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EMISSION CONTROL SYSTEM IN URBAN USING BIG DATA

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ABSTRACT

Today Automobiles have become the main part of regular life. Based on the demand the usage of vehicles has been increased in this urban life. Transportation carbon emission is a significant contributor to the increase of greenhouse gases, which directly threatens the change of climate and human health. Under the pressure of the environment, it is very important to measure transportation carbon emissions on a real-time basis. We get the transportation carbon emission information by calculating the combustion of fossil fuel in the transportation sector. In this paper, we predict the vehicle's real-time carbon emission using an MQ2 Gas sensor based on the Support Vector Machine (SVM) algorithm to observe datasets in the city, and the GPS data helps to locate the vehicle's current location. An initial warning is given to the driver regarding the amount of CO2 gas with the help of an LCD, buzzer, and later the same information is transferred to the Police Control Room in case of negligence. Here the hardware (carbon emission sensor) device which connected to the android application, and the application sends the data to the cloud server (RTO) through the Global System of Mobile Communication (GSM). When there is an excess amount of CO2 release from the vehicle, an alert message is sent to the vehicle owner.

Key words: GPS receiver, GSM modem, LCD, ignition control, buzzer alarm, temperature sensor, pollution CO sensor.

I. INTRODUCTION:

Vehicular ad hoc networks (VANETs) are a special case of mobile ad hoc networks. The group of vehicles communicates with each other in VANETs. Efficient mechanisms are necessary for VANETs to reduce road traffic. The pollutants from vehicles can impact the environment in an expansion of approaches. This mission suggests a treasured path for sensing engine emissions, especially CO2 gasoline emissions. The carbon emission is mostly done by the vehicle like car, bike, trucks, etc. To detect the pollution and to control the emission by using the gas sensor with a hardware set. The high emission CO2 is done by the old vehicle because the new vehicle comes with the catalytic converter, which catalytic converter reduces the 90% of the harmful gas and the pollution in the exhaust gas, even though it's hard to anticipate the specific effect of environmental change. The environment we are familiar with is not, at this point, a dependable guide for what's in store later on. These dangers from environmental change to humankind can be decreased generally. By settling on decisions that decrease ozone harming substance contamination and getting ready for the progressions that are now in progress, we can lessen chances by ceaseless observing CO2 outflows. CO2 sensors are available, but no system is available for real-time monitoring and thus controlling the CO2 emission levels with the control centers' help. The amount of CO2 emissions has to be reduced by having a check on the transport system or industries with governing bodies' help. The proposed model helps in real-time monitoring of CO2 emissions. The decision-making can happen at the central server at the environment board or the Pollution control board. CO2 can be controlled and thus helps in reducing global warming We have developed a hardware set that includes a gas sensor, a Pic Controller, LCD Display, Transformer, Power Supply Board, Bluetooth, and Global System of Mobile Communication (GSM). Gas sensor to discover Motor Vehicle Pollution. The vehicle proprietor can discover the emission stage without problems in advance. We used cloud storage to save the facts and to study the facts at any time. This gadget intends to create a compact vehicle pollutant detection device installed at the vehicle itself and detect the CO2 emission from the exhaust. The smoke ratio emitted from the car or bike is monitored by using sensors. The statistics can be displayed on the car proprietor's smartphone by the android application, which can be exhibited to officers while requested approximately the car's emissions document. These are the ways the emission occurs. This framework aims to make a conservative vehicle poison discovery device that could be mounted on the actual vehicle and diminish the CO2 discharge in the air. Sensors check the smoke proportion radiated from the vehicle. The information can be shown on the vehicle proprietor's mobile, which can be shown to authorities when getting information about the vehicle's discharge report. The information (CO2 level) is also stored in the cloud server here, which acts as an RTO server. Where the emission level increases, there will be an alert to the vehicle owner through the message, and the 2 nd alert will be held at the period of 15days where the user can service the vehicle within the period. If not, there will be a fine for the overdue service owner and more air pollution. With the device, air pollutions can be controlled in the main cities.

