

IOT and Fuzzy Logic Enabled Automated Air Pollution Monitoring System

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ABSTRACT: In last few years, Because of the increase in damage to the air by the some factors such as very tiny particles of dusts in air, very large amount of the CaCO_3 in the air, due to pollution generated by vehicles and other some other kind of Elections devices, etc. So to restrict such kind of problem there's need for a low cost air quality monitoring system to observe the air pollution at diff places, such as public facilities, homes, offices and other many places also. So we can take necessary action to restrict the damage cause by the air pollution. In this paper, we purpose IOT(Internet Of things) based Automated Air Pollution Monitoring System which might efficiently monitor the air pollution at diff places while don't care of restriction of any place. In previous Air Pollution Monitoring System has high exactitude, however giant bulk, high operational cost, and one common data point category makes it not possible for large-scale installation. Supporting IOT this paper extends the previous Air Pollution Monitoring System. This paper proposed a technique/method to sense the automatic pollution data sensed From the wireless sensors and predict the results. We predict and process the backend data using fuzzy logic in this paper, this method gives us result between the true and false, for example this can classify a raw data into three category (positive, negative & neutral) in order to measure the air pollution level and them make decision using fuzzy logic.

Keywords:IOT (Internet of Things). Fuzzy logic.Pollution monitoring.

I. INTRODUCTION

In the last few years the fast development and growth of, chemical industrial park, economy, construction and production area increasingly frequent, which leads to the increasing in Environmental pollution and pollution accident. As it is plagued geographical and meteorology conditions, pollution is very harmful when is accidently happens in the environment and its leads to problems such as inflicting or exasperating varied organ diseases into a flesh or may high bad effects upon human and surroundings.so this is a right time to line up automated air pollution monitoring system.[4]

In recent studies noticed that, conventional air automatic systems have very complex in its nature to understand and install for large area instalment, also have a very complicated operations and very high value results in it.so due to this it is not possible to install it into large area to monitor automated air pollution.to overcome this such kind of conventional air monitoring system .in this paper purposed a IOT based atmosphere monitoring system. In this we can use a low cost wireless sensors to sense the data from air, environment. And we can combine the data collected from the sensors and use it for prediction using diff decision making models [1]

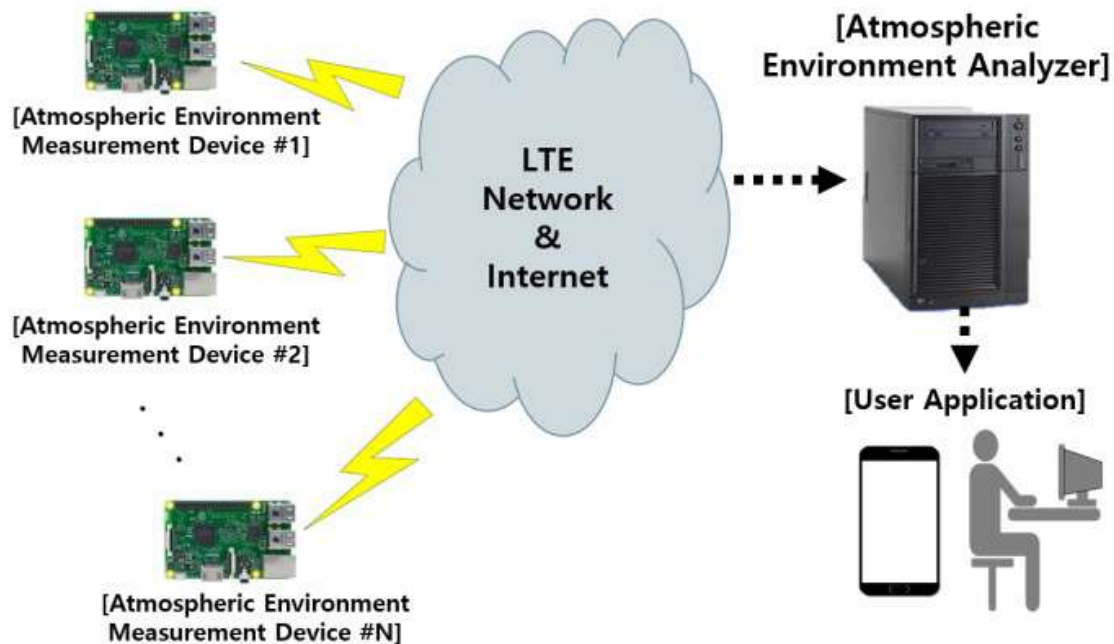


Figure 1: Configuration of pollution monitoring system [1].

