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SOLVING VEHICLE EMISSIONS IN CITIES BASED ON RFID TECHNOLOGY AND INTERNET OF THINGS

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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 Internet of Things (IoT) is proposed. By applying the system, it is possible to smoothly realize a green traffic network. In this system, Radio frequency identification (RFID) technology as a low-cost and mature wireless communication method is adopted to collect and transmit emissions information of vehicles. Moreover, The RFID devices need to be installed on the traffic lights so that reliable reading of emissions signals from a vehicle can be interrogated when the vehicles stop in front of the red light. Taken into consideration the real environment, an efficient and innovative maximum spanning tree algorithm (MXAST) is also presented to select suitable traffic lights aim to reduce the number of RFID devices (more economy) and guaranteed the whole urban cars can be monitored (simple & safety).

1. INTRODUCTION

The main intention of this project is to design a system and placed inside of vehicle and it can respond you like giving location where it is, and also that system can finds the accident which happened to your vehicle and will inform to related one with location of your vehicle where accident made and when. The purpose of this project is to find the vehicle where it is and also automatic identification of vehicle entering in to the tollgate and allots particular slot and also display the bill on LCD at the time of exit. Most of the times we may not able to find accidents because we don't know where accident will happen, in order to give treatment for injured people first we need to know that where that happened through location tracking and sending to your related one when your there inside of vehicle. To specially mention, traffic light is also a critical role in the whole system. It is a central component in the traffic system that no car could avoid it to drive in a city. In order to achieve the goal that monitoring closely all the motor vehicles, RFID reader will be

installed on the traffic light. It is well known that every car must stop in front of the red light for a long time. The stopping time is also the best timing for RFID reader to collect the emissions information from cars. With the innovative idea of applying IoT to collect vehicle emissions data, it is possible to smoothly realize a green traffic network However, in order to practically implement WINS, an important issues need to be considered. The 'infinity' number of RFID readers will be required as there are 'countless' traffic lights in the traffic network of a city, especially in international urban and metropolitan areas worldwide. To overcome this drawback, a maximum spanning trees (MAXST) algorithm with the Google Map is also proposed in this paper. By the algorithm, the amount of traffic lights needed for installing RFID readers can be reduced while at the same time the inspection of all vehicles in the city can be guaranteed. As a result, the vehicle emissions in whole urban can be controlled more effectively via WINS.

2. HARDWARE SYSTEM

Micro controller: This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

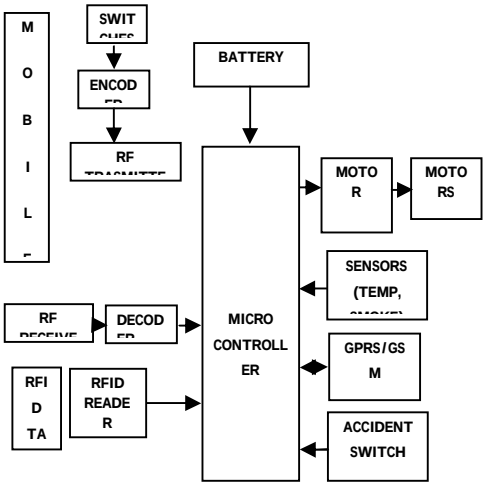
S3C2440A:

S3C2440A is a 16/32-bit RISC microprocessor. SAMSUNG's S3C2440A is designed to provide hand-held devices and general applications with low-power, and high-performance microcontroller solution in small die size. To reduce total system cost, the S3C2440A includes the following components. The S3C2440A is developed with ARM920T core, 0.13um CMOS standard cells and a memory complier. Its low power, simple, elegant and fully static design is particularly suitable for cost- and power-sensitive applications. It adopts a new bus architecture known as Advanced Micro controller Bus Architecture (AMBA). The S3C2440A offers outstanding features with its CPU core, a 16/32-bit ARM920T RISC processor designed by Advanced RISC Machines, Ltd.

