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TRAFFIC MANAGEMENT BY MONITORING WEATHER PARAMETERS AND POLLUTANTS REMOTELY USING RASPBERRY PI

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ABSTRACT

The increasing count of motor vehicles mainly in urban areas have become prominent reason for unhealthy environment and causing illness due to pollution. Systematic flow of vehicles will help in reduction of pollution. Use of technology is a solution in handling traffic, sensing pollutants like carbon dioxide and carbon monoxide in the pathway of transit will help in decision making for the traffic authorities as well as to the commuters. The proposed method is a stand-alone IoT system to measure few weather parameters at a dense location with heavy traffic and provide the corresponding live data. The system uses a low-power mini-computer Raspberry Pi 3B+. The various sensors are used to sense different parameters like temperature, pressure, carbon dioxide, carbon monoxide and humidity. The data collected by the Raspberry Pi is sent to the cloud and stored which can be viewed by anyone and anywhere at any time. Future measures can be taken using available recorded-data if there are unhealthy readings measured by the system set up at a location.

INTRODUCTION

CLEAN fresh air is a basic need for any creature on this planet. Around 1.4 billion people in urban areas are living with air pollution above recommended air quality according to the reports of the World Health Organization (WHO) and about 7 million people die due to air pollution every year. The uneven rise and fall in weather parameters and pollutants is effecting climatic seasons [1]. This has made people more cautious about air pollution in and around them. The exposure of living creatures to polluted air could cause cardiovascular diseases. And could also cause irritation and infection in respiratory track, bronchitis, lung diseases, asthma. This would result in short life

of living beings with painful deaths. The pollution is increasing to the danger level affecting the lifestyle of the people. The mankind across the world is worried about the sudden changes in the climate. To control air pollution first step is to monitor it well. Exponential increase in number of motor vehicles on road is leading to air pollution, contaminating the environment because of harmful gases, particles emitted during combustion. In urban cities there is problem of heavy traffic due to poor management of traffic which results in release of more

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pollutants and making the air toxic at many locations. Such locations with heavy traffic movement should be on the observatory radar. Meteorological Department has setup various high-cost weather and air quality monitoring units all over India to measure various weather parameters and pollutants, but each unit is separated by hundreds of kilometers. The existing approach use Arduino along with different set of sensors where a separate component for internet connection is necessary for data transfer to the cloud [1-2]. The proposed approach is used for Traffic management and also helps is easy traffic movement and keeping the environment clean by less combustion of fuel. The proposed system is used to measures various parameters like temperature, atmospheric pressure, carbon monoxide, carbon dioxide and humidity at selected locations. If the measured values are above safe level then authorities can take required steps in diverting the traffic through other routes. This helps in traffic management and allows the rider to take the safe healthy route and diverting the traffic results in stabilizing and reversing the various parameters back to safe level. The system helps in having a reasonably good quality of air for the people on the streets and around.

LITERATURE SURVEY

Stanly Wilson, Tony Manuel, Peter Augustin D, “Smart Pollution Monitoring System,” International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-7, Issue-6, March 2019

The world has travelled a long way through the industrial revolution. One of the consequences that the industries and its different forms gave to humanity is pollution. The environment that we live is being polluted in different ways. Different parts of the world are already experiencing air pollution as a matter of concern. The increasing amount of industries and the emission of gas by the vehicles cause much damage to the air. We are in a situation where we need to monitor the amount of pollution in our areas of living and working. In order to monitor pollution, the paper proposes an efficient and low-cost method with the help of the internet of things (IoT). The system is designed to monitor the levels of CO, CO₂, smoke, alcohol, NH₃, temperature and humidity. The various alarms and notification are arranged in such a way that the information is given when there is any sign of threat. The remote monitoring is made possible with dedicated website and mobile

app. From the time immemorial, human beings were fascinated by the weather and climate changes. The rise and fall of the temperature made different seasons. The same climate still fascinates them by being affected by human interventions. Nowadays people are very cautious of the pollution in their living areas. Many cities in the world are already experiencing the impact of air pollution. Air pollution could cause various diseases. The exposure to air pollution, whether for short or long duration could increase the risk of cardiovascular diseases [1]. Some of the diseases caused by air pollution may be chronic in nature while others are not. They could range from respiratory irritation and infection, lung cancer and lung diseases, bronchitis, asthma and other diseases that are connected with the respiratory system. Air pollution could both cause and aggregate the above conditions that may lead to premature mortality or shortens life cycle [2]. The pollution rate is already in the danger level affecting the ordinary lifestyle of the people. The world is worried these days at the drastic changes that happen in the climate. The first move to control air pollution is to monitor it well [3]. There were different methods that are employed to understand and predict the weather. They ranged from simple to complex methods as