Recently, because the damage from pollution because of fine mud and gas will increase incessantly, interest within the region atmosphere is increasing quickly round the world. in step with the recent study], fine mud is especially caused by combustion of fuel, and it's illustrious to act as main issue inflicting or exasperating varied respiratory organ diseases within the flesh. Gas is caused by the reaction of NO₂ and volatile organic compounds (VOCs) emitted from automobile exhaust gas and also the like because of robust daylight, that causes system diseases [1].

In this we collect the data from wireless sensors where the main role of the IOT is used for collecting the data from the sensors is frontend work and then main task is to analysis that data and then predict the upcoming changes to data in this we use a fuzzy Logic to analysis of the data and give accurate result because fuzzy logic is a one technique which can give a result between the 0 & 1.

1.1 Fuzzy Logic Model Implementation

It is a more-valued logic.it gives a result between true(1) and False(0),it used to handle

partial value which can completely between the two values 0 and 1.it is also used in a Boolean values

1.1.a Collecting Data ,Clustering and Pollution Monitoring

In proposed systems data is collected from the Wireless sensors networks and the results is get from it using some kind of media connected to them and also we can collect data from sensors through the internet but main purpose of collected data, to cluster that Data into the process of diff cluster .and then analysis that data we use a fuzzy logic approach to analysis the data. Fuzziness defines event ambiguity and inexactness of linguistic terms. Symbolic logic fits finest in applications wherever the variables are continuous and/or scientific models don't exist or obsolete system models become to a fault composite. WSN is characteristically wont to show some parameters of associate surroundings path. The model of fuzzy logic system as shown in Figure 2 consists of fuzzification, fuzzy rules, and fuzzy inference system and defuzzification process.

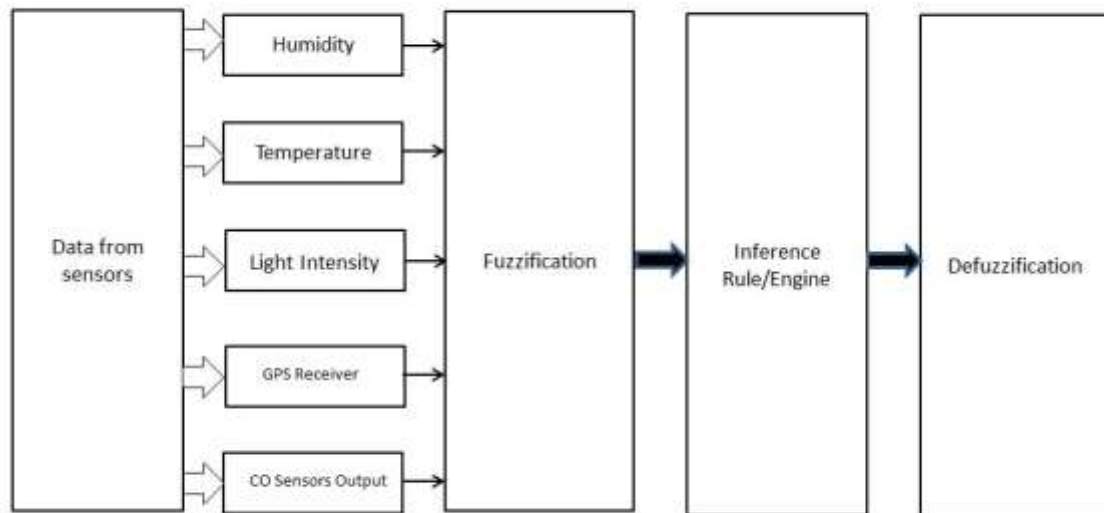


Figure 2: Automated air pollution monitoring system[2]