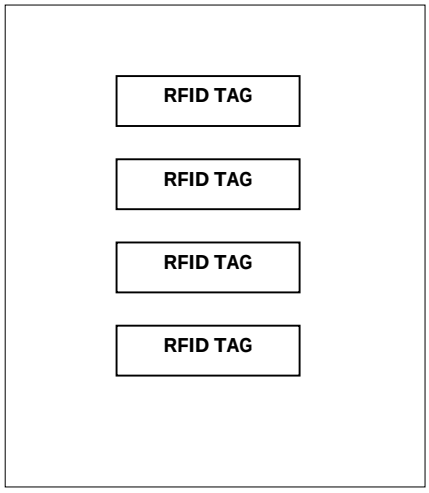
ARM7TDMI: ARM is the abbreviation of Advanced RISC Machines, it is the name of a class of processors, and is the name of a kind technology too. The RISC instruction set, and related decode mechanism are much simpler than those of Complex Instruction Set Computer (CISC) designs.

Liquid-crystal display (**LCD**) is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock.

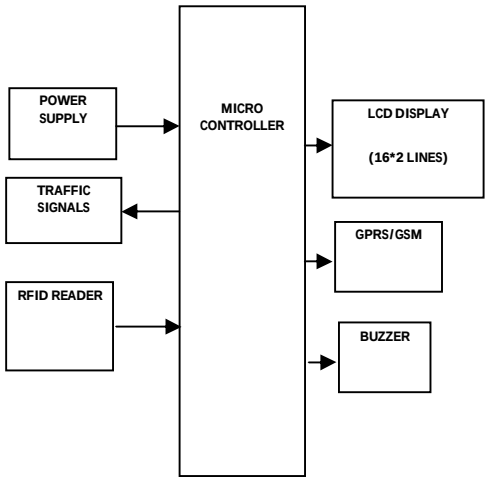
VEHICLE UNIT:



On road section:



TRAFFIC SIGNAL CONTROL UNIT:



3. Board hardware system features

RFID:

Radio Frequency Identification (RFID) is a silicon chip-based transponder that communicates via radio waves. Radio Frequency Identification is a technology which uses tags as a component in an integrated supply chain solution set that will evolve over the next several years. RFID tags contain a chip which holds an electronic product code (EPC) number that points to additional data detailing the contents of the package. Readers identify the EPC numbers at a distance, without line-of-sight scanning or involving physical contact. Middleware can perform initial filtering on data from the readers. Applications are evolving to comply with shipping products to automatically processing transactions based on RFID technology RFID Reader Module, are also called as interrogators. They convert radio waves returned from the RFID tag into a form that can be passed on to Controllers, which can make use of it. RFID tags and readers have to be tuned to the same frequency in order to Communicate. RFID systems use many different frequencies, but the most common

and widely used & supported by our Reader is 125 KHz.

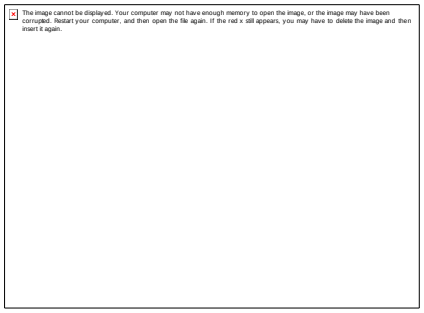


Fig: RFID Reader

Tags are classified into two types based on operating power supply fed to it.

1. Active Tags
2. Passive Tags

Active Tags: These tags have integrated batteries for powering the chip. Active Tags are powered by batteries and either have to be recharged, have their batteries replaced or be disposed of when the batteries fail.

Passive Tags: Passive tags are the tags that do not have batteries and have indefinite life expectancies.

