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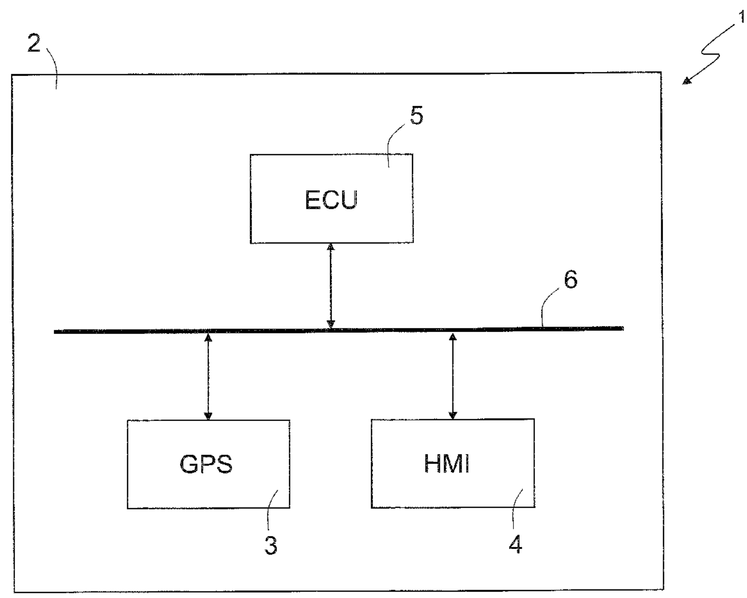

(57) **Abstract**: A fuel saving-aimed motor vehicle driver assistance system configured to receive and process motor vehicle-related data and motor vehicle position-related data to identify recurrent routes of a motor vehicle and to provide a motor vehicle driver, via an automotive human-machine interface, with motor vehicle driving assistance recommandations for fuel saving along the routes. The motor vehicle driver assistance system is configured to identify recurrent routes of the motor vehicle by determining a succession of geographic points, referred to as Waypoints, along a route of the motor vehicle, at which values of a series of physical quantities are determined and recorded, which define the attributes of the Waypoints. The Waypoint attributes are then updated when the vehicle travels through them. For each current motor vehicle position, a search is made for the Waypoint spatially closest to the current motor vehicle position and having certain characteristics, such that if such a Waypoint is not found, then a new Waypoint is defined, or else, if such a Waypoint is found, then variable Waypoint attributes are updated. The so-defined Waypoints are then concatenated so as to form an ordered list of Waypoints belonging to the same recurrent route. The characteristic points of the routes, such as bends, roundabouts and traffic lights, are identified and optimal speed profiles and primary controls for the motor vehicle at the characteristic points are computed. Based on the computed optimal speed profiles and primary controls and by means of the automotive human-machine interface, the motor vehicle driver is then provided with motor vehicle driving recommendations for fuel saving along the routes.

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PREVENTIVE FUEL SAVING-AIMED MOTOR VEHICLE DRIVER ASSISTANCE

TECHNICAL FIELD OF INVENTION

The present invention relates to preventive fuel saving-aimed motor vehicle driver assistance, in particular a passenger road motor vehicle, such as a car, bus, camper van, etc., or a goods road motor vehicle, such as an industrial vehicle (lorry, lorry-trailer combination, articulated vehicle, etc.) or a light or medium-weight commercial vehicle (van, box truck, chassis cab, etc.).

STATE OF THE ART

The increase in public awareness of climatic changes and the introduction in many countries of CO_2 emission control legislation for passenger cars and commercial vehicles are forcing original equipment manufacturers (OEMs) and suppliers to improve the energy efficiency of vehicles through the use of sophisticated and expensive systems and components.

Unfortunately, however, even the most efficient vehicle produces large quantities of CO_2 if it used by a driver with an aggressive driving style and/or in unfavourable traffic conditions. As such, the measures or technologies that allow assessing driver behaviour and informing the driver on the most efficient route are able to offer significant improvements in terms of fuel consumption and reduction of CO_2 emissions.

Improved navigation systems (eco-navigation), systems that enable vehicles to communicate with other vehicles and/or with dedicated infrastructures, and systems able to suggest the most effective way of driving (eco-driving) have thus been proposed and which will play a significant role in the future in emission reduction thanks to the favourable cost-benefit ratio associated with them.

