Vehicle enforcement system

FIELD OF THE INVENTION

The present invention relates to a vehicle enforcement system to ensure a plurality of road vehicles are compliant to a pre-determined set of traffic and vehicle-related regulatory requirements, the present invention is computer implemented and further comprises of a number of portable sensor apparatus that can perform exchange of electronic data between each said vehicle and a remote processor. Applications thereof may include the verification and compliance checking of said vehicle's on-road usage levy, statutory vehicle taxes, and vehicle insurance details.

SUMMARY OF THE INVENTION

The present invention comprises of at least one remote processor containing an electronic database, and said processor is in communication with a plurality of portable sensor apparatus. The sensor apparatus is operable to derive suitable electronic data from a plurality of road vehicles participating within a vehicular scheme (such as a vehicle registration system within a state or country).

First Embodiment of the Present Invention

The sensor apparatus, remote processor, or both in combination, may be operable to cause electronic data derived from said vehicles to yield information related to the status, operational data and related vehicular registration and compliance data-sets to a specified regulatory agent. Subsequent applications of the present invention include the systemic control, regulation, monitoring and enforcement of all participating road vehicles.

The sensor apparatus may be a RFID transponder reader unit, or a 802.11/802.16 transmitter-receiver device.

Second Embodiment of the Present Invention

The present invention may comprise of a remote processor as part of the vehicle enforcement system, and the system is in communication with a plurality of sensor apparatus. A plurality of road vehicles participating within the road network of the enforcement system is each equipped with a suitable device that is readable by the sensor apparatus. The device can send a specific set of unique electronic data to the sensor apparatus.

The device may allow for a smart chip, or card device to be inserted or operable with the said device to indicate either validity or payment of a specific vehicle related requirement (such as validity of the vehicle's insurance cover, or, payment of the vehicle's fee to use the road network for a specified time interval) – depending on the compliance level of the said requirement, the smart chip or card device will then cause the vehicle device to send an appropriate and unique electronic data to the sensor apparatus, thereby causing the said data to be relayed from the sensor apparatus to the remote processor for processing and verification.

Illustrative Example

For example, according to the second preferred embodiment of the present invention, each vehicle of the road network is equipped with an in-car device. The owner inserts a smart card (or RFID card) to pay for instance, the insurance cover premium.

If the vehicle is polled and within operational proximity of the sensor apparatus, the in-car device sends unique data indicating that the insurance requirement of the vehicle is satisfactory. This data may be then relayed to the enforcement system for updating. In another option, the data may only be relayed to the enforcement system when the data indicates a possible insurance violation (insurance cover is not paid, or has expired, thus, the data may indicate a "non-satisfactory state").

In addition to vehicle insurance, other forms of "vehicle related requirement" may be implemented and performed in the same manner, such as payment charges for the vehicle to be used on a particular road network for a pre-determined time or date.

GLOSSARY OF TERMS

Vehicle	road-based automobiles, motorcycles and trucks each equipped with a suitable prime mover (or motor device)
Vehicular Scheme	Any set of road rules, traffic regulatory or vehicle related regulatory requirement for the use and operation of each vehicle within a physical zone, a county, or a state or road network
Sensor Apparatus	A device capable of sending and receiving electronic signal data containing a pre-determined type and format of information from a

vehicle, and the electronic signal data may subsequently be used for information processing by suitable computational means

PRIOR ART

US Patent 6882930:□Stratech Systems Limited
US Patent 6034625:□NEC Corporation
US Patent 5969641: NEC Corporation
US Patent 5701127: Texas Instruments Incorporated
US Patent 4797948: Motorola, Inc.□
US Patent 7069118: International Business Machines Corporation
US Patent 6888445: Bradley L. Gotfried, Benjamin Gotfried
US Patent 4339753: RCA Corporation

ADDITIONAL PRIOR ART INFORMATION

North America

RFID tags are used for electronic toll collection at toll booths with Georgia's Cruise Card, California's FasTrak, Illinois' I-Pass, Oklahoma's Pikepass, the expanding eastern states' E-ZPass system (including Massachusetts's Fast Lane, New Hampshire Turnpike, New Jersey Turnpike, and the Maine Turnpike), Florida's SunPass, North Texas NTTA and Houston HCTRA EZ Tag, Kansas's K-Tag, The "Cross-Israel Highway" (Highway 6)

Asia, Oceania

Philippines South Luzon Expressway E-Pass
Brisbane's Queensland Motorway E-Toll System in Australia

EU

Autopista del Sol (Sun's Highway), Autopista Central (Central Highway), Autopista Los Libertadores, Costanera Norte, Vespucio Norte Express and Vespucio Sur urban Highways and every forthcoming urban highway (in a "Free Flow" modality) concessioned to private investors in Chile and all highways in Portugal (Via Verde, the first system in the world to span the entire network of tolls), France (Liber-T system), Italy (Telepass), Spain (VIA-T)...

