MACHINE LEARNING APPROACH FOR SENSING HARMFUL GAS DETECTION

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ABSTRACT

Industrial Air pollution that acts on our everyday activities and general well being. This thing constitutes a warning via the system and therefore the general well being on the earth. The terrible need to be compelled to detect the quality of ambient air is incredibly obtrusive, due to the rise in factory-made pursuit over the latest years. Folks have to be compelled to grasp the extent on which their pursuit has an effect on quality of ambient air. This paper came up with the Associate in Industrial Air pollution observance approach. This approach is being expanded to exploit the Arduino microcontroller. This Industrial pollution observance approach is sketched to analyze quality of ambient air in period. The clean air is estimated by the designed approach to be precise. The consequence is shown on the created apparatus exhibit port along with accessed cloud on any sensible portable accessory. This paper offers the improvement of pollution tracking systems with deployment of intelligent sensors. The proposed approach finds application in industry and additionally in monitoring of causes like a fan, motors.

Keywords: Internet of Things (IoT), Machine Learning, Prediction, Temperature Sensor, Arduino Microcontroller

I. INTRODUCTION

“Once the world was full of trees and now it was fully surrounded by pollutants”. And these pollutants lead to numerous classification of contamination like Air contamination, Aqua contamination, Ground contamination, Sound contamination etc. Among these Air pollution is considered as one of the most serious one because the pollutants like carbon dioxide, sulphur dioxide, nitrate, methane, chlorofluorocarbon etc. created by mankind as well as by natural calamities affect our environment by suppression of plant growth, acid rain, smog effect, global warming and it also affect human by causing eye irritation, lung cancer, respiratory problems, skin damage and in some cases it leads to death too.

The pollutants are released into the atmosphere by various activities like vehicle emission, burning of fossil fuels, mining operations, agricultural activities, natural events like volcanic eruptions, storms, forest fire and exhaust from industries etc..

India ranked second in world population after China in the whole world. The population was approximately 1.05 cores in the year 2000 and now it is 1 billion within 2.1 decades. As population grows the environment also gets affected. In 2000 the CO2 emission was 109 million short tons and in 2021 it is 240 million kilo tons which is growing rapidly every day and that leads to 120,000 deaths in the year 2020 and 1.7 million died in the year 2019 due to distinct diseases said by interdisciplinary journal Lancet planetary health report. Hence to control the air pollution we have proposed a solution using the internet of things and machine learning which helps in reducing the death rate caused by air pollution and also saves our environment.

This paper is prepared into Section I consists of Introduction, Section II consists of Relatedwork, Section III consists of Model Presentation, Section IV consists of Result and Section five consists of Conclusion and destiny work.
II. RELATED WORKS:

“An Web of Things found reason able valued contamination watching approach” projected by Gagan Parmer[1] printed in 2017 associate degree their projected plan says that a model for any circumstances contamination watching approach as long a strailing the absorption of principal air waste material gasoline has been advanced. The device uses reduced-worth air-fine trailing nodes incorporating an occasional free semiconductor fuel device with broad band modules. The method measures absorption of gasoline that embody Carbon monoxide, Methane, Sulphur dioxide and Nitrogen dioxide the utilization of silicon chips.

The device can acquire the statistics of various surrounding limitations and supply it to raspberry pi that act as a basestation. Realization of statistics accumulated with the help of devices is exhibited on Raspberry pi 3 based totally on the net porter. A MEAN stack is advanced to point out info over websites. The essential issue of projected exertion is to supply reduced worth base structure to modify the records assortment and proclamation of every or any contributor.

IOT Based – Automated Indoor Air Quality and LPG Leak Detection Control System using Support Vector Machine by Shah Alam published on 8th august 2020, their proposed solution is to analyse the LPG gas level using the sensor MQ2, MQ6, MQ7.DM106(Air Quality) etc and if any abnormal level of gas present or the threshold value exceeds then the exhaust fan connected with the arduino and raspberry pi 3 will be automatically on as well as the notification will be sent to the user as message using firebase through wifi and in the prototype they used C language for implementing the code and kodular.io for developing the app.

Their essential thing of the prototype is to control the LPG gas leakage and get notified to the user immediately and they used wifi here to notify in future scope they aim to create a design that splits the sensors from the fan, which will then be connected via wireless connection, particularly through Wi-Fi.

