**IOT Based Air Quality Monitoring,Filtering and Alert**

**System.**

Balaji B S

*Assistant Professor*

*Department of ECE,*

*BGS Institute of Technology, Adichunchanagiri University,*

B. G. Nagara, Karnataka, India.

b.s.balaji22@gmail.com

Manoj K

*UG Student,*

*Department of ECE,*

*BGS Institute of Technology, Adichunchanagiri University,*

B. G. Nagara, Karnataka, India.

manojkmanu2002@gmail.com

Sindhushree K A

*UG Student,*

*Department of ECE,*

*BGS Institute of Technology, Adichunchanagiri University,*

B. G. Nagara, Karnataka, India.

sindhushreeka@gmail.com

Sandhya L

*UG Student,*

*Department of ECE,*

*BGS Institute of Technology, Adichunchanagiri University,*

B. G. Nagara, Karnataka, India.

sl5876919@gmail.com

*Abstract*-Air pollution is a mixture of solid particles and gases in the air. Car emissions, chemicals from factories, dust, and pollen and mold spores may be suspended as particles. Some air pollutants are poisonous. Inhaling them can increase the chance you'll have health problems. People with heart or lung disease, older adults and children are at greater risk from air pollution. Microcontroller based systems are used widely nowadays. The microcontroller is used to control different devices automatically so many automated systems are built with the help of microcontrollers. There are various microcontrollers which can be used according to their properties and our requirements

The microcontroller-based system is designed which can be used to monitor air pollution at different areas. This system is designed in such a way that it will detect the pollution level in the particular area. Sensors are installed at the places to detect the amount of gas in the air. This information regarding the air flow is send to the administrator at the remote place. So, the administrator can monitor the air flow and the air pollution sitting at one place. This kind of system can be used for controlling the air pollution level in environment.

# INTRODUCTION

Air pollution is a mixture of solid particles and gases in the air. Car emissions, chemicals from factories, dust, and pollen and mold spores may be suspended as particles. Some air pollutants are poisonous. Inhaling them can increase the chance you'll have health problems. People with heart or lung disease, older adults and children are at greater risk from air pollution. Microcontroller based systems are used widely nowadays. The microcontroller is used to control different devices automatically so many automated systems are built with the help of microcontrollers. There are various microcontrollers which can be used according to their properties and our requirements

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# LITERATURE SURVEY

**Paper1-** International Journal of Computer Applications (0975 – 8887) 44, volume83, no10, june2017 Air Pollution Monitoring using GIS and Wireless Networking for Air Quality Management

**Abstract**: Air pollution is a serious problem in thickly populated and industrialized areas in India especially in Delhi. The air pollution in India is abundant especially in areas where pollution Sources and human population are concentrated. Economic growth in industrialization are proceeding at a rapid rate accompanied by increasing emissions of air polluting sources. Environmental impacts of air pollutants have impact on public health, vegetation, etc. To prevent or minimize the damage caused by atmospheric pollution suitable monitoring systems are urgently needed which can rapidly detect polluting sources for monitoring.

**Paper2**-ISSN: 2278-0661, p- ISSN: 2278-8727Volume 11, Issue 4 (May. - Jun. 2017), PP 65-69

Evaluating Air Pollution Parameters Using Zigbee (IEEE 802.15.4)

**Abstract**: Air pollution receives one of the prime concerns in India, primarily due to rapid economic growth, industrialization and urbanization with associated increase in energy demands. Lacks of implementation of environmental regulations is contributing to the bad air quality of most of the Indian cities. Air pollutants produced in any air shed are not completely confined, but at time passing all the geographical boundaries.

**Paper-3**: International Journal of Engineering Trends and Technology (IJETT) - Volume4Issue4- April 2017 Pollution Monitoring System using Wireless Sensor Network in Visakhapatnam

**Abstract**— As the technology increase, the degree of automation (minimizing the man power) in the almost all sectors are also increases. Wireless Sensor Networks (WSN) are gaining the ground in all sectors of life; from homes to factories, from traffic control to environmental monitoring. The air pollution monitoring system contains sensors to monitor the interested pollution parameter in environment.

