Title: SYSTEM FOR DETECTING AND MONITORING ATMOSPHERIC DATA

Abstract: The present invention belongs to the field of detection of atmospheric and environmental parameters and more specifically describes the detection of environmental weather conditions or other conditions in mobility. The present invention describes an innovative monitoring system, particularly suited to mobile data detection, of data which are particularly useful in the environmental field for the mobility of vehicles, in particular said innovative system is suitable to be placed on any type of vehicle.
Description of the text of the industrial invention having the title:
"A system for detection and monitoring of ambient data in a mobile environment"

**Text of the description**

The present invention relates to the field of detection of atmospheric parameters and more specifically of the detection in a mobile environment of actual meteorological conditions. More and more frequently the meteorological variable affects everyday life, both in the broadest sense considering for example the organization of certain activities depending on the weather and both in a strict sense, namely when meteorology becomes important for the security and the safety of people. Unfortunately, almost daily news report the continuous vagaries of a climate that appears almost crazy and that constantly puts in trouble the society, the habits and the operations of many working activities.

One area in which consistent and accurate monitoring of atmospheric conditions is particularly important is certainly the road and motorway area. To monitor weather conditions along the main roads is, to date, already a possibility thanks to motorway monitoring stations that provide information on traffic nearly in real time, especially in the most critical road sections; these detections, however, concern only short sections of the road with indications referring only to the point of installation of a detection unit. From the point of view instead of the non-highway road network, such as expressways, national roads etc. there are no installations of such kind while also these road host every day millions of vehicles in transit.

There are also radio and television road traffic assistance services that are often focused on signaling bad weather conditions that can cause traffic problems, but also in this case, the weather information provided either are obtained from said motorway installations or are provided by personal observations by specialized personnel on the spot (toll staff, road surveillance patrols, etc.).

In this case, the reports from personnel stationed along the road network, offer a greater network coverage but still remain very little widespread and almost always related to roads of major transit (highways). It must be considered also that the movement of people and goods continues to be widely supported by the traffic on wheels presenting very important
volume peaks, and not infrequently, often for issues related to adverse weather conditions, suffers from minor slowdowns up to major problems such as accidents and situations that can easily also endanger the health of users of roads and highways. From the point of view of these problems, namely those related to potentially dangerous weather conditions for smooth travel on roads and motorways, the most dangerous phenomena are represented by a slippery road due to rain or ice, visibility reductions due to heavy rain or fog, snowfalls etc. Since some time, on wheeled transport means (cars, trucks, motorcycles), thermometers are installed on-board that inform about the outside temperature recorded and possibly provide a warning about the potential risk of the presence of ice on the road. This type of thermometers for motor vehicle usually are installed at the factory level and often have a coarse resolution (one or half a degree Celsius) and can be housed in positions that are not specifically favorable for the correct detection of outside temperature; also, in case of malfunction, the replacement of parts it is usually expensive since it implies interventions on vehicle internal parts and interventions on the control unit.

Settings of the sampling frequency of temperature data are also absent and there is the possibility to obtain the reading only by means of the display of the vehicle. As is also known, it is in no way possible to define custom alert thresholds nor to register external values or sequences of external temperature values. Such information are of use to the drivers of the transport means and are information always detected by the onboard thermometer; therefore these information, even if only partially useful for the driver, cannot be used in advance in order for example to program or to be alerted before adverse weather conditions are met. These data also have a validity limited by the measurement made at the time of the passage or at the very moment in which the user or driver may already be in presence of the hazard; in no case these data can be useful as a warning of risky weather conditions.

In addition to that, disadvantageously each indication is available only to the user who has a vehicle equipped with such detection technology (e.g. a thermometer with indications on the dashboard of the external temperature) these data therefore are of little use.

Recently have been proposed and introduced on the market for example thermometric detection systems which comprise at least one external sensor, a reading terminal such as a display and a connection between the two elements that can be achieved with or without
wires, said systems can be installed on passenger cars externally with respect to the sensor, and internally with respect to the display, by means of the display an alarm threshold can be set.

These systems are of interest for those cars that are not equipped with a thermometer for reading only the temperature that is external to the car itself, in any event, such systems allow data reading to the driver, returning back, apart from the possibility of setting of any alarms, to the previous case.

Moreover the detected data is only a temperature data and only refers to the time and the place of the detection. Said data moreover is merely available in the moment itself.

Moreover, these additional systems remain objects that are not inserted in the aesthetic context of the vehicle as well as in any case they require an installation process. Finally, also in this case, apart from the ability to set a threshold alarm (normally not more than one) there are not provided functionalities or possibilities of more refined configurations.

Moreover, note that the document DE102012004998A1; in particular, said document describes a method for obtaining local weather data by means of vehicles, in particular said method comprises the monitoring of at least one temperature sensor of the vehicle, a navigation apparatus (integrated or not with the vehicle) and a communication interface to create a communication with a central office. The patent application therefore describes a method for detecting meteorological data in the proximity of a vehicle by means of a temperature sensor. The detecting position is detected by a navigation apparatus for example portable. The weather and location data are sent to a central server through a transmission interface. The server builds a weather map based on these detections to be distributed to users.