US 2012/0078496 A1 discloses an example of a preventive driver assistance system for a motor vehicle for the purpose of controlling fuel consumption, in which navigation data, situational awareness and driving style analysis are combined to provide recommendations for environmentally-friendly driving. In particular, the system combines visual and tactile feedback, especially in the form of a drive configuration, a display concept and/or a deceleration assistant, wherein the emphasis is, on the one hand, on a modified accelerator pedal characteristic and, on the other hand, on the eco-recommendations for interactive output of efficient driving instructions.

EP 1 973 078 A1 relates to an improvement in the driving efficiency of a vehicle by providing various indications to the vehicle’s driver reflecting the driving efficiency, the indications being based on the comparison of currently recorded parameters and parameters recorded during previous drives of the same route or with parameters recorded by similar systems of other vehicles.

GB 2 432 437 A relates to a vehicle fuel consumption measurement system comprising a digital storage for storing information on the fuel consumption, and related to location. The system includes a fuel flowmeter installed between vehicle's fuel tank and engine. The information is stored for the duration of a predefined itinerary. A fuel consumption measurement method comprising: storing a vehicle fuel consumption rate; integrating over a specific path; multiplying by cost of fuel; tagging each path with information relating to a plurality of variables for each travel; storing information for the paths. A control center is used to monitor and advise a plurality of cars how to reduce fuel consumption.

SUBJECT AND ABSTRACT OF THE INVENTION

The preventive driver assistance system described in the aforesaid patent application needs to interface with automotive infotelematic equipment capable of providing a series of characteristics in the form of data and functions, such as digital maps, route data provided by an Advance Driver Assistance System (ADAS), a route computing function provided by a navigation system and a deceleration assistance function for the vehicle.

For this reason, the preventive driver assistance system described in the aforesaid patent application is destined to be installed only on vehicles fitted with high-level infotelematic systems capable of making all of these characteristics available.

The object of the present invention is therefore to provide a preventive motor vehicle driver assistance system that reduces dependence on the characteristics of the motor vehicle infotelematic systems, so as to allow its installation on motor vehicles fitted with lower level infotelematic systems as well, thus increasing the diffusion on motor vehicles, with consequent benefits in terms of reductions in fuel consumption and pollutant gas emissions.

According to the present invention, a preventive motor vehicle driver assistance system is provided, as defined in the appended claims.

BRIEF DESCRIPTION OF DRAWINGS

The attached figure shows a block diagram of a driver assistance system for a motor vehicle according to the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

The present invention will now be described in detail with reference to the attached figures to allow an expert in the field to embody it and use it. Various modifications to the described embodiments will be immediately obvious to experts in the field, and the generic principles described herein can be applied to other embodiments and applications without leaving the scope of protection of the present invention, as defined in the appended claims. Therefore, the present invention should not be considered as limited to the embodiments described and illustrated herein, but is to be accorded the widest scope consistent with the principles and features disclosed and claimed herein.

In the attached figure, reference numeral 1 indicates, as a whole, a preventive fuel saving-aimed motor vehicle driver assistance system for a motor vehicle 2 according to the present invention.

The driver assistance system 1 basically comprises:

- an on-vehicle locating device 3, conveniently of a satellite type;
- an automotive human-machine interface 4 comprising a graphical electronic display device and, optionally, an electronic visual indicator device and/or an electronic haptic indicator device;
- an electronic control unit 5 connected to the on-vehicle locating device 3 and to the automotive human-machine interface 4 by means of an automotive on-board communication network 6, for example, CAN, FlexRay or others, to receive and process data provided by the on-vehicle locating device 3 and provide the driver, by means of the automotive human-machine interface and based on the data provided by the on-vehicle locating device 3 and on motor vehicle-related data such as vehicle speed, fuel consumption, engaged gear, accelerator

pedal and brake pedal positions, etc., with visual/audible/haptic driving assistance feedbacks, as described in detail hereinafter, which feedbacks, if put into practice by the driver, would result in fuel savings.