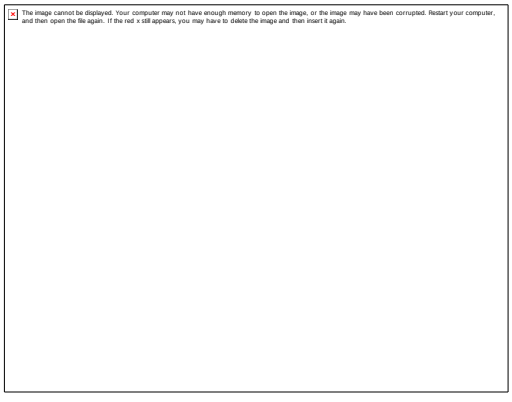


Fig: Different types of tags

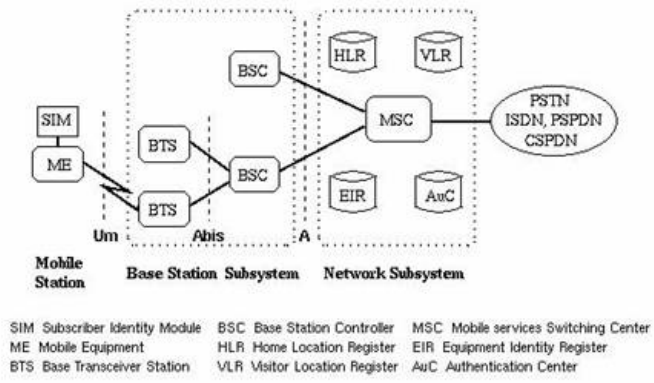
GSM:

Global System for Mobile Communication (GSM) is a set of ETSI standards specifying the infrastructure for a digital cellular service.

The network is structured into a number of discrete sections:

1. Base Station Subsystem – the base stations and their controllers explained
2. Network and Switching Subsystem – the part of the network most similar to a fixed network, sometimes just called the "core network"
3. GPRS Core Network – the optional part which allows packet-based Internet connections
4. Operations support system (OSS) – network maintenance

SM was intended to be a secure wireless system. It has considered the user authentication using a pre-shared key and challenge-response, and over-the-air encryption. However, GSM is vulnerable to different class of attacks, each of them aiming a different part of the network.



GSM architecture

Temperature sensor:

A thermistor is a type of resistor whose resistance is dependent on temperature. Thermistors are widely used as inrush current limiter, temperature sensors (NTC type typically), self-resetting overcurrent protectors, and self-regulating heating elements. The TMP103 is a digital output temperature sensor in a four-ball wafer chip-scale package (WCSP). The TMP103 is capable of reading temperatures to a resolution of 1°C.

Fig: Temperature sensor

Co2 sensor:

They are used in gas leakage detecting equipments in family and industry, are suitable for detecting of LPG, i-butane, propane, methane, alcohol, Hydrogen, smoke. The surface resistance of the sensor Rs is obtained through effected voltage signal output of the load resistance RL which series-wound. The relationship between them is described:

Rs\RL = (Vc-VRL) / VRL

Fig: Co2 sensor

DC Motor:

A DC motor relies on the fact that like magnet poles repels and unlike magnetic poles attracts each other. A coil of wire with a current running through it generates an electromagnetic field aligned with the center of the coil. By switching the current on or off in a coil its magnetic field can be switched on or off or by switching the direction of the current in the coil the direction of the generated magnetic field can be switched 180°.

Fig: DC Motor

Motor driver:

DC motors are typically controlled by using a transistor configuration called an "H-bridge". This consists of a minimum of four mechanical or solid-state switches, such as two NPN and two PNP transistors. One NPN and one PNP transistor are

activated at a time. Both NPN and PNP transistors can be activated to cause a short across the motor terminals, which can be useful for slowing down the motor from the back EMF it creates. H-bridge. Sometimes called a "full bridge" the H-bridge is so named because it has four switching elements at the "corners" of the H and the motor forms the cross bar. The switches are turned on in pairs, either high left and lower right, or lower left and high right, but never both switches on the same "side" of the bridge. If both switches on one side of a bridge are turned on it creates a short circuit between the battery plus and battery minus terminals. If the bridge is sufficiently powerful it will absorb that load and your batteries will simply drain quickly. Usually however the switches in question melt.

