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Vehicle Emissions Controlling Based On RFID Technology Using GSM & ARM7

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ABSTRACT

The proportion of air pollution which is caused by the cars is increasing. In order to solve this serious problem, many countries and regions have already presented a series of emissions standards, meanwhile some methods has been developed, include update motor engine or improve the quality of the gasoline. However, these actions have not brought about a striking effect as we expect. There are also some situations to fail implement these emissions standards. In this paper, a wireless inspection and notification system (WINS) through the concept of RFID Technology is proposed. By applying the system, it is possible to smoothly realize a green traffic network.

In this project the main purpose is to provide a single control point which provides access to all building services with low cost reduction factors. A remote monitoring allows the quick detection of failing devices without needing long searches and wasting personal time.

INDEXTERMS-ARM7LPC2148, GAS SENSOR, RFID (Radio-Frequency Identification), GSM.

INTRODUCTION

The environmental problems are growing rapidly. Air pollutants from cars, buses and trucks, particularly ground-level ozone and particulate matter can worsen respiratory diseases and trigger asthma attacks. Transportation can be responsible for more than 50 percent of carbon monoxide in the air. The air pollution may lead to Chronic Obstructive Pulmonary Disease (COPD) and escalates risk of cancer. The public health is affected due to pollution from cars and trucks can also be very high in the large metropolitan cities. One of the major reasons of air pollution is emission of polluting gases from vehicles which is responsible for 70% of the total air pollution. In order to control the air pollution, the amount of air pollution needs to be monitored and vehicles responsible for polluting should be identified. Internet of Things may become helpful in cities for monitoring air pollution from vehicles and also data related to the amount of pollution on different roads of a city can be gathered and analysed. The Internet of Things (IoT) is the interconnection of uniquely identifiable embedded computing devices within the existing Internet infrastructure. Typically, IoT is expected to Offer advanced connectivity of devices, systems, and services that goes beyond MachineTo-Machine communications (M2M) [8] and covers a variety of protocols, domains, and applications. The interconnection of these embedded devices is expected to usher in automation in nearly all fields, while also enabling advanced applications like a Smart Grid. Things, in the IoT, can refer to a wide variety of devices such as heart monitoring implants, biochip transponders on farm animals, electric clams in coastal waters, automobiles with built-in sensors, or field

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operation devices that assist fire-fighters in search and rescue. Current market examples include smart thermostat systems and washer/dryers that utilize Wi-Fi for remote monitoring. One of the things that make it special and different is that the Internet of Things allows objects to communicate directly or indirectly to Internet. Furthermore, this information does not have to be used only by the user, but by other people for applications or studies.

SYSTEM ARCHITECTURE

ARM7 LPC2148 to interact with Rfid, Gsm and sensors.

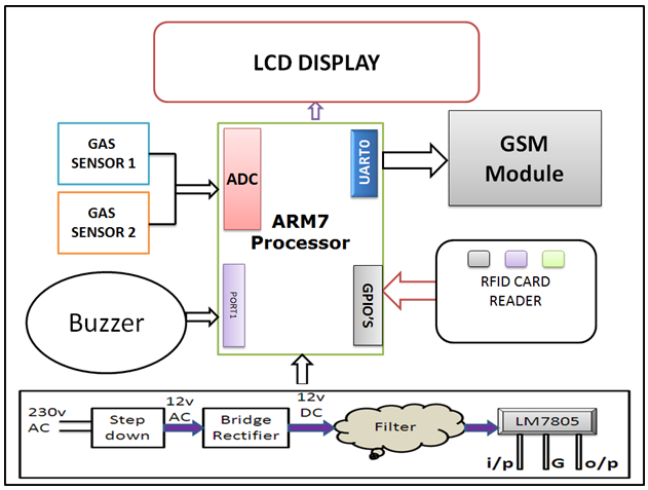

Fig. 1. VEHICLE EMISSIONS CONTROLLING BASED ON RFID TECHNOLOGY.

ARM (LPC 2148) :

ARM stands for Advaced RISC Machine developed by ARM Ltd which is most widely used in number of Embedded systems. Today ARM family accounts for approximately 75% of all embedded CPUs making it one of the leading architecture in the world. Previous designs used 8 bit/16 bit devices, but the designers are looking for highly integrated high performance ARM based 32-bit microcontroller. Heart of the design is ARM 32 bit RISC processor, hence brief description was given about its specifications below.

The basic block diagram of the system is as shown in fig 1, The vehicle emission indicator, reading, can be interrogated along with the corresponding tag ID through a wireless connection among traffic lights and vehicles. By monitoring the emissions data reading from gas sensor.

The LPC2148 board consists of ARM7TDMI as its core and it is designed by NSK. ARM7TDMI family has good performance in situations where the energy consumption is critical design goal. LPC2148 has ARM7TDMI as its core is called CPU core. The modules inside are connected by the CPU high performance bus called Advance High performance bus (AHB) and the peripherals are connected by VLSI peripheral bus (VPB).