In particular, the electronic control unit 5 is programmed to execute a driver assistance software designed to identify the recurrent routes of the motor vehicle and provide the motor vehicle driver with feedbacks relating to the motor vehicle driving along the routes, feedbacks that, if put into practice by the driver, would result in a fuel consumption reduction and, in consequence, in pollutant emission reduction.

In particular, the driver assistance software is designed to execute, each motor vehicle journey, defined as the time period between a starting and subsequent switching off of the motor vehicle's engine, a number of functions, described in detail hereinafter, by means of which the identification of recurrent routes is achieved:

1. <u>Waypoint Management</u>, which comprises the following sub-functions:

- Waypoint Tracking
- Waypoint Matching
- Waypoint Learning

2. <u>Route Management</u>, which comprises the following sub-functions:

- Route Identification
- Route Organization
- Route Optimization

3. <u>Driver Coaching</u>

With regard to the Waypoint Management function, broadly speaking, the Waypoint Tracking function is aimed at defining (in the sense of identifying/creating/selecting), along a route of the motor vehicle during a journey and based on data from the on-vehicle locating device 3, a succession of points, hereinafter referred to as Waypoints and indicated with WPs for brevity, which are used as references for vehicle navigation and are defined by primary attributes such as latitude, longitude and height above sea level and, optionally, by further secondary attributes, as described in greater detail hereinafter, and are defined (determined) along the motor vehicle route according to a dissemination criterion described in detail hereinafter.

In particular, values of a number of physical quantities, listed below, are determined and recorded at the WPs, these values defining the so-called attributes of the WPs, based on which the Route Management and Driver Coaching functions are then executed. As will become clearer from the ensuing description, each WP may belong to a number of routes and therefore may have different attributes for the different routes to which it belongs.

The attributes of each WP comprise:

- Identifier
- Geographic Attributes: latitude, longitude, height above sea level, and direction
- Use: state (learning, optimization, etc.) and number of passages
- Journey Attributes comprising:
  - vehicle speed statistics in the WP, differentiated by time slot and WP crossing direction, and comprising percentile, conveniently quantized into discrete values 1, 5, 25, 50, 75, 95 and 99, and time percentage the motor vehicle is stationary in the WP;

- vehicle fuel consumption statistics in the WP, differentiated by time slot and WP crossing direction, and comprising average fuel consumption per time unit (litres/hour) and cut-off percentage; and, optionally,
- other on-vehicle system usage statistics, differentiated by time slot and WP crossing direction, such as low gear usage percentage in the WP, brake pedal usage percentage in the WP, etc.

The Waypoint Learning function is designed to update the WP attributes whenever the motor vehicle travels through them, except for the invariant ones, such as the Identifier and Geographic Attributes.

The Waypoint Matching function is designed to search, for each current motor vehicle position provided by the satellite localization system, typically at a frequency of 1 HZ, for the WP which is spatially closest to the current motor vehicle position and having certain characteristics. If such a WP is not found, then the Waypoint Tracking function is executed, by means of which a new WP is defined; otherwise, if such a WP is found, then the Waypoint Learning function is executed, by means of which the WP attributes are updated.
The search for the spatially closest WP is performed:

- based on a scoring function, in which the motor vehicle driving direction is included in the scoring criterion,
- only when the motor vehicle is in motion, as the travelling direction is unreliable if the motor vehicle is stationary,
- based on a threshold distance such that, if the search finds no WP with the necessary characteristics within this threshold distance, then a new WP is defined.

A scoring function for searching for the spatially closest WP could, for example, be the following one, based on Pythagoras' theorem:

$$D = \mathrm{radq}((lat_v - lat_w)^2 + (long_v - long_w)^2 + (dir_v - dir_w)^2)$$

where D represents the score and is the distance between the current motor vehicle position and the WP considered, and where the subscripts v and w indicate the quantities related to the motor vehicle and to the WP, respectively.

Given that the search for the spatially closest WP performed by the Waypoint Matching function needs to be exhaustive, and therefore the computation of the scoring function can be computationally heavy, one or more of the following stratagems can be adopted to mitigate this burden:

- when computing the differences in latitude and longitude, only the WPs for which the difference in direction is less than 90° could be taken into consideration;
- defining partially overlapping geographical work areas, to be loaded separately; and
- defining preliminary selection criteria for WPs, for example, rejecting those that have differences in latitude or longitude greater than 500 metres or a directional difference exceeding 180°.