1.1.b Fuzzification it is a process of converting the original values into the fuzzy linguistic value/variables. Association function is used to grade the every linguistic value/variable. Association function operates and gives us a value between the 1(true) and 0(false) over the original values. In projected Pollution monitoring formula temperature, humidity, CO density, strength unit the input fuzzy variables. Range of association function depends upon the value form the input. The association function LOW HIGH and MEDIUM units on formula temperature, humidity, CO density. 1.1.c Inference Engine\Rules The fuzzy logic main part or we can say heart of fuzzy logic is inference engine, also we can say fuzzy logical thinking system contains fuzzy rules If then associates rules. The core of fuzzy logic system is the rule based system that intercepts the human reasoning; Fuzzy rule based operates the fuzzy logical thinking system to give fuzzy output.

Fuzzy knowledge base constructs the fuzzy logical thinking system which further helps the rules to predict the output in the desired manner of the knowledge base representation. The fuzzy if-then rules in knowledge base system are following:
 IF m1 is X1 and m2 is X2.....THEN n is Y1
 Else
 IF m1 is X12 and m2 is X21.....THEN n is Y2
 IF m1 is X1k and m2 is X2k.....THEN n is Yk

There is m is a Fuzzy input variable n is output and X is a fuzzy set. 1.1.d De-fuzzification Conversion the set of fuzzy set into the original

value is named as de-fuzzification. There square measure several sorts of de-fuzzification approaches, oft extreme association and centre of mass practices square measure used. In apply; de-fuzzification is finished exploitation centre of mass methodology

II. REVIEW OF LITERATURE

Different researchers used many techniques to automated air pollution monitoring, and in proceeding to air pollution monitoring, which has used important place in the domain, is becoming a very good research area and development topic. In the preceding papers diff techniques discussed for the air pollution monitoring which is such as image processing technique, satellite data sensing technique, artificial neural networks (ANN) technique, video based technique etc. And diff decision making models to process a data at backend such as game theory, Bayesian decision making, artificial neural network, Fuzzy Logic etc., Which are discussed below. Different Researchers have used many techniques to Air pollution monitoring, and early to Air pollution monitoring, which has used significant place in the domain, is becoming an most useful research and development topic. In last papers, diff techniques were used for Air pollution monitoring such as Artificial Neural Networks (ANN), Satellites Data sensing, Image Processing Techniques, Video based techniques etc. which are discussed below In [4], the paper writers use the artificial neural networks for air pollution

monitoring, the authors combined the wireless sensors to get the accurate data and analysis the data but in it author's used ANN's for data analysis at the backend which is complex Task. The info is separately labelled as knowledge and then given as input to the ANN to convert it into the intelligence.it can't work without the supervision of Human. In [5], Author does a several analysis using collected information from the images and then combine the info for the prediction of the results collected using an image processing. In theory the

high temperature frequency and 15min of the photography can help us to detect the fires in the forest. In [7], Author mentioned associate degree automatic system for fresh smokes supply detection using the real-time operation of clicked and stored pictures. 1st half describes the segmentation technique accustomed extract persistent high-octane envelopes of pixels into the pictures, whereas second half deals with the tactic to discriminate the varied natural phenomena that will cause such envelopes.