“ Gas Leakage Detection And Smart Alerting And Prediction Using Iot” proposed by the way of means of AsmitaVarma, Prabhakar posted on 2017 describes that IoT is an growing community of physical devices which might be associated with specific forms of detector along with the assist of affinity to the web, they may be capable of change records. By way of web of things, the web has now prolonged itsradicle to nearly each feasible factor gift spherical us and isn't always any more restricted due to unique pc structures with cell phones. Security, the number one trouble of any mission, has now no longer been left untouched by way of means of IoT. Gas Leakages in open or closed regions can display to be volatile and deadly.

III. PROPOSED SYSTEM

The proposed system of Machine approach on harmful gas detection describes that here The different sensors detect the extent of gasoline emission, fuel leakage, boiler temperature and so on. In case of detection of toxic gases, gasoline leakage above the secure restrict can assist to keep away from injuries. In order to maintain large information thing speak cloud is used and there is a certain limit if the gas is sensed beyond that the DC Motor connected to relay and Exhaust fan automatically switches ON in order to reduce the emission of harmful gases present in the atmosphere.

The conventional Gasoline Leakage Detector approach, despite the fact that it has exceptional precision, fails to understand some elements with inside the subject of notifying human beings over the water proofing. Consequently we've nearly new the WoT automation to build a Gasoline Demodulator Detector having elegant notify techniques associated with mission, dispatch textual content communication along with an electronic dispatch to the anxious dominance along with an capacity to are anticipating risky scenario simply so people can be madeup to date in beef up via accomplish facts systematic on detector

OBJECTIVE

- The main objective of this project is to reduce toxic substances released into the atmosphere and to create a pollution free environment in future.
- Sensing of harmful gas detection that can be integrated with almost all the polluted area and may be used to manipulate them remotely from any part of the world.
- To facilitate the wifi connectivity with the system, the Arduino uno may be embedded with a wifi module.
IV. METHODOLOGY

The block diagram below describes the workflow of the project: the sensor MQ2 observes the gases like methane, LPG and MQ3 sensor observe smoke and ethanol as well as MQ7 sensor is used to observe the gases like carbon monoxide.

![Block diagram of implementation](image1.png)

**Figure 1. Block diagram of implementation**

The sensor also detects different gases contains CO and temperature sensor LM35 to measure temperature anywhere between 55°C to 150°C in the atmosphere. All these sensed data is send to arduino and from there to node mcu to connect to the Thingspeak cloud after that the data is analysed using support vector machine algorithm which is coded in python and then based on the prediction the gas state will be printed as normal or abnormal. The exhaust fan connected to the arduino will turn on automatically when it exceeds the specified condition and it will off when the temperature is reduced.

**Machine Learning Part**

![Machine Learning Part](image2.png)

**Figure 3 Prediction of air quality**

The above Figure 3 explains the data passing from the ThingSpeak cloud to Personal Computer and then predicting the value using SVM Machine learning algorithm. The past data is used in the testing part the past data is in the form of Excel sheet with three gas values and a target of 0 and 1 where 0 denotes the harmful gas doesn’t exceed the limit and it is normal and 1 denotes the harmful gas like CO2, Butane etc exceeded the limit and it is in abnormal state.
4.1 HARDWAREMODULES

Arduino Microcontroller

Arduino is an Associate in Nursing ASCII text file platform used for building physics. Arduino is composed of every a bodily programmable published circuit (often remarked as the micro control) and the chunk of software programs system, or the IDE (Integrated Development Environment) that run in the laptop, wont able to jot down along with transfer code to bodily board. Unlike maximum preceding the programmable circuit board, the Arduino didn't would love the disparate piece of a hardware (referred to as the programmer) so as to load a new code onto the board -- which you will simply use the USB cable to boot, a Arduino IDE make sure of the simplified model of C++, growing it easier to be an informed to the program. Atlast, Arduino gives the regular kind difficulty that breakout a feature of the microprocessor into an extra attainable.

![Figure 4 Arduino](image)

Exhaust fan

The fan is employed to drag excessive and unwanted odors out of a selected space. In industries they additionally want to cut back the temperature. During this project fan is connected with relay and it's mechanically on or off supported the temperature condition.

![Figure 5 Exhaust fan](image)

Temperature sensor

The LM35 temperature sensing element is straightforward to take a live temperature mistreatment of an Arduino. The sensing element will live a reasonably big selection of temperature (-50°C to 125°C), is reasonably precise (0.1°C resolution), and is extraordinarily low price. The LM35 would not have a temperature touchy electric device. Instead this sensing detail makes use of the belongings of diodes; as a diode adjustments, temperature, the voltage adjustments with it at a well-known rate. The sensing detail measures the tiny modification And outputs an analog voltage among 0 and 1.
MQ2 Gas sensor

MQ2 is one in all the ordinarily used gas devices in MQ sensor series. MQ2 Gas device works on 5V DC and attracts around 800mW. It will observe LPG, Smoke, Alcohol, Propane, Hydrogen, alkane and carbon monoxide gas concentrations anywhere from 200 to 10000 ppm.