Said method partially follows the object of interest also for the scope of development of the present invention, said method may further comprise the monitoring of other parameters detected by the vehicle by means of equipment on the vehicle, such as turning on the lights, data detected by the driver assistance system, present on most modern vehicles, speed measurement, rain sensors (allowing activation of windscreen wipers) etc.

Said system among its purposes clearly mentions the fact that the higher is the number of the cars from which the data will be detected, the greater will be the advantageously available details, therefore the possibility to warn users will be even better and more accurate.
However, in a decidedly disadvantageous way, at least in the historical period that we are facing, it is true that the majority of modern vehicles are equipped with intelligent driver assistance systems, and the like, but it is equally true that at least half, if not most of the vehicles that are circulating on the road are of the previous generation, for which, apart from being sometimes be equipped with temperature sensors, (of otherwise poor quality as mentioned above), said vehicles are for the rest completely devoid of any kind of intelligent sensors onboard. Moreover, even in the case of the document cited here the temperature sensor is the vehicle's standard, and therefore it may have poor reliability as well as the disadvantages described above.

Therefore more than one significant, indeed decisive, problem can be immediately noticed, which impose great limits to the method proposed above; in fact, in order to have a real-time mapping system of weather conditions it is of the utmost importance that the majority of vehicles on the road should be equipped with such a detection system to be able to increase the precision of the data in a widespread fashion. Therefore, realistically, in order that such a method results effective, at least a large majority of vehicles should be equipped with intelligent systems at least of data transmission, as well as advanced sensors onboard, which today will take years to be implemented at the expense the utility of this method. Still, if for example a single automaker would want to propose such a system, the system might remain unavailable for users of other automakers, this always at the expense of the most important factor of such an invention, namely the ability of widespread collection and dissemination of information for the safety of users.

Furthermore, the quality of the measured data, for example, but not exclusively, of temperature is very uncertain relying on sensors that are not dedicated to precise atmospheric evaluations, furthermore the data is based on actions made also by a user on the vehicle, actions that can be misleading by the objective assessments of different kinds that actually lead to emissions of a map based on such data.

Moreover, said method does not seem aimed at increasing the overall safety on the road, but to carry out the mere monitoring of it, this probably because in fact as it is described this method may not have global spread.

As a further example of prior art document WO2016026779 is cited which describes a software implemented method for the realization of weather forecasts based on data collected
from vehicles. In particular, the document describes a short-term prediction method suitable
to interact with the vehicle actuators such as the windows closing systems, sunroofs etc.

Such a method proposes to perform a reading from the on-board sensors useful for detecting
environmental conditions, and to make a statistical comparison with previous similar data
and make a prediction to be transmitted to the same vehicles to manage actuators. This
method therefore is a weather forecasting method devoted to the interaction with vehicles
dedicated for the purpose, therefore equipped with the appropriate sensors (see the comment
to the previous prior art).

Moreover, it doesn't appears to be a suitable method to inform motorists on real time
weather conditions especially in relation to the practicability of the roads; this method is only
suitable for a particular category of vehicles that are designed to interact with those
functionalities.

It completely lacks the ability to create a network of environmental monitoring based on
detections made by vehicles of any type, through a simple device, of immediate installation,
low cost, universal, a network specifically dedicated to providing information on the real
conditions of current weather for example while traveling or in a particular location.

An object of the present invention is to describe an atmospheric detection system which
solves the prior art problems previously mentioned herein.

A further object of the present invention is to describe an atmospheric detection system
which allows a diffused monitoring of weather conditions on the territory.

Another object of the present invention is to describe a system that allows for the exchange
of data collected from a plurality of said innovative detection systems, even in real time.

Still another object of the present invention is to describe a system for immediate detection
and exchange of meteorological and environmental data between one or a plurality of the
same or compatible systems.

A further object of the present invention is to describe a system that by means of the
detection of said data allows to develop specific alerts for critical situations for in road trips.
A further object is to describe an economic monitoring system.

Another object of the present invention is to describe a system that is completely automatic.
A further object of the present invention is to describe a system that is simple to use and to
install.
A further important object of the present invention is to describe a system that can be mounted on any type of vehicle.

An object of the present invention is to describe a system for immediate detection and exchange of meteorological and environmental data between one or a plurality of the same or compatible systems.

A further object of the present invention is to describe a system which allows to perfect the warning system for adverse weather conditions on the road network.

A further object is to describe a detection system based on weather detection made in a mobile environment.

One important object of this invention is to describe a system which greatly increases safety on the road.

Another object of the present invention is to propose a system which can be implemented either in the type of sensors for the detected parameters or that can be implemented for the type of interactions with said system and is programmable depending on the needs.

These and further objects will be realized by the innovative and advantageous system for detecting and monitoring atmospheric data, particularly suited to vehicles, comprising at least one detection device such as at least an external temperature sensor, and at least means for data transmission between said at least one device and a terminal for reading said detected data, characterized in that said at least one detection device and at least said data transmission means are comprised in an assembly suitable to be inserted on each vehicle.

Said system further comprises at least a device for data management comprising at least means for monitoring, saving and processing of data detected from the at least one temperature sensor, at least a spatial localization device, a temporal reference device, and a transmission and remote receiving module of said data at least of temperature to at least a remote management system.

In a further advantageous way said assembly/device can also be integrated with the vehicle in some preferred embodiments, as will be described hereinafter with reference to the accompanying figures.