well as from inexpensive to expensive. There are different sources from where the weather information could be obtained. The government and non-government organizations provide the weather statistics that gives the general information. This information could be very useful in the areas of agriculture, construction, various modes of transportation etc. This information is general in nature, means, it gives the information of a particular geographical area. What if someone wants to monitor the quality of air in their company or living place? With an increasing amount of air pollution, it becomes a necessity to have products that are not complex, easily available, less costly and that could be monitored remotely. The paper focuses on air pollution in particular with the added advantage of temperature and humidity readings. One of the important aspects of weather forecasting is to make sense of the data that the sensors provide. These readings need to be made useful information for the people. For that matter, it must be presented well and accessible from anywhere. The data obtained, for that matter, must be processed and communicated to some server with the help of modules like GSM, Bluetooth, wired or wireless transmission etc. Another important aspect of the weather forecasting is to make the data

reliable. For that, the sensors used must meet the standards that are set.

R. Udaya Bharathi, M.Seshashayee,
“Weather and Air Pollution realtime
Monitoring System using Internet of
Things,” International Journal of
Innovative Technology and Exploring
Engineering (IJITEE) ISSN: 2278-3075,
Volume-8 Issue-9, July 2019.

Pollution detection and regular monitoring is extremely significant errand in this day and age of in our existing world. To make a better and more secure condition for individual, creatures, and plants. We have to screen and control the contamination through the Internet of things innovation. This investigation proposes air contamination and checking model which distinguishes contamination in air based on information mining calculation. The sensor System is used to recognize the sensor regards from different gas sensors. The microcontroller is utilized to exchange the qualities from ADC to server. Information mining is utilized to compute the toxins from various regions. ID3 algorithm is used to figuring the base of the characteristics on probability. Bluetooth module is utilized to interface the controller with the customer and the customer associated with the server by means of web

administrations. Remote sensors are utilized to ascertain the level of unsafe gases presents noticeable all around that, at last, gives a decrease in contamination. This framework not just computes the poisons present noticeable all around yet, in addition, we can figure to maintain a strategic distance from future contamination in and can send the notification message to the specific dirtied region. Here we consider basically the concoction Industry close Delhi and the metro urban communities. These research paper mainly focused on the proof of pollution monitoring and detect on particular location or geographical area for an IOT physical gadgets that collects information with respect to physical parameters, utilizing an advanced microcontroller stage, from different sorts of sensors, through diverse methods of correspondence and after that transfers the information to the an internet. The displayed gadget has been intended for remote checking of climate various environments. These article centers around the method of transferring obtained information on the web with the goal that the gadget can be utilized to remotely screen climate parameters and in the long run examine environmental change designs like temperature, humidity, Atmospheric Pressure. The paper also discusses the basic

concept of Internet of Things and its potential applications, especially for weather monitoring. This study intended to make a prototype System, which utilizes an embedded system utilizing raspberry pi for watching the climate interchanges in various areas. This prototype talks about an observing System which gives data about ecological position on a progressively nearby dimension, the execution region is classified by modern, home and office applications and quickly contacts the innovative headways in checking nature and drawing out the new extension in checking the present condition issues. The System could screen encompassing climate circumstances along with stickiness, temperature, light power, soil dampness, and precipitation. The present model and a similar examination of nature System were connected in an example horticultural ranch, already stated model System was observed to be agreeable for ranchers for viably checking the homestead anyplace whenever, which results from cost decrease, resource-sparing, and profitable administration in cultivating. The model System is created utilizing open source equipment Raspberry pi and WIFI which demonstrates practical and having low power utilization. The existing sensors are accumulating the information of different