High Side Left	**High Side Right**	**Low Side Left**	**Low Side Right**	**Quadrant Description**
On	Off	Off	On	Forward Running
Off	On	On	Off	Backward Running
On	On	Off	Off	Braking
Off	Off	On	On	Braking

Table: operation of H-Bridge

Buzzer:

A buzzer or beeper is a signaling device, usually electronic, typically used in automobiles, household appliances such as a microwave ovens, & game shows. The word "buzzer" comes from the rasping noise that buzzers made when they were electromechanical devices, operated from stepped-down AC line voltage at 50 or 60 cycles. Other sounds commonly used to indicate that a button has been pressed are a ring or a beep.

The "Piezoelectric sound components" introduced herein operate on an innovative principle utilizing natural oscillation of piezoelectric ceramics. These buzzers are offered in lightweight compact sizes from the smallest diameter of 12mm to large Piezo electric sounders. Today, piezoelectric sound components are used in many ways such as home appliances, OA equipment, audio equipment telephones, etc. And they are applied widely, for example, in alarms, speakers, telephone ringers, receivers, transmitters, beep sounds, etc.

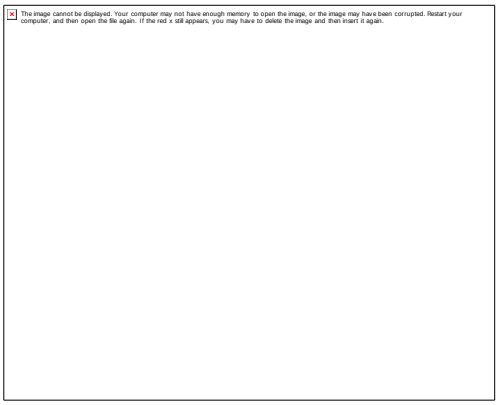


Fig: Types of Buzzers

RF transmitter and Receiver:

RF transmitters are electronic devices that create continuously varying electric current, encode sine waves, and broadcast radio waves. RF transmitters use oscillators to create sine waves, the simplest and smoothest form of continuously varying waves, which contain information such as audio and video. Modulators encode these

sign wives and antennas broadcast them as radio signals. There are several ways to encode or modulate this information, including amplitude modulation (AM) and frequency modulation (FM). The ST-TX01-ASK is an ASK Hybrid transmitter module. The ST-TX01-ASK is designed by the Saw Resonator, with an effective low cost, small size, and simple-to-use for designing.

1. Frequency Range: 315 / 433.92 MHZ.
2. Supply Voltage: 3~12V.
3. Output Power: 4~16dBm
4. Circuit Shape: Saw

RF receivers are electronic devices that separate radio signals from one another and convert specific signals into audio, video, or data formats. RF receivers use an antenna to receive transmitted radio signals and a tuner to separate a specific signal from all of the other signals that the antenna receives. Detectors or demodulators then extract information that was encoded before transmission. There are several ways to decode or modulate this information, including amplitude modulation (AM) and frequency modulation (FM).

Description:

The RX04 is a low power ASKS receiver IC which is fully compatible with the MitelKESRX01 IC and is suitable for use in a variety of low power radio applications including remote keyless entry. The RX04 is based on a single-Conversion, super-heterodyne receiver architecture and incorporates an entire phase-locked loop (PLL) for precise local oscillator generation.

5. CONCLUSION

In this paper, WINS under the concept of IoT for mandatory vehicle emissions inspection is proposed. IoT is an emerging networking concept within the pervasive or ambient things or objects are connected to provide a smart or intelligent service to make human life easier and happier. RFID technology, as one of the enabling technologies of IoT, is employed to develop the information system. With RFID, the vehicle emission indicator, e-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.

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