Said system in an advantageous way is adapted to create an interchange and data processing network between at least one of said detection systems and one or a plurality of further detection systems and/or a network; said system therefore allows to create in a particularly
advantageous and innovative way a database of data at least of temperature detected along entire road segments in a diffused way, said data being advantageously at least georeferenced and time-referenced.

Said system in a particularly advantageous manner comprises said assemblies/devices and means which are suitable to be transported and installed for example on a motor vehicle for which said system constitutes to all effects a practical mobile detection system.

Note that, in a particularly advantageous way, each of said devices, means or any other components of said system can be mounted and removed from the vehicle or other means of transport at any time without the need for any installation, nor of wires, as will be better described in the embodiments below.

Additionally, in particular, the herein cited known art sensors, monitor the temperature, while it is a particularly innovative object of the present invention to describe a detection system that includes the detection of additional parameters, such as for example the external air humidity. Note in this regard that the detection of data such as humidity can act as an indicator of rain falling on the road, of snow, etc. especially if detected in quite advantageous way, as is the object of the present invention, in conjunction with temperature data, which especially in a decidedly innovative way, can be transmitted and exchanged in real time with a network of users having the same detection and atmospheric data exchange system, in particular, completely innovative and useful for use on motor vehicles.

Still, in an entirely advantageous way, said system allows detection of meteorological parameters along the road through the means that houses it, store data detected in real time, characterizing each reading (possibly user-definable in its sampling interval), as said with a georeferencing for example by GPS and a time reference.

Substantially in a particularly innovative way the present mobile data detection system achieves all the innovative purposes described herein above through the implementation of said detection system which preferably will be increasilly advantageous in conjunction with its spread among users.

In further advantageous manner the possibility of use of any type of said system on vehicles will make the rapid dissemination of such system widespread within the reach of all users and all types of vehicles.
Said system that comprises at least the components described above, preferably advantageously in some advantageous embodiments will include additional types of detecting sensors, which may be integrated in the external detection device, or may be additional devices subsequently integrable. Note that this makes it possible to obtain a network of systems of detection of at least the temperature data ideally comprised by increasingly numerous users utilizing said system. Each user represents a mobile detection station and will also be an user of data received from every other user, this in real time or for the past.

The user location does not in any way preclude the monitoring, for which in such an absolutely advantageous fashion, for example, real-time data will be innovatively potentially available for each segment of road, therefore, not only highways, or large arteries, where the security is more guaranteed, but also for secondary roads, often bumpy and poorly controlled. Said roads, however, as is known are the most dangerous for motorists. The data will be also available to any centralized monitoring systems, such as highway management companies, firefighters, police and others entities potentially interested for traffic safety in such a kind of information.

It seems evident that such system in a totally innovative way may revolutionize road safety in case of bad weather.

In a further advantageous way said mobile detection system can be adapted to be interfaced with additional mobile data transmission systems.

Still in a further advantageous manner, said mobile data detection system dates the detection even in real time and, above all gives the ability to process, transmit, receive data, allowing to promptly develop specific warnings for critical situations for the road journey, this to warn motorists at all times and in real time of any icy roads, storms, snow, hail, etc. allowing as said to overly increase the safety of motorists.

Said system also in an entirely advantageous way will be composed of devices and really simple means that do not require complex settings, being thus accessible to any user segment.

Moreover, in an entirely advantageous and innovative way said system comprises the detection of at least temperature data, and even more preferably comprises means, such as sensors, for the detection of further environmental and atmospheric data; by means of said
data transmission interface, advantageously said detected data can be transmitted, processed, etc. and a plurality of parameters can also be set such as sampling intervals, alarm thresholds, alert notifications on certain road sections, and further variants of warnings at a discretion of the user which allows to significantly refine and clarify road alerts at a diffused and global levels.

In further advantageous manner, therefore, the present mobile atmospheric detection system may include sensors such as for example: temperature sensor for air external to the vehicle, ambient light sensor, humidity sensor, wetting sensor, etc.

Such sensor equipment will allow the detection of various weather situations potentially critical for circulation. These data also may be compared with typically non local detections (for example: weather radars, satellite images, etc..) in order to refine the definition of the type of weather conditions that may be present such as on a particular stretch of road. For example, in broad daylight, the detection used by said system fitted on one or more vehicles in transit may detect in a given geographical point, a low-light and humidity, substantially close to 100%, this means the crossing of a bank of mist by a vehicle or vehicles equipped with such a system. Such information, useful for those who already are on site, will be very useful for users that a little later will be travelling on the same road section being already aware of the reduced visibility.

Still, the reporting by the innovative system described by the present invention, of which vehicles in transit may be equipped, of data of temperatures near or below freezing, of humidity in saturation, of positive wetting (in addition it would be possible to compare such data with widely present online radar readings), it would mean the occurrence of a snowfall. Additionally if the system detects, for example detected temperatures proximal to or below zero, high humidity and possibly positive wetting, this would mean high risk of frozen road sections.

A further example may also be the detection by the system of positive wetness, and of a low luminosity in daylight hours to signify the presence of strong precipitation in place.

These are just some of the examples of particularly preferred forms of embodiment of the system for the detection of atmospheric parameters in a mobile environment inventively achieved according to the present invention.
Said system will be in an entirely advantageous way also programmable, customizable and georeferenced, as also said further advantages and will be realized will be described below in some of the advantageous embodiments relating to the enclosed figures.