# PROPOSED METHODOLOGY

Block Diagram

The air pollution monitoring and prediction is the biggest challenging task nowadays, especially in the big cities like Bangalore (since we are acquired with pollution which is our own mistake). The government of all the countries of whole world has attempted to check and improve the air quality in environment.

Industrialization increases the degree of Automation and at the same time it increases air pollution by releasing unwanted gases in the industrial area Delhi to detect the percentage of pollution we use array of sensor to measure gas quantity in physical environment the sensor converts them into electrical signal for further processing. These sensor node networks are connected through wireless network and gives wireless sensor network. Main functioning unit Composed of a sensing unit is designed and programmed to sense gas pollution in air in busy area Delhi that can sense the polluted air, dust, carbon content etc. A converter that transforms the sensed from an analog to a digital signal a processing unit in the microcontroller process the signals sensed from sensor with the help of embedded memory operating system, associated circuitry.

A flowchart is a visual representation of the sequence of steps and decisions needed to perform a process. Each step in the sequence is noted within a diagram shape. Steps are linked by connecting lines and directional arrows. This allows anyone to view the flowchart and logically follow the process from beginning to end.

The word system is possibly the most overused and abused term in the technical lexicon. System can be defined as the “a set of fact, principles, rules etc., classified and arranged in an orderly form so as to show a logical plan linking the various parts” here the system design defines the computer based information system. The primary objective is to identify user requirements and to build a system that satisfies these requirements.

Design is much more creative process than analysis. Design is the first step in the development of any system or product. Design can be defined as “the process of applying various techniques and principles for the purpose of defining a device, a process or a system in sufficient detail to permit its physical realization”.

It involves four major steps they are

1. Understanding how the system is working now;

2. Finding out what the system does now;

3. Understanding what the new system will do; and

4. Understanding how the new system will work.

So as to avoid these difficulties, a new system was designed to keep these requirements in mind. Therefore the manual process operation has been changed into GUI based environment, such that the user can retrieve the records in a user-friendly manner and it is very easy to navigate to the corresponding information.

# IV.TESTING

The testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub-assemblies, assemblies and/or a finished product It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of tests. Each test type addresses a specific testing requirement.

**TESTING METHODOLOGIES:**

**Black box testing**

This is done by testing the system without any knowledge of internal design or code. This typically will be carried by a functional expert than a technical expert. Tests are based on requirements and functionality.

**White box testing**

This testing is based on knowledge of the internal logic of an application's code. Tests are based on coverage of code statements, branches, paths, and conditions.

**Unit Testing**

Unit Testing is the first level of dynamic testing and is first the responsibility of the developers and then of the testers. Unit testing is performed after the expected test results are met or differences are explainable /acceptable.

**Parallel/Audit Testing**

Testing where the user reconciles the output of the new system to the output of the current system to verify the new system performs the operations correctly.

**Functional Testing**

Black-box type of testing geared to functional requirements of an application. Testers should perform this type of testing.

**Usability Testing**

Testing for 'user-friendliness'. Clearly this is subjective and will depend on the targeted end user or customer. User interviews, surveys, video recording of user sessions, and other techniques can be used. Programmers and testers are usually not appropriate as usability testers.

**Incremental Integration Testing**

Continuous testing of an application as new functionality is recommended. This may require various aspects of an application's functionality be independent enough to work separately before all parts of the program are completed, or that test drivers are developed as needed. This type of testing may be performed by programmers or by testers.

**Integration Testing**

Upon completion of unit testing, integration testing, which is, black box testing, will begin. The purpose is to ensure distinct components of the application still work in accordance to customer requirements. Test sets will be developed with the express purpose of exercising the interfaces between the components. This activity is to be carried out by the Test Team. Integration test will be termed complete when actual results and expected results are either in line or differences are explainable/acceptable based on user/management input.