III. PARAMETRIC ANALYSIS OF EXISTING WORK

Table 1: Comparison of decision making models

Decision making model / Attributes	Artificial Neural Networks	Bayesian Decision Making	Game Theory	Fuzzy Logic
Working Models	ANN's is an Interconnected cluster of nodes, as similar to neurons in brain.in it node represent the artificial neuron and edges or arrows shows links between neurons.	It is statics based on Bayesian Interpretation of probability, in this probability shows a degree of belief in event.	It is study of mathematical models.	It is a more-valued logic.it gives a result between true(1) and False(0),it used to handle partial value which can completely between the two values 0and 1.it is also used in a Boolean values
IOT Support	Medium	Medium	Less	High
Computation Time	High	High	High	Low
Efficiency	Less	Less	Medium	High
Complexity	Complex	Highly Complex	Complex Pay-Off Matrix	Simple
Accuracy in Outcome	Least Accurate (May Give Non-Deterministic Output).	Least Accurate (It can give us a result between yes or no)	Accurate (Is an Un-Realistic Approach).	Most Accurate (It can also give us a result between yes or no)

IV. LITERATURE GAP IN EXISTING ALGORITHMS

Table 2: Comparison of loopbacks in Exiting Work

S.NO.	AUTHOR	YEAR	ALGORITHM	LIMITATION
1	Bright KeswaniLi et. al.	2018	smart irrigation technique or VLRGD technique which is variable learning rate gradient descent	The irrigation value management commands are Generated with the symbolic logic based model to achieve the equal farm irrigation demand of the weather.
2	Chen Xiaojun et.al	2015	Algorithm of air pollution detection & monitoring & forecasting System	A good resolution to the complexness of pollution. Wireless sensors collect the info about the pollution in environment and send the pollution related details to the connected node then there is work is divided into two parts front & backend which id quiet complex task to manage along with the monitoring and forecasting. The front end collected the huge info and them make it available for the background to process it and Forecast the emergency response to pollution accident..
3	SeungHo Kim et. al.	2017	Atmospheric Environment Monitoring System	The solution projected Associate in Nursing IoT-based atmospherical setting observation system, that is developed by a model. it's expected that the event system are going to be effectively utilised in atmospherical setting based mostly services by putting in the developed activity devices at public facilities.
4	KeshavDhired. al.	2018	Employee performance evaluation	In this paper a completely unique technique, primarily based upon neuralfuzzy synergism to guage performance of staff. In addition to the neural- fuzzy we can use a hybrid neural-fuzzy which facilitates us to predict better performance and outcome from this model but it also take a time and some of heavy resource to give a response on time .
5	Ravi Kishore Kodali et. al.	2018	Analog Pin Multiplexing	Lot enabled weather system is a good choice of predicting the weather .we can use this type of system in our houses and rooms also where we want to monitor the pollution parameters continuously. but it can also lead to the time and money consumption to setup this large circuitry inside the house.
6	Edmond Nurellari et. al.	2018	Energy Efficient Two-Step Transmission	WSN ends up in a reliable and operational system even within the worst attenuation line case. To any

			Decision Algorithm	extend the WSN operational period of time, we've projected an easy however economical algorithmic rule such the metallic element transmit power are often considerably reduced.
7	Jichun Zhao et al.	2017	Remotely Iot enabled monitoring system with wireless internet & communication.	This approach is completely wireless method to implement Remotely Iot enabled monitoring system with wireless internet & communication. Due to completely wireless approach it also lead to some in convince in the collecting info on time and restrict the pollution accident on time. It also effect the prediction of greenhouse effect with this algorithm we can predict the pollution but it may not give us a result on time.

V. CONCLUSION AND FUTURE SCOPE

In This IOT and Fuzzy Logic Enabled Automated Air Pollution Monitoring System Paper, we have Suggested a Fuzzy Logic and IoT Enabled Automated Air pollution monitoring system, which is a used to monitor the air pollution complexity parameters. The use of huge No. of wireless sensor reduce huge no. of persons need to monitor air pollution and take samples, it also reduce the cost of monitoring and make the collection of data in area more accurate & timely available. Huge amount of data collected and Received by wireless data sensors Makes Fuzzy logic and data analysis in background layer to provide an accurate data results For the emergency and quick response to the nearby users and the all the resident in that particular area after pollution accident happens. The fuzzy logic helps us to provide more accurate result because it can give us result between the true false. In Future we can add fuzzy logic inference engine 2 and GPS enable module to predict more accurate results in the Further work

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