Moreover for example, each user, before travelling on a road section will have the opportunity to see in real time the conditions of said section and eventually, in some possible embodiments to ask questions to other users or to the authorized offices that will further repeat the information derived from the system using additional media.

Note that, even users that are not in possession of said innovative system will be able to consult said information by means of appropriate ways and means which will be described below.

For example, said monitoring system being geo-referenced, can be easily interfaced with satellite navigation systems, now very popular all over the world market, yet, these systems properly implemented in some embodiments may be integrated with the vehicles in production. Note that vehicles have been described as a mere reference, nothing prevents these systems may be fitted on trains, scooters etc. and other means of land transport.

Note that in particular it is referred to the deepening examples reported hereinafter, that the means for road transport as mentioned are increasingly basing their marketing promotions on the connection of the vehicles provided with external means which provide information. However, only by purchasing a certain type of vehicle of a certain automaker said means will be equipped with the said innovative onboard computerized device, therefore the data that said vehicle will be able to receive and/or transmit will be very scarce compared to the huge amount of circulating vehicles, for which the data will be scarcely useful. Still a plurality of users is not able or is not concerned with the use of complex instrumentation on board for which most advantageously it is useful to propose a device which is capable of providing data never monitored before in the way described by the invention, as well as describing a detection and monitoring system easy to be used and adapted to be mounted on each vehicle both pre and post production.

These and other advantages obtained thanks to the innovative system of detection of meteorological data on mobility described by the present invention will hereinafter be detailed in the description of the attached figures of some preferred embodiments in which:
in fig. 1 it is represented a block diagram of a basic form of embodiment of the system described by the present invention;

in fig. 2 it is shown an example of realization of interaction of two or more systems described by the present invention in a preferred embodiment;

in fig. 3 it is represented a real application example of said innovative system which interacts with further systems;

in fig. 4a, b, c there are represented particularly preferred forms of realization of the innovative monitoring system applied for example on antennas for motor vehicles;

in fig. 5a, 5 b there are represented more particularly preferred forms of realization of the innovative monitoring system applied for example on rear-view mirrors for vehicles;

in fig. 6a a further embodiment is shown suitable to be applied on any area of a vehicle;

and in fig. 7 are represented particularly preferred application points of said environmental data monitoring system for example on a motor vehicle.

With reference to Figure 1 there is shown a preferred form of a basis representation of the first mobile detection system for atmospheric data innovatively described by the present invention, particularly suited to vehicles, which here comprises at least a detection device 2 such as for example at least one temperature sensor external to the vehicle, at least a terminal 4 for reading the data detected by said at least a first temperature sensor and further means 3 for transmitting data between said at least one said device 2 and said terminal 4. Said first mobile detection system 1 for atmospheric data comprises in the present embodiment means 5 at least for monitoring, saving and processing data sent from said at least one sensor 2; in the present embodiment said innovative system further comprises devices for the collection of data such as at least one further sensor for humidity detection 6 and at least one further sensor for brightness detection 7. Said data detected by said sensors 2, 6, 7 are transmitted at least to said receiving and reading data terminal 4 and said monitoring terminal 5.

Said innovative system 1 further comprises at least one transmission module 8 for said data, said module 8 is also suitable for receiving further data from outside; said system further comprises at least one time reference device 9 and a GPS location system 13.

In the system it is comprised at least said receiving terminal 4, a monitoring terminal 5, a transmission and data reception module 8, a time reference device 9, a GPS location system 13, such part of the system is referred to as data management device 12. It is to be noted that
in a particularly advantageous way, compared to the prior art, the present mobile detection
system 1 for atmospheric data further allows, thanks to the data management device 12 to
associate to each reading of the data of temperature effected by the sensor 2, a geographical
coordinate derived from the GPS location system 13. In addition to this, to the data read from
the external temperature sensor to the vehicle 2, it is associated, by virtue of the time
reference device 9 also a reading time of the data so that the reading of the data is identified
both geographically and temporally. The terminal for monitoring, saving and data processing
will record the data detected by the external temperature sensor 2 by associating said data to GPS coordinates data and time data. Said data management device 12 also innovatively
composed of a data transmission and reception module 8 may provide, for example, to the
transmission of said data detected by the temperature sensor 2 to which have been associated
the geographical coordinates of reading derived from the location system GPS 13 and the
time coordinates made available by the temporal reference device 9. By doing so, the data of
the outside temperature reading will be made available not only, for example, to the user of
the vehicle but may also be reused by remote users (the way in which said data will be made
available to said remote users, will be described below in further attached figures).
Also in an entirely advantageous and innovative way, in addition to the outside temperature
sensor 2 there can be present additional sensors such as an air humidity sensor 6 and still for
example, a brightness sensor 7. The data obtained by said sensors 6 and 7, as in the case of
the temperature sensor 2, will be transmitted to the data receiving and reading terminal 4,
associated with the data provided by the GPS location system 13 and time reference 9 and
then processed and saved on the monitoring and saving terminal 5 to then be transmitted by
the transmission and reception module 8 to another data management and external data
processing system 20. Therefore, the innovative system 1 herein described for the movable
detection for atmospheric data for example in the present embodiment of the invention
allows to obtain a meteorological monitoring at least of temperature data, humidity, real-time
ambient light on any route taken by vehicle on which the system is installed. It is evident that
if said innovative system 1 were available to a least of a plurality of vehicles transiting at
least on a plurality of road segments, such systems would make it possible to monitor in real
time at least the temperature data, humidity and ambient light detected by each of said
systems in those vehicles. Then by means of the continuous, widespread and real time
monitoring of at least temperature data, humidity and light, it is possible to deduce the presence of particular meteorological conditions in place. For example the detection of a temperature proximal to or below 0 °C and of humidity close to saturation can be assumed as favorable conditions for the development of ice plates on the road surface with a high reliability.