The WPs are disseminated along the motor vehicle route in accordance with a dissemination criterion based on the following three quantities, measured or computed starting from the last WP disseminated:

- elapsed time
- travelled distance, and
- route curvature.

In particular, the WP dissemination criterion contemplates that a new WP can be disseminated if all three of the quantities have values greater than corresponding minimum values, and is then actually disseminated when at least one of the quantities reaches a corresponding upper value.

Possible lower and upper values for the three quantities are listed in the following table:

Quantity	Minimum Value	Maximum Value
Time [s]	3	10
Distance [m]	25	200
Curvature [1/m]	0	25

Furthermore, given that the Waypoint Matching function is used not only in the Tracking phase, but also in the Coaching phase in order to identify the WP spatially closest to the current position of the vehicle for reference purposes, it is necessary that the dissemination criterion for the WPs along the route of the vehicle is such as to ensure that the Waypoint Matching function always returns a WP to refer to in the Coaching phase.

For this reason, a corresponding area of influence is associated with each WP, this area having a shape and size such that the areas of influence of adjacent WPs partially overlap.

Conveniently considering areas of influence of a circular shape centred on the related WPs and having radii equal to the maximum matching distance, defined as the maximum distance between a WP and the current motor vehicle position below which that WP is desired to be representative of the current motor vehicle position; in order for the areas of influence of adjacent WPs to be partially overlapping, it is necessary that the maximum distance between two adjacent WPs is less than twice the radius r of the areas of influence.

Conveniently, the motor vehicle speed statistics in the WPs, which form part of the attributes of the WPs, can be computed based on either the instantaneous motor vehicle speeds at the WPs or the average motor vehicle speeds in the corresponding areas of influence.

Passing now to the Route Management, the Route Identification function is designed to perform a concatenation of the WPs according to predetermined criteria so as to form an ordered list of WPs belonging to a same recurrent route.

These criteria substantially regard:

- the sequence in which the WPs are defined, i.e. their progressive sequence number,
- the distance between one WP and the next, such that beyond a certain value, the route is interrupted and the WP becomes the final WP, and
- the "typical" sequence in which the WPs are matched during the journeys.

Attributes are then defined for each identified recurrent route, comprising:

- Route Identifier
- Route Name
- Geographic Attributes: WPs belonging to the route, route start WP, route end WP, total distance, partial distances between adjacent WPs, gradients, etc.
- Use: learning, optimization, etc.
- Driver Attributes: average journey time, WP influence area crossing times, namely elapsed time from when the WP Matching function determines that a WP is the one closest to the current motor vehicle position to when it determines that

another has become the closest WP to the current motor vehicle position, journey average fuel consumption, etc.

- Optimized attributes: typically, the optimal speed profile and, in greater detail:
  - Optimal accelerator pedal position
  - Optimal gear
  - Total route travelling time constraints for the optimizer
  - Target speed, which is calculated on the basis of the other attributes of the WP and added to the attributes of the WP.

The Route Organization function is designed to identify and cleanse the route collection of:

- route segments that are too short, for example, formed by single WPs or sequences of only two or three consecutive WPs, and
- unused routes, or rather routes that are sufficiently long, but with too low a number of passages in relation to the time that has passed since these routes were defined.

The Route Optimization function is designed to identify characteristic points of the routes such as bends, roundabouts and traffic lights, compute the optimal speed profiles and primary controls for the motor vehicle at these characteristic points, and then compute the expected journey times and the expected fuel consumption along the routes.

The Route Optimization function is performed on a particular route only after the Learning phase has been completed for a sufficient number of WPs belonging to that route, namely when the number of passages for those WPs is greater than a certain threshold, for example, from a minimum of five to a maximum of twelve passages.

