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CONSCIENCE: A SOLUTION FOR POLLUTION CONTROL

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Abstract - CONSCIENCE is an autonomous pollution monitoring system which detects & records the various types of emissions pertaining to different classes of vehicles. This emission data can be logged on to a web server database periodically. Depending on the class of the vehicle the emission for that particular vehicle can be predefined. If the real time measured value exceeds the preset value then, suitable action can be defined using a web server monitoring. The server shall be monitored by the competent authority. This can be done by using a direct web service or a mobile app. Both the competent authority as well as the user of the vehicle will be able to keep track of the pollutants emitted out of the vehicle. Suitable charges will be levied based on the owner by the competent authorities depending on the class of the vehicle and an excess amount of emission.

Key Words: Autonomous, Pollution control, Authority, class of vehicle, web monitoring.

1.INTRODUCTION

The development of automobiles was one of the great achievements for humans. But today these automobiles are one of the major sources of pollution. This issue needs to be addressed immediately to avoid adverse effects of pollution.

1.1 Need for such a system

Pollution is one of the major concerns in every part of the globe today. It has a direct effect on people's health as well as on the environment. Minimizing the emission levels will no doubt be a positive step in improving the health of the planet and its inhabitants.

1.2 Current PUC systems in INDIA.

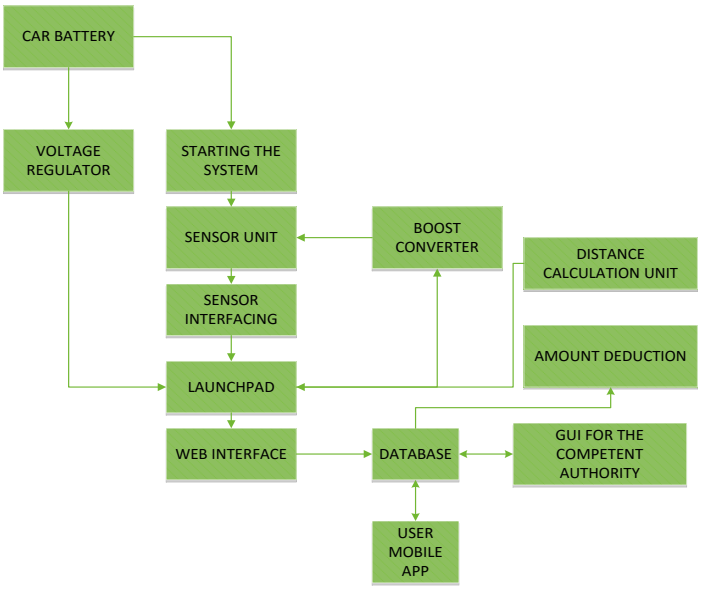
Presently the way pollution checks work India is by measuring the exhaust gasses every six months or so. This long gap between two consecutive checks leaves the vehicle at risk. It also degrades the accuracy of measurement. This current PUC system is quite inefficient. Many people don't take PUC check of their automobile regularly and therefore there is no check on the emissions of the automobile and its maintenance. Due to this ignorance, the health of both the car and the people is affected, as a poorly maintained vehicle will emit more pollutants into the environment than that of a vehicle who is maintained and serviced regularly.

2. Process Flow

The conscience unit will act like a transmitter wherein it will collect the information on a regular interval basis. The unit will take readings after a specific interval of time/days. There will be an inbuilt memory that can store all this data locally. It will store the data until it has been transferred to the central database. This central registry will be linked to the owner's driving license. Thus, when the driving license is to be renewed the latest data of the emissions should be updated and all the arrears should be cleared to get the renewed license. The main unit is the transmitter and the receiver will be stationed at PUC centres or local authority offices. The data collected will be pushed to the database so that a centralized data of each zone will be available for the regional traffic office (RTO's). The RTO will be able to monitor the car's emissions registered under their jurisdiction. They can issue warnings and impose fine. RTO monitoring will be made easy because of a centralized database. One can check his/her due amount, warnings issued etc. by a mobile app. Online payment actions can be made available for smooth functioning.

3.Proposed Design

The system proposed in this paper will be used to monitor exhaust from vehicles regularly rather than at six-month interval. The overview of the entire system is represented using a block diagram. The function of every block is mentioned below.



STARTING SYSTEM –

The system is used to trigger the actual functional system under immediate signal at the start of the engine.

WORKING: -

The starting system is used to trigger the functional system at the start of the vehicle and then cut off the supply from the main battery after a particular interval. The starting system consists of the following parts –

- Variable voltage regulator
- Variable timer circuit
- Disabling line through the Microcontroller.