Note that if said innovative system 1 were available even to one or to a small number of users, said innovative system 1 will still be useful, because the reliable data transmitted by said system 1 are sent to a central database or not, but in any case known and suitable for the purpose, therefore it will be possible for the users concerned in any case to receive the information transmitted from said one or more devices, for example, it will be possible to realize an application for smartphones that is suitable for receiving said data, or even systems can be integrated devices suitable for the purpose on satellite portable navigation systems or embedded in vehicles, or still can be realized, for example in the form of gadgets, for receiving said data particularly suitable for the purpose dedicated. Note that in a further advantageous manner that said system 1 comprises devices and means which are suitable to be transported and installed for example on motor vehicles, trucks, but also motorcycles etc., In any case it said system 1 is in any case suitable to be comfortably transported in any mode at the user's choice. Furthermore said system so far as it is conceived and in particular also for the plurality of detections that will be able to do is to be considered extremely reliable in the assessments performed. Even the measurements carried out, the diffusion of the innovative system 1 described here, will be more and more advantageously widespread, this to the benefit of the safety of the drivers who will have definite information on road conditions on every possible way and in an even more advantageous and innovative way also on secondary roads such as mountain roads, etc.

With reference now to Figure 2, there is represented an embodiment of the application of environmental data of the detection system 10 in a mobile environment innovatively described by the present invention in which, said system 10 comprises at least an assembly 11 that is preferably positioned on the outside of a motor vehicle, said assembly comprises, in this particularly preferred embodiment, at least one temperature sensor, a humidity sensor, a light sensor and a wetting sensor, said assembly may comprise at least one transmission device and for example at least one feeding device.
Said assembly 11 transmits the detected data to a receiving device 12 that comprises means for receiving data from said assembly 11 of sensors, at least means, such as a display, to show at least the measured data (on said display may also be read received data which will be discussed below), means for setting parameters such as setting for the type of alerts that are desired, setting of road sections of interest, modalities to handle alerts (light, sound, etc.), transmission frequencies, diagnostic sensors for setting the external assembly 11 functionalities.

Note that said system 10 is mounted/transported entirely on a moving vehicle; as mentioned, in a particularly advantageous way it said receiving device 12 can also be a smartphone with a special application integrated therein realized to fulfill the functions useful for the purposes of the present invention described above.

Said at least one innovative detection of environmental data system 10 in a mobile environment, using said at least a receiving device 12, which is adapted to also act as a transmission device by means of WiFi protocols, Bluetooth, 3G; 4G etc, GSM, etc, is also precisely adapted to transmit some or all of the received data to at least one database or remote management system 20, said remote system 20 being adapted at least to the reception, processing, analysis of said data, and also for example to the retransmission of said processed data upon a choice, depending on the embodiments and setting chosen, to one or a plurality of further detection and monitoring of environmental data systems 10', 10', mobile or not; said data may of course be further transmitted to any receiving means able to allow the reading of said data from one or from a plurality of users. In fact each user in possession of that new system will help to provide data that can advantageously be processed to provide a comprehensive and accurate overview of the complete meteorological conditions on the territory, but each additional user in possession of a device 30 suitable for the purpose, or enabled for the purpose (such as for example as already mentioned, smartphones, tablet, PC, satellite navigators, etc.) can advantageously make use of said data to plan their journeys under safety, or even simply for information. Between said one or a plurality of transmission devices 12 and said one or a plurality of database or central processing systems 20 thus takes place an active exchange of data and information; between said database and said further users not in possession of said innovative system 10, but in
any case in possession of means or devices 30 suitable for the reception of said data, a
passive exchange of information occurs.
Said devices 30 will in any case normally act to receive, display, process that data and also
receive alerts, alarms, etc. as already mentioned, by virtue of the predisposition of means
suitable for the purpose, such as applications or dedicated software etc. Some users that may
advantageously take a benefit so far not obtained of information obtained by means of said
innovative system may be, for example, police, roads and highways control authorities,
companies, radio information and/or television services, individual users equipped with
means the purpose or to whom it is possible to consult a dedicated website, etc.
Still, a further exchange of information and data may preferably also take place directly
between individual users who are along for example a single road section to share real time
alerts of any rain, fog, hail, snow, ice, etc.
Note, therefore, how in an entirely advantageous way said innovative environmental data
detection and transmission system 10 can definitely make a significant improvement in the
widespread monitoring of environmental conditions for the vehicles in motion and not. Said
system also, in a further innovative way allows the monitoring of environmental data that
until now were not considered nor monitored in any way with regard to monitoring in the
widespread movement of said data with all the innovative purposes mentioned earlier.
In figure 3 is represented a particularly preferred embodiment, for example, application of
the innovative system 1,10 described in some of its forms of particularly preferred
embodiments according to the present invention.
In the figure below shows a number of innovative systems 101,102,103,104 of acquisition
and management of environmental data preferably in a mobile environment which form an
extensive data collection network. These systems 101,102,103,104 communicate with at
least a database or remote management system 200 that performs the functions described
earlier, and each system 101, etc. can also communicate directly with each other. The
processed data from said one or a plurality of databases can be processed in any manner that
is deemed useful to the purpose of the present invention.
Again, as said, some or a plurality of said data can be transmitted and subsequently
processed, read, retransmitted, etc. by further users 400 even not in possession of the systems
1,10,101... innovatively described in the present invention.
In an absolutely advantageous way further it appears evident that said innovative system can be manufactured and installed with very reduced costs, since the technology for the detection, dissemination and retransmission of said data, and also for and from moving vehicles is complete and reliable, in even more advantageous way said transmission device 12 of said system may be, or be integrated with a common smartphones, with a portable navigation system, fixed, a tablet, etc. this obviously decidedly advantageous in terms of costs for users. Still, in a further advantageous manner the wide range of settings, alarms, data receive modes etc. allows each user the use of information personalized in view of specific needs. Yet, in a further innovative and advantageous way the data will be recorded on any type of path, in real time, and equally for example data can be processed and transmitted in real time to provide a useful means of support for the safety of the traveling on streets, highways and whatever path travelled by at least one user with said new system.