natural affection and give it to Raspberry pi, which goes about from central server. The Raspberry pi dispatch the information utilizing WIFI and the prepared information will be shown on PC through getting to the server that is on the recipient side. It has a terrible effect on human wellbeing, amphibian life and creatures. Pollution in urban areas isn't a new issue. The consumption of coal has led to contamination. Amid foggy conditions, the contamination transforms into exhaust clouds. Exhaust cloud causes interruption of traffic which may prompt conveyed urban communities to a stop and ascend in death rates to drastically rise. General Health Act segment endeavored to decrease smoke contamination. In the twentieth century, higher measure of modern controls diminished exhaust cloud contamination. Smoke Abatement Act diminishes smoke outflows. Contamination is a bothersome change in physical, concoction or organic qualities of air. Land or water which influences the life of person or makes wellbeing perils to living creature. Air contamination is a noteworthy hazard factor for wellbeing incorporating diseases in skin and eye. Aggravation of the nose. Throat and eyes. Coronary illness. Lung malignancy, Bronchitis. Trouble in breathing. The

fundamental drivers of contamination are Carbon dioxide (CO₂) gas. Changes in atmosphere and climate conditions have been watched for quite a long time. Observing the weather framework variations is essential to determine the environment differences. There and then always huge importance of climate influencing on human life which had motivated to the development of whole scientific areas on the climate and weather observation. In the beginning there were simple and inaccurate instruments used, which were inadequate for easy reading and storing of measured parameters. Nowadays, there are many automated observatories and weather forecasting systems all over the world collecting the environmental parameters continuously for some of the other applications which shows the importance of the weather on the day to day life. Transmission of the measured data could be done by a number of means: WI-FI link, GSM/GPRS link, satellite link direct, a wired link, etc. Weather forecasting has to be reliable and accurate, regardless of its application. Also, it has to provide simple access to all the measured parameters [1]. The Internet of Things (IoT) has the potential to make the world more hospitable for present and future generations of humanity. IoT devices can be deployed in numerous

ways for sustainable development. The IOT devices can be used to measure physical frameworks pertaining to a sensible object and upload them real-time to an online repository i.e. to cloud storage where they can even be analyzed in realtime. Thus, the measured data can be observed from anywhere around the world using Internet-enabled devices. IoT, integrated with cloud computing, allows for decentralization of data storage, processing, and analysis. The collected data can also be used to automatically control other remote devices, using machine-to-machine (M2M) communication through the Internet. The quality of sensors and precision of measurements may vary, and the area/location of climate or weather forecasting station can decide the exactness and unwavering quality of the climate information accumulation. As a rule, the client is restricted to the alternatives given by the maker. Regardless of whether a slight change in parameter checking or information preparing is watched, the business gadgets ended up irrelative. For some particular applications, it is required to have flexible and configurable solutions.

Gagan Parmar, Sagar Lakhani, Manju K. Chattopadhyay, “An IoT Based Low Cost Air Pollution Monitoring System”, Recent

Innovations in Signal Processing and Embedded Systems RISE-2017.

A prototype for an Environmental Air Pollution Monitoring System for monitoring the concentrations of major air pollutant gases has been developed. The system uses low cost air-quality monitoring nodes comprises of low cost semiconductor gas sensor with Wi-Fi modules. This system measures concentrations of gases such as CO, CO₂, SO₂ and NO₂ using semiconductor sensors. The sensors will gather the data of various environmental parameters and provide it to raspberry pi which act as a base station. Realization of data gathered by sensors is displayed on Raspberry pi 3 based Webserver. A MEAN stack is developed to display data over website. The fundamental aspect of proposed work is to provide low cost infrastructure to enable the data collection and dissemination to all stakeholders. OVER the past quarter century, there has been an exponential growth of industries. These industries have caused complex and serious problems to the environment. Considering the significance of air quality on human lives, the World Health Organization (WHO) has developed guidelines for reducing the health effects of air pollution on public health by setting the limits of the concentrations of various air

pollutants, some of which are ground-level ozone (O₃), nitrogen dioxide (NO₂), and sulfur dioxide (SO₂).The first and the foremost is the severe environmental pollution which has caused deterioration of atmosphere, climate change, stratospheric ozone depletion, loss of biodiversity, changes in hydrological systems and the supplies of fresh water, land degradation and stress on systems of food producing, acid rain, and global warming [1] Stationary and mobile sources release various chemical pollutants, including suspended particulate matter (SPM), carbon monoxide (CO), oxides of nitrogen (NO), oxides of sulfur (SO₂), lead aerosol, volatile organic compounds (VOC), and other toxics. It is well known that some of these chemical pollutants have increased the occurrence of diseases such as lung cancer, pneumonia, asthma, chronic bronchitis, coronary artery disease, and chronic pulmonary diseases [2-3]. Hence, there is a growing demand for the environmental pollution monitoring systems. In view of the ever-increasing pollution sources with toxic chemicals, these systems should have the facilities to detect and quantify the sources rapidly. Using laboratory analysis, conventional air automatic monitoring system has relatively complex equipment technology, large bulk,

unstable operation and high cost. High cost and large bulk make it impossible for large-scale installation. This system can only be installed in key monitoring locations of some key enterprises, thus system data is unavailable to predict overall pollution situation. To overcome defects of traditional monitoring system and detection methods and to reduce test cost, this work proposes a method combining IoT technology with environment monitoring.

