

# Survey on On-Road Air Quality Analysis and Path Recommendation

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## Abstract:

An agent based system is used to find the air pollution in traffic area and generate recommendation to the road users. The air pollutants data are collected using static air pollution monitoring stations and mobile sensors. These mobile sensors are low cost. Using this data find Air Pollution Index (API) then creates a road network. This network is represented as a weighted graph. From this graph find the least polluted path. Dijkstra algorithm is used to find the least polluted path. To find the concentration of pollutants use Artificial Neural Network (ANN) is used. Here need to process large amount of data so Hadoop framework is used.

**Keywords:** Dijkstra Algorithm, Air Quality Management, Traffic regulation, Mobile sensors.

## 1. Introduction

Air pollution makes many health issues. Traffic in urban area is major source air pollution. The air pollutants data are collected using mobile sensors. Traditionally air pollution data are monitored using static monitoring stations. So the air quality prediction is not accurate. For the accurate prediction of air quality real time data are needed.

The proposed system [1] is able to give relevant information according to user's query. For this large amount of data is need to process. The data are collected using static and mobile sensors. This mobile sensor is embedded on user's vehicle. This gives real time data. Artificial Neural Network is used to calculate the pollutant concentration. The air pollution index is calculated based on Murena method [4]. This Air Pollution Index value and length of the path are given as the edge weight of the road network. From this data the cost is of each path is calculated. This data are used to generate weighted graph. From this the least polluted find the least polluted path. Dijkstra algorithm is used to find shortest path. Hadoop framework [6] provides efficient data processing in less time.

## 2. Literature Survey

Air quality monitoring will help the people to awareness about air quality and air pollution. Many researches are done related to air quality monitoring. They have many advantages and disadvantages. In past the data are collected from monitoring stations, crowdsourcing and participatory sensing.

One of the researches related to air quality monitoring is

MESSAGE (Mobile Environmental Sensing System Across Grid Environments) [2]. In this project the data are integrated data from fixed and portable sensors grids in real time to give dynamic estimation of pollutant and hazards concentration. The criteria to choose an appropriate sensor is, the sensor should low-cost, accurate, low power, fast, reconfigurable and redeploy able.

In another project introduce an electrochemical sensor to monitor urban air quality in low-cost and high density environment [3]. These electrochemical sensors are sensing data at part per billion levels. It has the capability to provide far more complete assessment of high-granularity air quality data from urban traffic area.

A MAS (Multi Agent based System) is used in air pollution monitoring system. The advantage of using MAS is it reduces the complexity of the system by creating modular components [5]. Each agent does their job separately by using most effective method. In [7] use both a MAS and improved version of Dijkstra algorithm for path finding. The MAS can be used in different applications. Here it used to solve the issues related to the traffic system. Here uses a TRACK-R device it is connected to the Bluetooth device to find the location. Dijkstra algorithm is commonly used in routing purposes. It improves the efficiency of road network routing. The drawback of classical Dijkstra algorithm is storage structure and searching area. The Dijkstra algorithm is used for graph with non-negative edges. This algorithm is used to find the shortest path between two nodes. The multi agent system is capable of solving traffic problems. In a research introduce an adaptive multi agent system. It is based on ant colony behaviour and the hierarchical fuzzy model. This is based on the adaptive vehicle route guiding. It adjusts the efficiency of route according to the real time dynamic data. ANN (Artificial Neural Network) is used to predict the air quality and pollution level [8]. ANN is a mathematical model. This is inspired from nervous system. In which the neurons are associated based on the issue to be address. Here back-propagation is used as the learning rule. Back-propagation is quite slow but very effective. It works by adjusting the error between actual and desired output by propagating the error back into the system. The neural network evaluation is based on Mean Square Error (MSE). ANN has greater flexibility and accuracy. They are capable of learning from experience, generalizing previous cases from new case. If an input contains irrelevant information it extracts relevant information. ANN requires less computation and its computation is less complex. In [10] apply a stochastic analysis for getting stochastic variable. It represents the relevant information in a stochastic system. This is used as the input for the training of a neural network. It will help to reduce the amount of data for training the neural network without reducing the predictive power of the network.

This air pollution system need to handle large amount of data and the pollutant data are dynamic. So need large storage space and efficient data processing. The Hadoop frame work is used for large data handling [6]. Hadoop is an open source framework that allow to store and process bid data

in distributed environment. Here use a single server, which is connected with thousands of computers. But it provide local computation. HBase is the data base used in Hadoop framework. HBase provide real time access to the data in Hadoop. It give fast, fault tolerant data processing. Using this massive amount of data can store. In [9] propose a study on big data integration with data warehouse build using relational technology.

The air pollution analysis system contain massive amount of data and it changed over time. The MAS and Big data analytics tools help to improve the efficiency of the system.

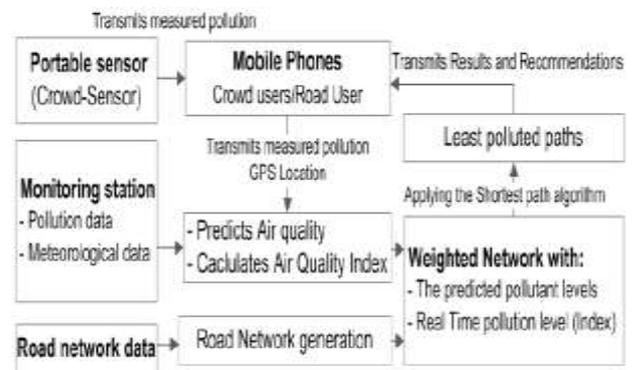


Figure 1: Overview of the proposed system

### 3. Conclusion

The main contribution of the proposed system is the air quality analysis and path recommendations to the users. For this the data gathered from different static as well as mobile sensors. Hadoop provide efficient data storage and fast user’s query processing. The Air Pollution Index value is used to find the least polluted path. The proposed system uses historical as well as current traffic data in order to make best recommendation. The Hadoop framework provides efficient data processing and it will take less time for data processing. The Hadoop framework improves the efficiency of the system.

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