**System Testing**

Upon completion of integration testing, the Test Team will begin system testing. During system testing, which is a black box test, the complete system is configured in a controlled environment to validate its accuracy and completeness in performing the functions as designed. The system test will simulate production in that it will occur in the "production-like" test environment and test all of the functions of the system that will be required in production. The Test Team will complete the system test.

Prior to the system test, the unit and integration test results will be reviewed by Software Quality Assurance (SQA) to ensure all problems have been resolved. It is important for higher level testing efforts to understand unresolved problems from the lower testing levels. System testing is deemed complete when actual results and expected results are either in line or differences are explainable/acceptable based on client input.

**End-to-End Testing**

Similar to system testing, the 'macro' end of the test scale involves testing of a complete application environment in a situation that mimics real-world use, such as interacting with a database, using network communications, or interacting with other hardware, applications, or systems if appropriate.

**Regression Testing**

The objective of regression testing is to ensure software remains intact. A baseline set of data and scripts will be maintained and executed to verify changes introduced during the release have not "undone" any previous code. Expected results from the baseline are compared to results of the software being regression tested. All discrepancies will be highlighted and accounted for, before testing proceeds to the next level.

**Sanity Testing**

Sanity testing will be performed whenever cursory testing is sufficient to prove the application is functioning according to specifications. This level of testing is a subset of regression testing. It will normally include a set of core tests of basic GUI functionality to demonstrate connectivity to the database, application servers, printers, etc.

**Performance Testing**

Although performance testing is described as a part of system testing, it can be regarded as a distinct level of testing. Performance testing will verify the load, volume, and response times as defined by requirements.

**Load Testing**

Testing an application under heavy loads, such as the testing of a web site under a range of loads to determine at what point the systems response time degrades or fails.

**Installation Testing**

Testing full, partial, or upgrade install/uninstall processes. The installation test for a release will be conducted with the objective of demonstrating production readiness. This test is conducted after the application has been migrated to the client's site. It will encompass the inventory of configuration items (performed by the application's System Administration) and evaluation of data readiness, as well as dynamic tests focused on basic system functionality. When necessary, a sanity test will be performed following the installation testing.

**40Security/Penetration Testing**

Testing how well the system protects against unauthorized internal or external access, willful damage, etc. This type of testing may require sophisticated testing techniques.

**Recovery/Error Testing**

Testing how well a system recovers from crashes, hardware failures, or other catastrophic problems.

**Compatibility Testing**

Testing how well software performs in a particular hardware / software / operating system / network etc. environment.

**Comparison Testing**

Testing that compares software weaknesses and strengths to competing products.

**Acceptance Testing**

Acceptance testing, which black box is testing, will give the client the opportunity to verify the system functionality and usability prior to the system being moved to production. The acceptance test will be the responsibility of the client; however, it will be conducted with full support from the project team. The Test Team will work with the client to develop the acceptance criteria.

**Alpha Testing**

Testing of an application, when development is nearing completion Minor design changes may still be made as a result of such testing. Alpha Testing is typically performed by end users or others, not by programmers or testers.

**Beta Testing**

Testing when development and testing are essentially completed and final bugs and problems need to be found before the final release. Beta Testing is typically done by end users or others, not by programmers or testers.

# V.CONCLUSION

The project “Air pollution monitoring and alert system” is one of the most useful projects to control the pollution in developing cities. The project can overcome all the existing air monitoring stations, it is also created in infrastructural level. Hence it is field independent

The project can be used anywhere without any modification, but just need to follow the main module. This technology is readymade for the vast variety of real time application, but still it had its own drawbacks. This project has been built based on Node MCU which having very less storage. The system to monitor the air of environment using 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 Here, we are using the MQ2 gas sensor gives the sense of different type of dangerous gas and NodeMCU is the heart of this project which control the entire process. Wi-Fi module connects the whole process to internet and LCD is used for the visual Output. This project can also be upgraded with using expensive sensor to get accurate results.

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