Note further that in a particularly innovative and advantageous way, said system is adapted to be implemented with sensors adapted to any kind of environmental sensing, such as for example the detection of CO₂, percentage of fine dust, noise, wind speed, wind direction, UV radiation, electric field and/or electromagnetic, pressure, pollens, etc., it will be possible the detection of atmospheric environmental data and also of further physical parameters.

With reference to Figures 4a, 4b, 4c there are shown three examples of prior art antennas for vehicles that have been advantageously modified to accommodate the whole, or in part of the innovative detection and monitoring of environmental data system 1 in the described mobile environment of the present invention, in particular in this case for example the antennas 22,23,24 are examples of assemblies 11 of sensors.

On the antenna of Fig. 4a are represented integrated with said antenna 22, a plurality of environmental and/or atmospheric sensors and/or additional types of sensors, adapted to monitor a plurality of parameters designed for this purpose such as, for example: at least one temperature sensor 2 located for example in a higher antenna end 22 relative to the vehicle not to influence the reading of the temperature with the temperature of the moving vehicle, at least a humidity sensor 6 for detecting the humidity of the air, at least a wetting sensor 83 to detect rain or snow, at least a pressure sensor 80 for detecting the impact for example of raindrops or snowflakes - depending on the detection frequency and the detected pressure.
and/or noise it could be deduced the presence of weak/medium/strong rain, hail, or weak /abundant snow etc..

Additionally, there can be present and be therefore part of said of detection system 11, even freezing sensors 81 (so-called "frost sensor"), a GPS sensor 82 directly integrated with the device or antenna 22,23,24 which in this case represents a particularly preferred embodiment of said assembly 11 to transmit the data recorded directly to the remote management system 20; Note that in this particularly preferred embodiment, therefore, said assembly 11 also includes part of the data management device 12 previously described for the previous embodiments; for which in the embodiment given here said data receiving device 12 does not necessarily have to comprise a sensor or means of detection gps 13; for which, in a particularly advantageous way, will not need to be equipped on said vehicle of a further device 12 equipped with any GPS, or, in extreme cases, be provided with an additional data management device 12; In fact, the previously defined components of the GPS tracking system 13, time reference device 9 and transmitter module and receive data 8 can be integrated directly with the innovative detection assembly or device 11 described by the present invention.

In a totally advantageous manner in a further embodiment, said assembly or the detection device 11 may be equipped with a modem for example gsm integrated which will be adapted to transmit the location data and any other data to a remote management system 20.

In this case obviously the user on board of said vehicle remains an active subject for sending data but not a subject user of the service. In a particularly advantageous manner, therefore, the detection and monitoring system can be further simplified and compact, this in any case depending on the preferences and needs of the individual user.

In the variant described here therefore said terminal 4 described hereinbefore, coincides with the remote management system 20, this variant is however comprised in the object of the invention is a mere variant embodiment.

Yet, in a further advantageous way say detection assembly 11 of said innovative system 1 may include gyroscopic sensors 84 to provide the proper sensor placement information to verify that the data collected are derived in effect from properly positioned sensors on the vehicle.
In a further advantageous way, to this purpose, but not only, there can be provided one or a plurality of acceleration sensors 85 suitable for example to assess whether the vehicle is stationary or in motion, and the stresses to which the vehicle is subjected; therefore in this case in a particularly advantageous way said detection and monitoring system 1 of environmental data in a mobile environment will be further able to assess abnormal stress suffered by the vehicle, such as road or problematic rough road surface.

In a further advantageous way said one or more assemblies 11 may include one or more anemometers sensors 92, for example, using ultrasounds (not represented here) to assess the degree of wind of the championship place.

In a further advantageous way there can be integrated possibly with said device assembly sensors for the detection of pollutants such as for example sensors for the detection of CO₂, thin powders, etc.