Use and Application of additional prior art

The tags, which are usually the active type, are read remotely as vehicles pass through the booths, and tag information is used to debit the toll from a prepaid account. The system helps to speed traffic through toll plazas as it records the date, time, and billing data for the RFID vehicle tag. The plaza- and queue-free 407 Express Toll Route, in the Greater Toronto Area, allows the use of a transponder (an active tag) for all billing. This eliminates the need to identify a vehicle by licence plate and saves the end user money.

Sources:

1. "Radio Frequency Identification." Rachel Wadham. "Library Mosaics" v14 no.5 (S/O 2003) pg.22.
2. European Conference of Postal and Telecommunications Administration
3. European Telecommunications Standards Institute (ETSI)
4. US Customs and Border Protection NEXUS website
5. US Customs and Border Protection SENTRI website

BRIEF DESCRIPTION OF THE DRAWINGS

Illustrative embodiments of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 illustrates the present invention, a vehicle enforcement system comprising a remote processor, which is in communication with a plurality of sensor apparatus and each said apparatus exchanging and obtaining electronic data from a plurality of vehicles. The remote processor has means to use the said data to determine a number of applications such as verification of the vehicle's compliance to a pre-determined number of vehicle regulatory regimes (such as vehicle insurance coverage validity).

Figure 2 illustrates the data types that may be exchanged between the vehicle and the sensor apparatus.

Figure 3 illustrates a device that is attached to the vehicle that contains a specified data that is usable by a remote processor. The device contains data that can be suitably exchanged between the device and the sensor apparatus, causing information from the said data to be derived about the said vehicle to the sensor apparatus.

Figure 4 illustrates an embodiment of the present invention, a vehicle enforcement system, comprising a remote processor and a database.

The processor is in communication with a plurality of sensor apparatus. The said apparatus may each be in communication with a plurality of road vehicles. The vehicle contains a device further containing a specified data unit, which is exchanged between the sensor apparatus and the vehicle's said device, which may be implemented by wireless radio communication means.

The sensor apparatus will forward the data derived from the vehicle's said device to the remote processor, and processor further retrieving additional information about the said vehicle from the connected database.

In this embodiment, the processor may derive computational results from the said database and said data derived from said vehicle device.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention comprises a vehicle enforcement system that is operable to derive unique data from a plurality of road vehicles, and the system further comprising at least one remote processor, and the unique data derived is operable by the remote processor to determine whether the vehicle is in compliance to a number of pre-determined traffic and vehicle registration rules.

The traffic and vehicle registration rules belong to a road network further governed by the enforcement system – these may include the vehicle's insurance coverage and insurance period validity, and any charges or road toll fees that may have to be paid for the use of the vehicle on the said road network.

The enforcement system is also in communication with a number of sensor apparatus, and each apparatus having means to derive said unique data from each vehicle remotely by radio communication means – and remote proximity range of the sensor apparatus and each vehicle equipped with a device to store the said unique data is dependant on the radio communications protocol. In the case of long-range proximity radio communication means, this can encompass 802.11 radio communication standards (commonly termed "Wi-Fi"), or 802.16 radio communications standards (commonly termed "Wi-Max"), or some other suitable radio communications standard capable of spatial and or directional signal transmission. Further, use of RFID (Radio Frequency Identification) may comprise of a transponder (also termed RFID "tag") on each participating vehicle.

With reference to figure 1, the present invention comprises a remote processor 1, and the remote processor 1 is in communication with a plurality of mobile sensor apparatus 2. In one embodiment, the mobile sensor apparatus 2 may comprise of a portable electronic device such as a handheld unit containing a wireless radio communications system, a display unit, and a data input interface. The data input interface can also perform the role of data request, input and transfer between the mobile sensor apparatus 2 and a participating road vehicle 3. The data input interface can also perform the role of data request, input and transfer between the sensor apparatus 2 and the remote processor 1.