Primary pollution from motor vehicles is pollution that is emitted directly into the atmosphere, whereas secondary pollution results from chemical reactions between pollutants after they have been released into the air. Despite decades of efforts to control air pollution, at least 92 million Americans still live in areas with chronic smog problems. U.S. Environmental Protection Agency (EPA) predicts that by 2010, even with the benefit of current and anticipated pollution control programs, more than 93 million people will live in areas that violate health standards for ozone (urban smog), and more than 55 million Americans will suffer from unhealthy levels of fine-particle pollution, which is especially harmful to children and senior citizens. While new cars and light trucks emit about 90 percent fewer pollutants than they did three decades ago, total annual vehicle-miles driven have increased by more than 140 percent since 1970 and are expected to increase another 25 percent by 2010.

II. EXIXSTING SYSTEM

George F. Fine, Leon M. Cavanagh, Ayo Afonja and RussellBinions used Metal Oxide Semi-Conductor and Gas Sensors in Environmental Monitoring. They are relatively inexpensive compared to other sensing technologies, robust, lightweight, long lasting and benefit from high material sensitivity and quick response times.

K. Galatsis, W. Wlodarsla, K. Kalantar-Zadeh and A. Trinchi, Investigate gas sensors for vehicle cabin air quality monitoring. In this system the Car cabin air quality monitoring can effectively be analysed using metal oxide semiconducting (MOS) gas sensors.

LIU Zhen-ya, WANG Zhen-dong, CHEN Rong, analysed Intelligent Residential Security Alarm and Remote Control System Based On Single Chip Computer. This paper presents intelligent residential burglar alarm, emergency alarm, fire alarm, toxic gas leakage remote automatic sound alarm and remote control system, which is based on 89C51 single chip computer.

S. M. Klara, R. D. Srivastava, and H. G. McIlvried, found Integrated collaborative technology development program for CO2 sequestration in geologic formations– United States Department of Energy R&D. Here Predictions of global energy use in this century suggest a continued increase in carbon emissions and rising concentrations of CO2 in the atmosphere.

S. Solomon did Carbon dioxide storage: Geological security and environmental issues-case study on the Sleipner gas field in Norway. In this case study, Carbon dioxide capture and storage (CCS) is one option for mitigating atmospheric emissions of carbon dioxide and thereby contributes in actions for stabilization of atmospheric greenhouse gas concentrations.

J. Gale, N. P. Christensen, A. Cutler, and T. Torp Demonstrated the potential for geological storage of CO2: The Sleipner and GESTCO projects. The accepted options for doing this include fuel switching, improving energy efficiency, and the introduction of renewable energy sources.

J. B. Riding and C. A. Rochelle have done the IEA Wey burn CO2 monitoring and storage project. Here the IEA Weyburn CO2 Monitoring and Storage Project has analysed the effects of a miscible CO2 flood into a carbonate reservoir rock at an onshore Canadian oilfield.

D. G. Jones, T. R. Lister, D. J. Smith, J. M. West, P. Coombs, A. Gadalia,M. Brach, A. Annunziatellis, and S. Lombardi found In Salah gas CO2storage JIP: Surface gas and biological monitoring. In this system a variety of monocotyledonous and dicotyledonous plants was present, particularly in dry wadis or shallow depressions.

Famesh D. Thakre , Bidyut K. Talukdar, Gaurav S. Gosavi , Prashant R. Tayade proposed a work based on the minimization of CO & CO2 from Exhaust of Two Wheeler Motorcycle. This research is focused on decreasing the level of CO2 from exhaust gases of a Two-Wheeler or Motorcycle by adsorption technology.

Y. J. Jung, Y. K. Lee, D. G. Lee, K. H. Ryu, and S. Nittel designed Air pollution monitoring system based on sensor network. The design of an air pollution monitoring system which involves a context model and a flexible data acquisition policy.

Abu Jayyab, S. Al Ahdab, M. Taji, Z. Al Hamdani, F. Aloul proposed , Pollumap: Air Pollution mapper for cities. This system collects pollution data using mobile hardware modules, transmits the data regularly using GPRS to a back-end server, and integrates the data to generate a pollution map of the city using its geographical information system.