GAS SENSOR

The MQ series of Gas Sensors used in this research work are simple and cost effective sensors useful for sensing gases in the air. There is a wide range of sensors available each of which are made to detect a specific gas like Methane, NOx, SOx, LPG, CNG, Carbon Monoxide and Alcohol.

Gas leak detection is the process of identifying potentially hazardous gas leaks by sensors. These sensors usually employ an audible alarm to alert people when a dangerous gas has been detected. Common sensors include infrared point sensors, ultrasonic sensors, electrochemical gas sensors, and semiconductor sensors. More recently, infrared imaging sensors have come into use. All of these sensors are used for a wide range of applications and can be found in industrial plants, refineries, waste-water treatment facilities, vehicles, and homes.

Figure 2 GAS sensor

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LCD DISPLAY

A liquid-crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are used in a wide range of applications including computer monitors, televisions, instrument panels, aircraft cockpit displays, and signage. They are common in consumer devices such as DVD players, gaming devices, clocks, watches, calculators, and telephones, and have replaced cathode ray tube (CRT) displays in most applications. They are available in a wider range of screen sizes than CRT and plasma displays, and since they do not use phosphors, they do not suffer image burn-in. LCDs are, however, susceptible to image persistence. The LCD screen is more energy efficient and can be disposed of more safely than a CRT. Its low electrical power consumption enables it to be used in battery-powered electronic equipment. It is an electronically modulated optical device made up of any number of segments filled with liquid crystals and arrayed in front of a light source (backlight) or reflector to produce images in colour or monochrome. Liquid crystals were first discovered in 1888.[2] By 2008, annual sales of televisions with LCD screens exceeded sales of CRT units worldwide, and the CRT became obsolete for most purposes.

RFID

Radio frequency identification (RFID) is a very useful technology for electronically identifying, locating, and tracking products, animals, and vehicles. This work uses RFID technology for tracking vehicles responsible for creating pollution. Communication takes place between a reader and a transponder (Silicon Chip connected to an antenna) often called a tag. Tags can either be active (powered by battery) or passive (powered by the reader field), and are available in various forms including tags, smart cards, labels, watches and even embedded in mobile phones. The frequencies used for communication depend on the application, and range from125KHz to 2.45 GHz. Figure 5 shows RFID tag and RF Receiver used in this work. Output of an active RFID transmitter tag is a unique 16 bit ID in serial data at 9600 bps baud rate and the active RFID transmitter transmits 16 bit unique ID on 433 MHz frequency giving range of around 25 meters.

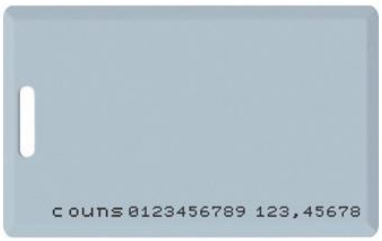

Figure 3 RFID

RFID Reader:

The RFID reader reads EM4100 family transponder tags that are brought in proximity to the reader and output the unique tag identification number through RS232 serial port @9600 bps. The reader output 12 byte including one start, stop byte and 10 unique data byte. The start byte and stop byte are used to easily identify that a correct string has been received from the reader. The middle ten bytes are the actual tag's unique ID. Vertical and horizontal parity checking has been done in card reading algorithm to ensure data integrity. One status LED is provided to indicate card detection. RFID (radio frequency identification) systems use data

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strings stored inside RFID tags or transponders) to uniquely identify people or objects when they are scanned by an RFID reader. These types of systems are found in many applications such as passport protection, animal identification, inventory control systems, and secure access control systems, robotics, navigation, inventory tracking, payment systems, and car immobilization. Because passive tags require a strong RF field to operate, their effective range is limited to an area in close proximity to the RFID reader.

GSM Module

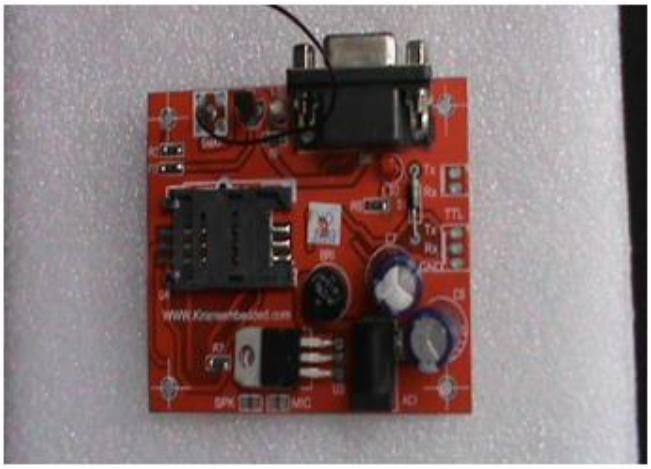

Figure 4: GSM Modem

GSM supports voice calls and data transfer speeds of up to 9.6 kbit/s, together with the transmission of SMS (Short Message Service). GSM operates in the 900MHz and 1.8GHz bands in Europe and the 1.9GHz and 850MHz bands in the US. The 850MHz band is also used for GSM and 3G in Australia, Canada and many South American countries. By having harmonized spectrum across most of the globe, GSM's international roaming capability allows users to access the same services when travelling abroad as at home. This gives consumers seamless and same number connectivity in more than 218 countries. Terrestrial GSM networks now cover more than 80% of the world's population. GSM satellite roaming has also extended service access to areas where terrestrial coverage is not available.