EXISTING SYSTEM

In existing systems, traffic management primarily relies on data from traditional sensors like cameras, loop detectors, and traffic lights to optimize signal timings and manage congestion. However, these systems often do not consider real-time weather conditions and air quality, which can significantly impact traffic patterns and overall road safety.

The integration of Raspberry Pi, a versatile and affordable single-board computer, enables the incorporation of additional sensors to monitor weather parameters and pollutants remotely. Weather sensors can provide data on factors such as precipitation, temperature, and visibility, allowing traffic management systems to dynamically adjust signal timings and implement adaptive traffic control strategies based on current weather conditions.

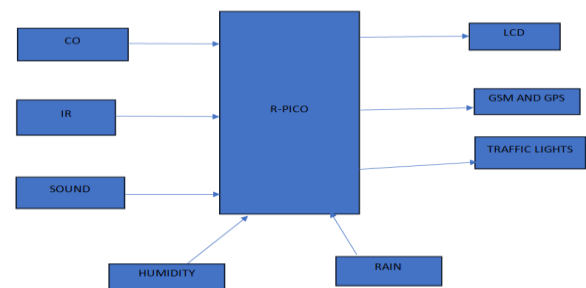
Simultaneously, the incorporation of pollutant monitoring sensors allows for the assessment of air quality in real-time. This

information can be crucial for implementing measures to mitigate the impact of poor air quality on traffic congestion and the health of commuters. For example, the system could dynamically reroute traffic away from areas with high pollution levels or implement variable speed limits to reduce emissions.

While these technologies are promising, challenges may include ensuring the accuracy and reliability of the data collected by Raspberry Pi-based sensors and integrating this information seamlessly into existing traffic management systems. Ongoing research and development are likely to refine these systems further and address any potential limitations.

IMPLEMENTATION

Block diagram



In the proposed traffic management system, the integration of Raspberry Pi serves as a central component to revolutionize the way urban mobility is regulated. The system envisions the deployment of Raspberry Pi-based devices equipped with an array of sensors to remotely monitor real-time weather parameters and pollutants. These sensors would include weather sensors to capture data on factors such as temperature, precipitation, and visibility, as well as pollutant monitoring sensors to assess air

quality. The Raspberry Pi devices would process this data locally, utilizing their computational capabilities to analyze and interpret the environmental conditions. Through wireless connectivity, the Raspberry Pi units would then transmit the processed information to a centralized traffic management system. This system, informed by the dynamically changing weather and pollution data, could implement adaptive traffic control measures. For instance, in adverse weather conditions, the system might adjust signal timings to enhance safety by considering factors like reduced visibility or slippery roads. Similarly, real-time air quality data could trigger traffic rerouting strategies to minimize exposure to high levels of pollutants, promoting environmental sustainability and public health.

The proposed system embraces the Internet of Things (IoT) paradigm, leveraging Raspberry Pi's versatility and affordability to create a distributed network of sensors contributing to an intelligent and responsive traffic management ecosystem. Challenges in terms of data accuracy, sensor calibration, and system integration would need to be addressed during implementation. However, the envisioned system holds the potential to significantly enhance traffic management by proactively responding to changing environmental conditions, ultimately contributing to safer and more sustainable urban transportation. Ongoing advancements in sensor technology and Raspberry Pi

applications would likely play a crucial role in refining and expanding the capabilities of such a system.

CONCLUSION

A low-cost, reliable, compact, low maintenance system is designed to monitor the various weather parameters and pollutants remotely. The system helps in improving the quality of lives of living creatures and will be a support for 2-tier and 3-tier cities to make them smart in managing the pollution and traffic which are very concerning. The proposed kind is need of an hour. When such systems are setup around the city then it could be easy to know the safe routes for the movement of public and to cut down the carbon particles in the affected area so that as soon as the values become normal the traffic movement could be restored.

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