III. PROPOSED SYSTEM

The proposed design falls in the IoT. The IoT system serves as a transparent path between the physical world like objects and the social world together with itself to form an intelligent system. Transportation is one of the main reasons for climate change and air pollution. The most of the existing system uses WSN to detect their data, but that cast a high range of noise, more time consumption, and signal duplication. Hence, we process and gather the real-time data. This makes less time consumption and a high accurate value of data. While going for the development cost-wise, the existing methods involve more protocol hierarchy algorithm and signal duplication. To avoid this problem, this paper aims to reduce the data by its complex nature and low-cost sensing setup. The proposed system focuses on monitoring and identifying the emission level in the individual vehicle and alerts the owner and RTO if the vehicle releases CO_2 more than the standard limit. This method consists of a gas sensor that can detect CO_2 , where the sensor is placed in the exhaust of the vehicle. To protect the hardware from the malfunction caused by the vehicle's heat is terminated by using an Isolated Thermal Clip. The GPS that presents in the device is used to locate the vehicle by using the android application and helps from the vehicle's theft. The hardware set consists of a Global System of Mobile Communication, LCD, GPS (Global Positioning System), gas sensor, Pic Controller, Transformer, Power Supply Board, Bluetooth to transmit the data between the hardware application. The real-time data is collected and stored in the pic controller. Any abnormality in the reading is communicated to the driver through the LCD and the GPS and GSM modules, the nearest control station.

In this paper we are presented a system that can be interconnected with the car alarm system and alert the owner when the pollution emission crosses beyond the threshold limit the parameters along with GPS coordinates will be sent to RTO authorities in the form of SMS using GSM technology. When the pollution emission level shoots beyond the already set threshold level, there will be a buzzer in the vehicle to indicate that the limit has been reached and the vehicle will stop after a certain period of time. The system aims at designing an intelligent vehicle state estimation system regarding engine temperature and vehicle pollution. The system also has a relay to control the ignition of the vehicle. The alerts server; when a network is not available the device stores data in internal memory and will transmit stored data to the server later when the network becomes available again.

In the Proposed system we used (i) GPS tracking device: The device fits into the vehicle and captures the GPS location information apart from other vehicle information at regular intervals to a central server. Capability of these devices actually decides the final capability of the whole tracking system. (ii) GPS tracking server: The tracking server has three responsibilities: receiving data from the GPS based tracking unit, also securely storing it, and also the system serves this information on demand to the user. (iii) User interface: The user interfacing system determines how one will be able to access the current information, view vehicle related data, and elicit all the important details from it.regarding abnormal parameters are given through buzzer and on LCD display.

IV. SYSTEM SPCIFICATIONS

Hardware Requirements :

- Pic Controller
- LCD Display
- Transformer
- Power Supply Board

- Bluetooth
- Gas Sensor

Software Requirements:

- Front End : Asp.net
- Database : MSSQL 2008
- Coding : C# Language

V.HARDWARE DESIGN OF PORTABLE DEVICE:

An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessors and Microcontrollers. Microprocessors are commonly referred to as general purpose processors as they simply The main controlling device of the whole system is a microcontroller.

The input modules interfaced to the microcontroller are

- Pollution sensor for detection of pollution level,
- Temperature sensor for engine over heat detection,
- GPS to provide the Location information using latitude and longitude details

The output modules interfaced with the microcontroller

- 1.Visual alerts display on to the LCD module
- 2.Audible alerts when the pollution emission crosses beyond the preset limit using Buzzer alarm
- 3.GSM modem using which the SMS messages can be sent to the pollution control authorities along with location of the vehicle for further actions.

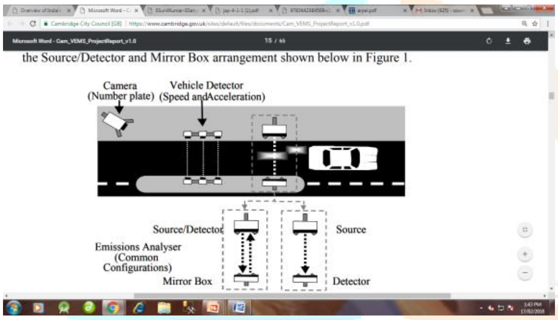
The PIC Microcontroller continuously monitors the pollution and engine temperature levels along with GPS location coordinates. It automatically sends the information of abnormal parameters to predefined numbers (RTO authorities). The System provides both visual and audible alerts. The Microcontroller is loaded with a program written in embedded 'C' language to perform the task.

Accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result. The portable Electronic security mobile device consists of GPS receiver module, GSM modem, sensors like pollution, temperature, alerts through LCD display module, buzzer alarm interfaced with PIC16- F877A micro-controller. The microcontroller collects the data of location using GPS module and sends as input to the microcontroller (16F877A).

ESP Remote Sensing Detector (RSD-4600) operation

The vehicle emission remote sensing measurements were carried out using a AccuScan TM RSD-4600 instrument supplied by Environmental Systems Products (ESP, Arizona, US) as a dedicated across-road vehicle emissions monitoring system. Individual exhaust plumes trailing vehicles are measured by casting a focused beam of Non-Dispersive Infrared (NDIR) and Ultraviolet (UV) light across the plume. A corner cube mirror reflects the IR/UV beam back to the remote sensing detector (spectrophotometer and opacity) module. Open-path NDIR spectroscopic techniques were first used to measure CO vehicle emissions by Bishop et al (1989). Enhancements to measure a portion of HC emissions (Cadle & Stephens, 1994), the addition of a high-speed UV spectrometer capable of measuring NO (Popp et al, 1997, Zhang et al, 1996) and a UV opacity meter (wavelength 230nm) to provide a PM10 proxy (index) measure (Stedman et al, 1997) followed.

The RSD-4600 measurements include the concentration ratios of NO, CO, HC and the PM10 proxy (opacity measure) to the concentration of CO_2. The measurement ratios therefore reflect the pollutant emissions per unit of fuel used. The use of CO2 as a reference gas facilitates quantitative measurements of exhaust species without knowledge of the plume location or extent of dilution. The emission measurements are supported by: a speed/ acceleration module, temperature and barometric pressure sensors, a camera system to capture a clear digital image of the vehicles number plate for post-processing, and a control/ data logging PC. This approach is commonly used in the US and Canada in large-scale pre-screening testing for vehicle inspection and maintenance emission programs (e.g. Stedman et al, 1997). The basic deployment configuration is similar to the Source/Detector and Mirror Box arrangement



Vehicle Emissions Measurement System (RSD4600) Schematic

In accordance with the manufacturer operating procedures, the remote sensing beam is located in a position where it will intersect a significant proportion of exhaust gas, with the beam aligned between 250 - 300 mm from the road surface. It is important the source/ detector module (SDM) is well aligned with the corner cube mirror. An alignment laser beam and digital level are initially used to coarsely align the IR/UV beam before a real-time beam intensity measure is used to fine-tune the setup. The system was powered on for a minimum of 45 minutes prior to an initial on-sitecalibration to gain thermal stability in the circuitry, source and detector elements. Onsite quality assurance procedures include calibration of the SDM to the known concentration of gas in a reference cell that is placed (automated) in the beam path. The calibration is verified (an audit) by a blended calibration gas (1000ppm propane, 2% CO, 13.6% CO2, 1000ppm NO) released into the sensing beam.

These calibrations and audits were conducted hourly during normal operation. All routine calibrations were within normal performance tolerances. A measurement is defined as a beam block (by a vehicle body) followed by a half second of data collection. If the data collection is interrupted by another beam block, i.e. a following vehicle with a headway less than 0.5 seconds, the measurement attempt is aborted. A measurement is declared 'valid' when: the size of the observed CO2 emission plume is sufficient to allow emission ratios to be calculated (i.e. the maximum CO2 concentration in the measurement open-path is > 10% and the mean of 5 consecutive 50Hz CO2 measurements is > 5%); a speed/ acceleration measure is present with the speed is in the range 5 to 60kmh-1; and a clear 'static' digital image of the number plate is captured. The 5 consecutive 50Hz measurements prior to a beam block are considered as the background concentration for that pass-by. The collection of a high proportion of 'valid' measurements requires:

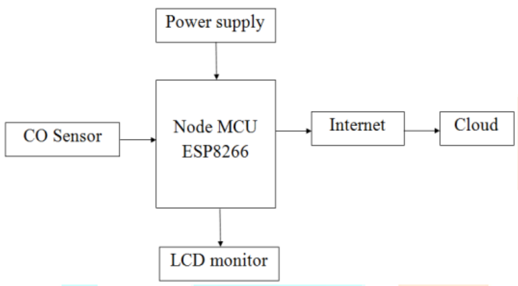
Selected monitoring sites are restricted to single lane operation;

- The optical beam path distance is limited to less than 10 m;
- The majority of vehicle engines are under load as they drive through the
- measurement site. This is to ensure significant emission plumes are available for measurement. Sites are therefore recommended to have an uphill grade; Weather and environmental conditions are favourable as high wind speeds rapidly
- disperse exhaust plumes.

The equipment is also not weather-proof, so cannot be operated in rain or snow.

The RSD-4600 was deployment was led by Dr James Tate (ITS), supported by Christopher Rushton (ITS PhD student) in accordance with guidelines in the operator's manual, risk assessments, operator/ pedestrian/ driver safety issues and public rights of ways. At the start of each RSD-4600 sampling session, ambient conditions and road gradients were logged. The 'static' digital image of each 'valid' drive-through measurement was viewed offline and the number plate (Vehicle Registration Mark – VRM) alphanumeric character string added to the measurement dataset. This record was cross-referenced with the www.carweb.co.uk UK detailed vehicle registration database, and the Cambridge taxi license register (July 2013) so the vehicle fleet composition could be characterised, broken down by vehicle type (Car, Taxi, LGV, OGV, Bus), age, fuel type and emission standard (e.g. Euro 0 - 6).

VI. BLOCK DIAGRAM



Block Diagram

VII. WORKING PRINCIPLE

In this system mq2 sensors placed at the vehicle exhaust, monitor the hydrocarbon, carbon monoxide and nitrogen oxide value emitted from the exhaust. The analog value received from the sensors is processed by the controller with wifi connection to the internet. The value obtained from the sensors is continuously updated to LCD and cloud. When the value obtained from the sensor reaches the threshold limit, the controller will alert to the user through LCD and database of the vehicle owner. Io T helps the system to update the value to the cloud. The Node MCU connected to the sensors helps to update the value obtained from the sensors to cloud when wifi is connected to the internet. The value is continuously updated to vehicle owners cloud storage. when the value reaches the threshold limit set by the government, it will indicate it to the vehicle owner. When the vehicle owner ignores the alert, the entire details will be shared with the transport office.

VIII. TESTING

Implementation is the stage of the project when the theoretical design is turned into a working system. This is the final and important phase in the system life cycle It is actually the process of converting the new system into a operational one.

Unit Testing

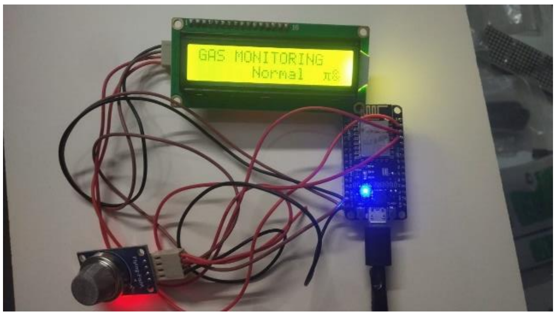
Unit testing comprises the set of tests performed by an individual programmer prior to integration of the unit into a larger system. The module interface is tested to ensure that information properly flows into and out of the program unit. The local data structure is examined to ensure that data stored temporarily maintains its integrity during all steps in an algorithm's execution. Boundary conditions are tested to ensure that the module operates properly at boundaries established to limit or restrict processing. All independent paths through the control structure are tested. All error-handling paths are tested.

Block Box Testing

Black-box testing is a method of software testing that examines the functionality of an application without peering into its internal structures or workings. This method of test can be applied virtually to every level of software testing: unit, integration, system and acceptance. It is sometimes referred to as specification-based testing.

IX. SYSTEM IMPLEMENTATION

Implementation is the stage of the project when the theoretical design is turned into a working system. This is the final and important phase in the system life cycle It is actually the process of converting the new system into a operational one.



Output Implementation

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