MQ3 Gas sensor

The Grove - Gas Sensor (MQ3) module is helpful for gas discharge detection (in home and industry). It's appropriate for detection of Alcohol, Benzine, CH4, Hexane, LPG, CO. The sensitivity of the sensing element may be adjusted by mistreatment of the potentiometer.
MQ7 Gas sensor

MQ135 Gas sensing element is associated with air quality sensing element for detection of a large number of gases, together with NH3,NOx,alcohol, benzene, smoke and dioxide. Ideal to be used in the workplace or works. MQ135 gas sensing element has high sensitivity to Ammonia, chemical compound and benzoyl steam, conjointly sensitive to smoke and different harmful gases.

4.2 SOFTWARE DESCRIPTION

MACHINE LEARNING

Over the past twenty years Machine Learning has become one in every of the mainstays of data technology and therewith, a rather central, typically hidden part of our life. With the ever increasing amount of knowledge information turning into offered there's a sensible reason to believe that sensible data analysis can become even additional pervasive as a necessary ingredient for technological progress. Various Machine learning algorithms include Linear Regression, DecisionTree, SVM, NaiveBayes,Random Forest etc.

SVM ALGORITHM

Here we using SVM Algorithm, SVM or Support Vector Machine could be a linear model for classification and regression issues[11][12]. It will solve linear and non-linear issues and work well for several sensible issues[13]. The thought of SVM is simple: The formula creates a line or a hyperplane that separates the information into categories.

PYTHON

Python is Associate in Nursing open supply Artificial language. Python was created to be easy-to-read and powerful. Python is Associated as a nunderstood language. Easy to compile and run. This implies that an engineer can modify the code quickly and see the results. This additionally suggests that Python is slower than a compiled language like C, as a result. Python could be a smart Artificial Language for beginners. It’s a Problem-Oriented Language and takes less time to code.

THINGSPEAK

ThingSpeak is like the cloud computing service to shop the statistics. Here Arduino can browse its main frame degree and sends it to a ThingSpeak, and it could be keep track from an area in the international victimization web. Already stated may be beneficial if it was you are walking it for a completely long term for some packages at a few far off place and need to display its mainframe temperature. ThingSpeak was an unclosed associate for the IoT platform watching your know-how accessible. In the ThingSpeak channel you’ll be capable of setting the statistics as non-public or public consistent with your selection. Thingspeak takes no less than fifteen seconds to replace your readings. It is a pleasant and really trustworthy platform for constructing IoT. There are a few benefits of Thingspeak over different platforms. It has numerous selections to plan graphs. It works with Arduino, RaspberryPi and MATLAB. However it ought to paintings with all quiet Programming Languages, because it makes use of a RESTAPI and hypertext transfer protocol. The Thingspeak carrier conjointly permits you to perform online analysis and act to your know-how.

V. RESULTS DISCUSSION

The study was ready to produce an example of a sway system that's capable of automation for there gulation and observation of Indoor Air Quality(IAQ) and is capable of detection LPG leaks. Except for user alert and notification, once any of the given parameters’ threshold price exceeds, the example also can regulate the exceeded levels into traditional conditions by sanctionative an automatic fan for the acceleration of ventilation. The regulation of the exceeded levels into traditional conditions is completed by exhausting the air from the
controlled house into the surroundings through the activation of the fan that successively can cut back the concentration of pollutants and chemicals.

![Figure 10 Sensed gas and temperature value](image1)

![Figure 11 Normal state of gas](image2)

![Figure 12 Abnormal state of gas](image3)

VI. CONCLUSION

Pollution monitoring system is today’s need. In this paper, we have suggested a comprehensive air polluted air has a severe effect on pollution monitoring system which will increase the performance, reliability and reduce the cost substantially than previously proposed traditional sensor network architectures. We have suggested an overall air pollution monitoring system which increases the performance, reliability and reduces the cost substantially than previously proposed traditional sensor network. Our proposed solution would be deployed in the Middleware Layer of IoT architecture and its predicted air pollution index would help the concerned agencies to take an appropriate action to minimize the pollution effect on the population.

VII. FUTURE WORK

The main objective of this model is to watch and analyse the Air pollution from any location. Real time readings can be obtained using this proposed model and it can be carried out within the future. Maintenance of equipment says that the climate, Transmission of data effectively etc. are to be self addressed. And in future to make India a pollution free country in the world

REFERENCES