Yet, in a further advantageous way radio receiving means 86 can be integrated with said detection assembly 11 to maintain for example radio reception, whereby said assembly 11 were replaced in lieu of the common antenna of the vehicle, and also said means 86, being electric field and magnetic field detectors may suitable for the detection of further types of frequencies useful to discern electromagnetic signals from the vehicle for example due to electrical motors such as those actuating the wipers being of interest to monitor in wireless mode if the windshield wipers are activated, the operating speed to obtain additional information, in this case indirect about the possible presence of rain or other occurring meteoric precipitation.

Obviously these data will be evaluated in conjunction with other data received from the assembly or the detection device 11 itself, to give a most reliable detection of possible of events in place.

Furthermore said radio receiving means 86 can be useful for receiving radio signals generated by electromagnetic discharges, such as lightning, and then refine the characterization of the meteorological conditions in place.

Still on said detection assembly 11 may be present or including photovoltaic panels 70 to recharge the at least one supply device mentioned in the previous patent application, such as for example a battery.
Note that said feeding device can also be simply realized by direct connection to the assembly 11 to the vehicle electrical system. In a particularly advantageous way there will obviously be present in some or all versions or embodiments, that may be decided depending on the needs, brightness sensors 87 and atmospheric pressure 88 in addition to at least a Bluetooth interface for connection with a possible detection assembly 11 onboard the vehicle.

Note that the variants of Figures 4a, b, c are suitable to replace advantageously antennas already pre-existing on the vehicle, but in any case those preferred embodiments of variant forms can also be added to vehicles without antennas, if that is desired, or, especially for the version of fig. 4c and Fig. 6, said detection devices/assemblies 11/24, 11/29 can be mounted for example by means of magnetic connection means, or by means of adhesive connections or other type of connection, on any vehicle.

In particular, with reference to figures 4b and 4c are represented for example only the antenna rod, namely the assembly 11/23 having for example a screw coupling so as to be able to interface with sockets already mounted on passenger cars. This will also greatly facilitate aftermarket compatibility. The antenna rod 23, in addition to functioning still as a traditional antenna, comprises said sensors above such as, pressure sensors, temperature, wetting, brightness, surface pressure etc ... in addition to house also an electrical feeding device and an interface for wireless connection such as Bluetooth 89; in Fig. 4c it is shown another example of embodiment inspired to an installation on the roof with a typology of antenna assembly 11/24 "fin-like". The body of the fin 11/24 can also comprise the above mentioned sensors and the additional means or elements cited.

Figures 5 a and 5b show two further advantageous embodiments of the innovative detection assembly 11 of said innovative data detection and monitoring system in a mobile environment described by the present invention, in particular in this case said assembly or detection device 11 will be for example of cubic shape 11/25 and will be suitable for housing all or some of the above said sensors, as well as any additional sensors suitable for the purpose. Note that this embodiment is merely indicative, said assembly 11 can be made of any shape suitable for the purpose.

For example in figure 5b there are shown further embodiments of said assembly 11/26 or 11/27, for examples realized in the production phase of the vehicle and therefore partially
integrated with, for example, a rearview mirror 90 of said vehicle. The is no need to dwell here that would be redundant with the description, the figure has only the purpose to better highlight the vast plurality of embodiments suitable for the purpose and possible innovative functional variants of the monitoring and control system 1 for environmental data described by present invention.

Similarly in Fig. 6 it is shown an embodiment of a completely stand alone detection assembly 11/29, for example having hemispherical or spherical cap shape and is absolutely advantageous for the purchase and the aftermarket positioning on any type of vehicle, such as car, motorbike, truck, bicycle, scooter, etc. that may be of interest to interact with the information network that may of interest in present invention.

In a particularly advantageous way also in this case said assembly 11/29 may comprise or not parts of the detection and transmission device 12 described above, thus giving even more versatility and ease of use to the innovative system 1 described by the present invention. In an absolutely advantageous way said system 1 will be integrated or used on any type of vehicle, this to the benefit of the diffusion of said monitoring system 1, given that, as clearly explained in the aims of the present invention, the advantages will be much more for the management in traffic safety and vehicle, so the safety of users will be more increased as it said innovative detection and monitoring system for environmental data on the move will be diffused.

Finally in Figure 7 are presented examples of possible placements of said assemblies/devices 11 of said innovative system 1 shown merely by way of illustrative example.

These and further variants of the herein described innovative system 1 which variations in the form of assemblies 11 and/or device 12, numerosity, type of sensor, types of connection to the vehicle, integration, installation, data transmission mode, data reception mode, part of the vehicle in which said assembly or assemblies and or device 12 can be integrated etc., are all embodiments included in the object of the present invention.