At the start of the system, the current will be drawn from the car battery and given to the timer circuit and then to the variable voltage regulator. The Microcontroller will be continuously powered externally. The disabling line will be provided from the Microcontroller to the input of the timer circuit. Let the actual functional time of the system be t_o The time period of the timer circuit t_x > Microcontroller timer interval t_o. Hence after t_o interval, the disabling line will go low hence the timer circuit and the variable voltage regulator will be disabled. Therefore, this mechanism is designed to trigger the functional system only at the start of the vehicle.

CAN INTERFACING –

CAN stands for Controlled Area Network. It provides a direct interface with the CAN of the vehicle for intercommunication with other ECUs (Electronic Control Units).

SENSOR UNIT –

Sensor unit is one of the key parts of the entire system. The sensor unit detects the various exhaust gases and sends the analog data to the sensor interfacing unit. The sensors will be placed in such a way that it will obtain highly accurate measurements and then send the corresponding analog data to the controller.

SENSOR INTERFACING –

It is a sensor interfacing chip used to send the data from the sensor unit to the microcontroller.

CONTROLLER –

The controller is the major component of the functional system performing the following functions –

1) Converting the analog data from the sensor unit to digital form.
2) Sending the data to the database through a web interface.
3) Quantizing the data into the specific unit scale for the user mobile app.

The controller will be continuously powered externally through the car battery.

WEB INTERFACE –

The web interface transfers the real time data to the server database.

USER APP-

It will notify the user about the excessive emissions caused and the appropriate charges that will be levied. It will also notify the user of any abrupt emission of the car based on the monitored readings. This can be useful for the user to keep his/her car in a well-maintained state.

AUTHORITY GUI-

It will be used by the competent authority to find the required data about the specific user. It will also assist the authority to monitor any incorrect readings recorded by the system.

DISTANCE CALCULATION UNIT:

This unit will calculate a fixed distance and trigger the Microcontroller and eventually the sensors, to take the reading. The odometer is a device present inside the car which calculates the distance travelled by car. The odometer is interfaced with the other ECUs using CAN. The Microcontroller will also be interfaced with CAN using a

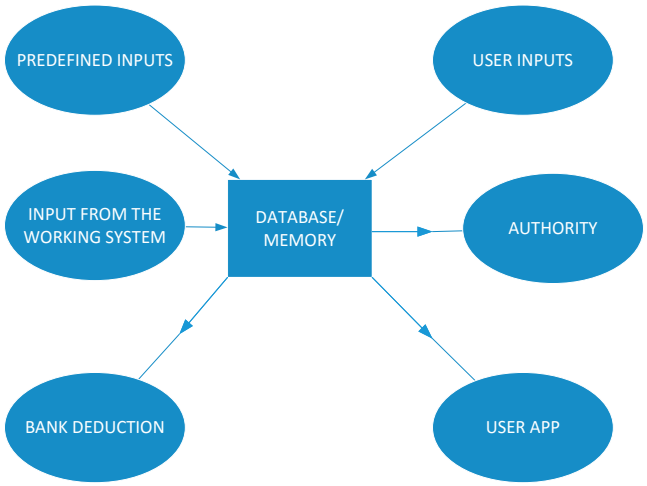
transceiver. A timer can be assigned in the Microcontroller to count the number of triggers given by the odometer.

To give a better perspective let us assume that we are measuring the emissions after every 5km then, 5 counts of the odometer will be equal to 1 trigger to the Microcontroller in order get the readings from the sensor. The values taken from the sensor will be stored in the local database. This data can be exported to the central database when a suitable network is available.

DATABASE

The database is another crucial component of the system. The database will be managed in a way that data is recorded and logged in for every user of the "CONSCIENCE" system.

Below is a functional block diagram of the database management system.



The following are the inputs to the database will be as follows.

These inputs will vary from user to user and will be demarcated by the customer.

- User information
- Registration number
- License number
- Savings or Current bank account number

Predefined inputs

As the emission rate varies depending on the fuel type and car type these inputs will help in setting the threshold limit for every vehicle. These specifics will be provided by the car manufacturing company.

- Fuel type
- Type of the motor vehicle (LMV/HMV/MC)

Inputs from the working system
Data from the vehicle will be monitored at predefined time intervals and will be logged onto the server as real time data. These values will be fed from the actual measurement unit placed inside the car. These inputs will include:

- Digital data of the emissions
- Distance measurements synchronized with the emissions

The database has a predefined configured threshold for different cases. It will synchronize with the bank account in such way that it debits appropriate amount from the users account depending on how much excess pollutants will be emitted by him/her.

4. CONCLUSIONS

The system will provide regular pollution monitoring of the automobile based on the emissions of each car. Suitable decisions can be made based on real time data acquired from the system. This data can also be used to levy suitable charges as a compensation to environmental degradation. This, in turn, will encourage the car user to maintain his/her vehicle. This will eventually lead to a reduction in emission levels. It will also provide an easy access for the competent authority to monitor pollution caused by every car and assist them in taking appropriate action.

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