This wireless radio communications system embedded into the handheld unit may be a GSM, GPRS, 3G or 802.11/802.16 (Wi-Fi/Wi-Max) communications unit, and the remote processor 1 may be located at a central facility, such as a traffic enforcement facility, or remote processor may instead be formed network of individual and de-centralized facilities.

The road vehicle 3, when within an operating proximity of the mobile sensor apparatus 2, may cause the transmission of data from the road vehicle 3 to the mobile sensor apparatus.

In a preferred embodiment, the road vehicle 3 may only send data to the mobile apparatus 2 upon receipt of a data transmission request from the mobile sensor apparatus 2 to the road vehicle 3.

In the earlier embodiment where the road vehicle 3 sends data passively to any suitable mobile sensor apparatus 2 that is within data processing proximity distance, the road vehicle may cause such transmission of data to be performed along a pre-determined time interval, ranges from 1 second to several minutes. However, the road vehicle 3 may further be adapted to cause transmission of data to the mobile sensor apparatus 2 to any time interval that the user of the road vehicle may set, or it may be electronically adjusted by the remote processor 1, mobile sensor apparatus 2, or an authorized personnel.

In figure 2, a mobile sensor A communicates with a road vehicle B, remotely, to acquire information ranging from data D1 to D5 as depicted:

D1	insurance validity (and or absence/presence of insurance cover/premium)
D2	toll fee payment (and charges for use of road vehicle according to a prescribed time for use)
D3	outstanding fines (such as parking fine, traffic dues and charges etc)
D4	legal status (of the vehicle, its classification, operational status, etc.)
D5	owner particulars (name, passport number, identification number, personal details)

In figure 3, the means and method for transfer of data between a mobile sensor 100 and a road vehicle 200

is illustrated. In the present embodiment of the present invention, the mobile sensor 100 may transmit a request signal remotely via T1, and await a confirmation data T2 to be transmitted by the road vehicle 200. This confirmation may cause proper transmission of data, or contain preliminary or header data for display formatting.

The mobile sensor 100 may transmit to the road vehicle 200 a second signal T3 containing the type and detail of information requested from the sensor 100, while signal T4 from the road vehicle 200 contains the actual information for the mobile sensor 100. In one preferred embodiment of the present invention, the mobile sensor 100 may subsequently cause forwarding of the data signals T1 to T4 to a remote processor of the vehicle enforcement system (which is the present invention). The data signals T1 to T4 are transmitted between the mobile sensor 100 and road vehicle 200 via remote radio communications means and can be electronically encrypted for two reasons: security and prevention of "man-in-the-middle" siphoning of such data contained within the said signals, and segregation of individual data between multiple road vehicles similar to road vehicle 200. This can occur when the mobile sensor is adapted to perform request of specified information from a plurality of road vehicles passing within a designated proximity and operational region.

In figure 4, the present invention; a vehicle traffic enforcement system is depicted. The traffic enforcement system has at least one remote processor 02 that is in electronic communication with a plurality of mobile sensor 03. Each of the said sensor 03 are further in communication with a number of road vehicles 04. The road vehicles 04 may have to be within a designated proximity region with respect to the sensor 03.

The road vehicle 04 passes within operational proximity distance in relation to the mobile sensor apparatus 03, and sensor 03 exchanges data signals with the road vehicle 04 further deriving usable data which is electronically routed from the sensor apparatus 03 to the remote processor 02 of the present invention, and remote processor 03 is also in communication with a database 01 containing detailed information in relation to the road vehicle 04. It should be noted that the data signal exchanged between road vehicle 04 and mobile sensor apparatus 03 may involve representative data types that can be subsequently used by the remote processor 02 and database 01 for retrieval of the required information pertaining to road vehicle 04. With reference to figure 3, the data signals exchanged may be performed using the signal exchange protocol as depicted for T1, T2, and T3, T4 between the mobile apparatus 100 in figure 3 and the road vehicle 200 in figure 3.