PROPOSED METHOD

We can overcome the disadvantages of the existing method by Remote control is a new feature and used in agriculture and industrial automation systems. However providing a mechanism for interaction between devices in this environment is quite challenging. The communication protocol has been mostly used to connect personal computers so far, but shortly all kinds of appliances with embedded computers will exchange information over the wireless network. In this project the main purpose is to provide a single control point which provides access to all building services with low cost reduction factors. A remote monitoring allows the quick detection of failing devices without needing long searches and wasting personal time. The system uses a compact circuitry built around LPC2148 (ARM7) microcontroller Programs are developed in Embedded C. Flash magic is used for loading programs into Microcontroller.

RESULTS AND EXPERIMENTS

In order to verify the effectiveness of RFID, experiments were carried out through a simulation of road situation in an open area of about 200 square meters, where a five meters height pole was set up to simulate traffic light as shown in Fig.. Vehicles equipped with the designed RFID tag would drive in this area. A RFID reader was mounted on the pole while the back-end system was installed in a distant room. Obviously, the most critical part in the information system is the interrogation among the traffic light and the vehicles, while the issue of the data transmission from the RFID reader at the traffic light to the back-end system can be negligible due to the maturity of 3G telecommunication technology. The interrogation among the traffic light and the vehicles was evaluated under five tests: tag position test, obstruction test, effective distance test, effective inspected vehicle number test, and reliability test. These tests are Based on the experimental results are more effective, convenient and economical than traditional test program for vehicle emissions inspection.

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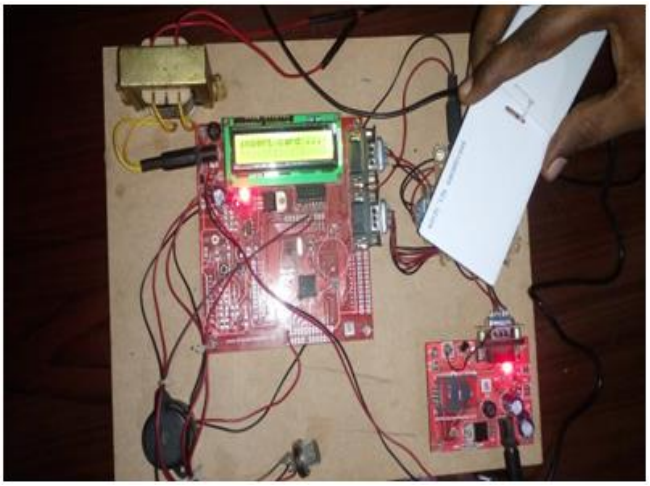

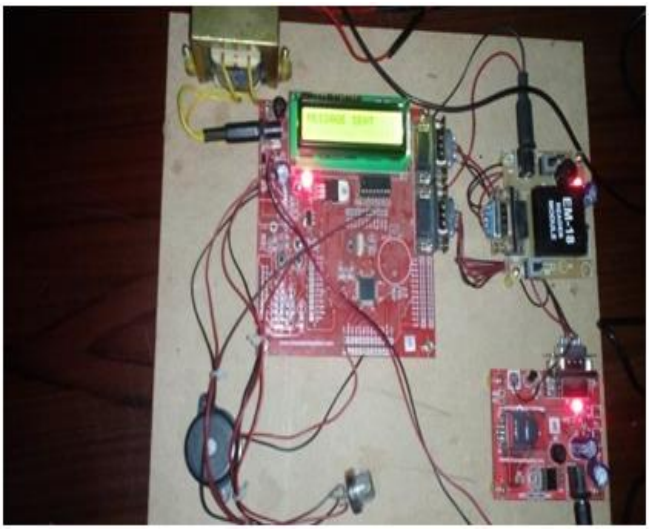

CONCLUSION

In this paper, vehicle emissions inspection is proposed. RFID technology, as one of the enabling technologies to develop the information system. With RFID, the vehicle emission indicator, reading, can be interrogated along with the corresponding tag ID through a wireless connection among traffic lights and vehicles. By monitoring the emissions data, the engine health can be easily inspected and examined. Experimental results show that the proposed system is effective and reliable for vehicle emissions inspection. With the proposed information system, the core idea of "Green environment" can be realized. It not only effectively takes an advance the environmental quality, but also helps vehicle owners to save a lot of unnecessary troubles compared to the traditional emissions inspection test. Furthermore, since WINS may be provided to the governmental authorities for vehicle emissions control, some implementation issues are analyzed.

FUTURE SCOPE

In future we can optimize this RFID tag for multiple applications by providing standard security authentication. This can be implemented not only for these polluted vehicles but also to find the thefting vehicles and to find the location of parking vehicles

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