sensors which should be able to detect the presence of the human beings.

IX. ACKNOWLEDGEMENT

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