Modifications within the spirit and scope of the invention may readily be effected by persons skilled in the art. It is to be understood, therefore, that this invention is not limited to the particular embodiments described by way of example hereinabove.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A vehicle enforcement system, comprising: a plurality of road vehicles belonging to the said system, and each said vehicle having a device containing unique data, and the enforcement system also in communication with a plurality of sensor apparatus, and the enforcement system also containing a remote processor, and each said sensor apparatus is operable to derive said unique data from any of the plurality of road vehicles

2. A vehicle enforcement system as claimed in claim 1, where said unique data is operable by remote processor to determine if said vehicle is compliant to a pre-determined number of operational and regulatory rules for the continued use and operation of the said vehicle within a road network belonging to the enforcement system

3. A vehicle enforcement system as claimed in claims 1 and 2, where said system can use said unique data to determine said vehicle insurance coverage information

4. A vehicle enforcement system as claimed in claims 1 and 2, where said system can use said unique data to determine said vehicle insurance coverage validity

5. A vehicle enforcement system as claimed in claims 1 and 2, where said system can use said unique data to determine vehicle status information selected from a group consisting of, vehicle insurance validity, vehicle road use fee payment information, vehicle identification data, vehicle owner identification data, vehicle driver identification data, vehicle chassis identification data, vehicle engine identification data, vehicle classification data, vehicle type information, vehicle registration data, vehicle outstanding traffic payment information, vehicle traffic violation data, vehicle license plate data, vehicle maintenance history data, and vehicle registration history data

6. A vehicle enforcement system as claimed in claims 2 and 5, where said vehicle status information is stored on the said remote processor

7. A vehicle enforcement system as claimed in claims 1 and 5, where said vehicle status information is stored on the said vehicle device

8. A vehicle enforcement system as claimed in claim 1, sensor apparatus is mobile and operable to derive said unique data from said vehicle remotely by radio communication means

9. A vehicle enforcement system as claimed in claim 1, sensor apparatus is mobile and operable to derive said unique data from said vehicle remotely by radio communication means from the vehicle to the said apparatus and further from apparatus to the enforcement system

10. A vehicle enforcement system, comprising, a plurality of road vehicles each equipped with a in-car device, and the system also in communication with a plurality of sensor apparatus, the said apparatus having radio communication means to derive from the in-car device of the said vehicle, vehicle related data

11. A vehicle enforcement system as claimed in claim 10, where the in-car device further having means to exchanging transaction data with a card device

12. A vehicle enforcement system as claimed in claims 10 and 11, where said vehicle related data produced by the in-car device has data values dependent on said transaction data exchanged between said card device and in-car device

13. A vehicle enforcement system as claimed in claim 10, where vehicle related data is selected from a group consisting of vehicle insurance information, vehicle tax payment information, road tax payment information

14. A vehicle enforcement system as claimed in claims 10 to 13, where said sensor apparatus has means to transmit said vehicle related data to a remote processor

15. A vehicle enforcement system as claimed in claims 10 to 13, where said sensor apparatus has means to transmit said transaction data to a remote processor

16. A method of detecting the absence or presence of insurance of a road vehicle, comprising, a in-car device storing unique electronic data related to absence or presence of said insurance of the vehicle and, a sensor apparatus having means to derive said data from the in-car device remotely from a specified distance and, the sensor apparatus further adapted to have means to send said data to a remote processor for recording said absence or presence of said insurance of the vehicle

17. A method as claimed in claim 16, where the remote processor forms a part of a road network system

18. A method as claimed in claim 16, where a plurality of sensor apparatus is in communication with said remote processor

19. A method as claimed in claim 16, where sensor apparatus is a portable and mobile machine system

20. A method as claimed in claim 16, where sensor apparatus is a portable and mobile vehicle mounted machine system

21. A method as claimed in claim 16, where sensor apparatus is a portable hand-held human operated machine system

22. A method as claimed in claim 16, where remote processor may derive from said unique data further vehicle related particulars selected from a group consisting of, vehicle insurance validity, vehicle road use fee payment information, vehicle identification data, vehicle owner identification data, vehicle driver identification data, vehicle chassis identification data, vehicle engine identification data, vehicle classification data, vehicle type information, vehicle registration data, vehicle outstanding traffic payment information, vehicle traffic violation data, vehicle license plate data, vehicle maintenance history data, vehicle road tax data, and vehicle registration history data