Note that of course on the same vehicle can be inserted one or more of innovative detection systems; as previously said, said systems besides being able to communicate with each other from vehicle to vehicle can obviously also communicate with each other being positioned onboard of the same vehicle.
These are just some of the particularly preferred embodiments of the innovative detection and environmental data management system particularly suitable for a mobile environment described by the present invention, for which it is noted that variations in: the form, material, and in the types and numbers of detecting sensors, positioning mode and installation on the vehicle, data transmission mode, reception and display of such data mode, power supply mode of said system, as well as methods of use of said innovative system (in fact, nothing prohibits the use of said system also not a mobile environment to provide data detected by said at least fixed points to the database and centralized management system for example computerized and to increase the diffusion of the system), data processing mode provided, which can be managed in any way by means of dedicated software, etc. are to be considered object the protection provided by the present invention as best defined by the appended claims.
CLAIMS

1. A system (1,10) for detecting and monitoring of at least atmospheric data, particularly suitable for vehicles, comprising at least one detection device (2) such as at least an external temperature sensor, and at least means (3) for data transmission between said at least one device (2) and a terminal (4) for reading said detected data, characterized in that said at least one detection device (2) and at least said data transmission means (3) are comprised in an assembly (11) suitable to be inserted on each vehicle.

2. The system (1,10) for detecting and monitoring of at least atmospheric data according to the preceding claims, wherein said assembly (11) is an antenna for vehicles (11,22,23,24) or a spherical dome (29) or a mirror or part thereof (25,26) or any other stand alone or vehicle integrated device.

3. The system (1,10) for detecting and monitoring of at least atmospheric data according to the preceding claims, wherein one or more assemblies (11) can be mounted on the vehicle in any way suitable to the aim, for example by means of magnetic connection means, or by means of adhesive connections or other type of connection, on any vehicle.

4. The system (1,10) for detecting and monitoring of at least atmospheric data according to the preceding claims, wherein said system further comprises at least a data management device (12) further comprising at least means (5) for monitoring, saving and processing of data detected from the at least one temperature sensor (2), at least a spatial localization device (13), a temporal reference device (9), and a transmission and remote receiving module (8) of said data at least of temperature.

5. The system (1,10) for detecting and monitoring of at least atmospheric data according to the preceding claims, wherein said system is suitable for any type of vehicle, such as car, truck, bicycle, scooter, etc. and can be mounted and removed from the vehicle or other transporting means at any time without necessity of installation, neither of wires.

6. The system (1,10) for detecting and monitoring of at least atmospheric data according to the preceding claims, wherein said assembly (11) of said system further comprises at least humidity sensors (6), wetness (83), pressure contact sensors (80), atmospheric pressure sensors (88), freezing sensors (81), gyroscopic sensors (84), acceleration sensors (85), brightness
sensors (87), radio reception sensors (86), one or more anemometric sensors, for example ultrasonic sensors (92), photovoltaic panels (70) etc.

7 The system (1,10) for detecting and monitoring of at least atmospheric data according to the preceding claims, wherein said radio reception means (86) being electrical and magnetic field detectors are suitable for the detection of further types of frequencies useful to determine electromagnetic signals deriving from the vehicle such as for example those deriving from electrical motors such as those powering the windscreen wipers in order to monitor wirelessly the activation, speed of operation in order to obtain an indirect information regarding the possible presence of rain or of other actual meteorological precipitations.

8 The system (1,10) for detecting and monitoring of at least atmospheric data according to the preceding claims, wherein said at least one receiving device 12 that comprises data receiving means from said sensor assembly 11, comprises at least means, such as a display, to show also the detected data, means for the presetting of parameters such as for example presetting for the type of warnings that are desirable to receive, presetting of roads segments of interest, management mode of warnings (light, sound, etc.), transmission frequencies, presetting of sensor diagnostic for the functionality of the external assembly 11, etc.

9 The system (1,10) for detecting and monitoring of at least atmospheric data according to the preceding claims, wherein the detected data, may be compared with n typically non localized detections (e.g. meteorological radar, satellite images, etc.) in order to improve the definition of the type of meteorological situation that can be present for example on a certain road segment.

10 The system (1,10) for detecting and monitoring of at least atmospheric data according to the preceding claims, wherein said assembly (11/29) can comprise or not parts of the detecting and receiving device (12) providing in such a way even more versatility and simplicity of use to the system.

11 The system (1,10) for detecting and monitoring of at least atmospheric data according to the preceding claims, wherein the assembly (11/23) is provided for example of a screw coupling in order to interface with the inserts already mounted on the cars to facilitate compatibility also aftermarket.

12 The system (1,10) for detecting and monitoring of at least atmospheric data according to claim 3, wherein, said assembly (11) comprises at least a modem for example an integrated gsm
that will be able to transmit the position data and any other data to a remote management system (20).

13 The system (1,10) for detecting and monitoring of at least atmospheric data according to the preceding claims, wherein said means (86), being electrical and magnetic field detectors are furthermore suitable for the detection of types of frequencies useful to determine electromagnetic signals deriving from the vehicle for example due to electrical motors such as those powering the windscreen wipers in order to monitor wirelessly the activation of the windscreen wipers and their speed of operation.

14 The system (1,10) for detecting and monitoring of at least atmospheric data according to the preceding claims, wherein said assembly may comprise sensors for the detection of polluting substances such as sensors for CO₂ detection, or of thin powders, etc.

15 The system (1,10) for detecting and monitoring of at least atmospheric data according to the preceding claims, wherein said detecting system in a mobile environment can be suitable to be interfaced with further system of data transmission in mobile environments.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

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According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

G01W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
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**Date of the actual completion of the international search**

6 June 2017

**Date of mailing of the international search report**

20/06/2017

Name and mailing address of the ISA/

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Bagnera, Carlo
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