The identification of the characteristic points of the routes is performed by searching for the so-called minimum WPs, namely those WPs that satisfy a certain condition in terms of crossing speed, for example, those for which the 75th percentile of the smoothed speed is less than the 75th percentile of the smoothed speed of the previous WP and less than or equal to the 75th percentile of the smoothed speed of the next WP. This condition can be reinforced by performing the following additional check, namely that the difference between the unsmoothed acceleration on exiting the WP considered measured on the 75th percentile (average acceleration from the WP considered to the next one) and the acceleration on entering (which is negative) exceeds a certain threshold, for example, 0.2 (in m/s^2).

Furthermore, in order to avoid finding false minimums at normal cruising speeds, above a certain WP crossing speed, for example 90 km/h, it does not make sense to search for minimums as WPs for which the 75th percentile smoothed speeds are greater than this threshold will never be classified as minimums.

In addition, to lighten the search for minimums, a check could also be made that the WP prior to that considered is not already a minimum, thereby avoiding, in the affirmative case, considering a WP following a minimum in the search for minimums. The identified minimum WPs are then classified in three categories, namely traffic lights, stop signs or tailbacks, and bends or roundabouts.

In particular, the WPs that correspond to traffic lights are determined first, after which those that correspond to stop signs or tailbacks are searched for among the minimum WPs, namely those for which the 75th percentile of the speed in lower than or equal to a predetermined threshold, for example

20 km/h, and, lastly, the remaining WPs are classified as bends or roundabouts.

Computation of the optimal speed profiles and primary controls for the motor vehicle at the characteristic points of the routes, as well as the expected journey times and the expected fuel consumption along the routes, is carried out based on the attributes of the WPs of the routes, typically the speeds of crossing the routes and their characteristic points, vehicle parameters such as the run-down curve (deceleration curve of the vehicle with the accelerator pedal released and gear engaged) or the power of the vehicle, and where the following attributes of each WP are considered:

- Header: Tmin (sec) Tmax (sec): Total route travelling time constraints for the optimizer
- Identifiers of the WPs
- Partial distances between successive WPs
- Heights above sea level (for calculating gradients)
- Target speed
- Approximate curvature.

Additional quantities relating to the WPs that could be used to refine the calculation include:

- Speed profile at 25th percentile
- Speed profile at 75th percentile
- whether the WP is low speed, high speed or transitional
- whether the vehicle enters the WP in deceleration, in acceleration or at a substantially constant speed with respect to the previous or next WP
- type of minimum: traffic lights, stop sign or bend.

Feedback on the optimal speed profiles and primary controls for the motor vehicle at the characteristic points of the routes, as well as the expected journey times and the expected consumption along the routes could, for example, be provided in the following manner, with a certain spatial resolution (rate), for example, every 5 metres travelled by the motor vehicle:

- Identifiers of the WPs (to facilitate Waypoint Matching)
- Progressive distance
- Optimal speed
- Gear to use
- Percentage of torque to output
- Brake usage flag
- Cumulative fuel utilization

The Driver Coaching function is then executed based on the optimal speed profiles and the primary controls for the motor vehicle at the characteristic points of the routes, which, through the motor vehicle human-machine interface, provides the driver with visual and/or audible and/or haptic motor vehicle driving recommendations that, if put into practice by the driver, would result in more efficient or environmentally-friendly motor vehicle driving.

The visual recommendations can be provided to the driver by displaying messages of the type "slow down" or "remove foot from accelerator pedal", also in combination with "speed limit ahead" or "bend ahead" and/or further coloured indicators or message flashing, or by displaying dedicated icons, for example, an icon depicting a foot raised from the accelerator pedal, or an icon depicting a speed limit road sign, etc.

CLAIMS

1. A fuel saving-aimed motor vehicle driver assistance system characterised by being configured to receive and process motor vehicle-related data and motor vehicle position-related data to identify recurrent motor vehicle routes and to provide a motor vehicle driver, along the routes and via an automotive human-machine interface, with motor vehicle driving recommendations which, if put into practice, would result in fuel savings;

wherein the motor vehicle driver assistance system is configured to identify recurrent routes of the motor vehicle by implementing the following functions:

- Waypoint Management comprising:
  - Waypoint Tracking,
  - Waypoint Matching, and
  - Waypoint Learning;
- Route Management comprising:
  - Route Identification, and
  - Route Optimization;
- Driver Coaching;

wherein the Waypoint Tracking function is designed to define, along a motor vehicle route and based on motor vehicle position data, a succession of geographic points, referred to as Waypoints, used as motor vehicle navigation references, at which values of a series of physical quantities are determined and recorded, which define the attributes of the Waypoints, and based on which the Route Management function is then executed;

wherein the Waypoint Learning function is designed to update the Waypoint attributes when the motor vehicle travels through the Waypoints;

wherein the Waypoint Matching function is designed to search, for each current motor vehicle position, for the Waypoint spatially closest to the current motor vehicle position and having predetermined characteristics, such that if such a Waypoint is not found, the Waypoint Tracking function is then executed, by means of which a new Waypoint is defined, or else, if such a Waypoint is found, the Waypoint Learning function is then executed, by means of which variable Waypoint attributes are updated;

wherein the Route Identification function is designed to concatenate the Waypoints so as to form an ordered list of Waypoints belonging to a same recurrent route;

wherein the Route Optimization function is designed to identify characteristic points of the routes, such as bends, roundabouts and traffic lights, compute optimal speed profiles and primary controls for the motor vehicle at the characteristic points, and then compute he expected journey times and expected fuel consumption along the routes;

and wherein the Driver Coaching function is designed to provide the motor vehicle driver, based on the optimal speed profiles and the primary controls computed for the characteristic points of the routes and by means of the automotive human-machine interface, with motor vehicle driving recommendations along the routes, which, if put into practice, would result in more efficient or environmentally-friendly motor vehicle driving.

2. A motor vehicle driver assistance system according to claim 1, wherein the Waypoint Tracking function is designed to determine new Waypoints along a motor vehicle route in accordance with a dissemination criterion based on the following three quantities, measured or computed from the last Waypoint determined:

- elapsed time
- travelled distance, and
- route curvature.

3. A motor vehicle driver assistance system according to claim 2, wherein the Waypoint Tracking function is designed to determine a new Waypoint along a motor vehicle route when all three quantities have values greater than corresponding minimum values, and when at least one of the corresponding

quantities reaches a corresponding upper value.

4. A motor vehicle driver assistance system according to any one of the preceding claims, wherein the Waypoint Tracking function is designed to associate a corresponding area of influence with each Waypoint having a shape and size such that the areas of influence of adjacent Waypoints partially overlap, so that the Waypoint Matching function implemented during the Driver Coaching phase in order to identify the Waypoint spatially closest to the current motor vehicle position always returns a reference Waypoint.

5. A motor vehicle driver assistance system according to claim 4, wherein the areas of influence have a circular shape centred on the associated Waypoints, have radii r equal to the maximum matching distance, defined as the maximum distance between a Waypoint and the current motor vehicle position below which that Waypoint is desired to be representative of the current motor vehicle position, and the maximum distance d between two adjacent Waypoint is lower than twice the radius r of the areas of influence.

6. A motor vehicle driver assistance system according to any one of the preceding claims, wherein the Waypoint Matching function is designed to search for the Waypoint spatially closest to the current motor vehicle position:

- based on a scoring function, in which the direction of travel of the motor vehicle is included in the scoring criterion,
- only when the motor vehicle is in motion,
- based on a threshold distance such that, if the search finds no Waypoint with the necessary characteristics within this threshold distance, then a new Waypoint is defined.

7. A motor vehicle driver assistance system according to any one of the preceding claims, wherein Waypoint attributes comprise:

- Identifier
- Geographic Attributes: latitude, longitude, height

above sea level, and direction

• Use: status (learning, optimization) and number of passages of the motor vehicle in the Waypoint

• Journey Attributes comprising:

- motor vehicle speed statistics in the Waypoint differentiated by time slot and Waypoint crossing direction and comprising percentile, conveniently quantized to assume discrete values, and time percentage the motor vehicle is stationary in the Waypoint;

- vehicle fuel consumption statistics in the Waypoint differentiated by time slot and Waypoint crossing direction and comprising average fuel consumption per unit time and cut-off percentage; and, optionally,

- other on-vehicle system usage statistics differentiated by time slot and Waypoint crossing direction, such as low gear usage percentage in the Waypoint and brake pedal usage percentage in the Waypoint.

8. A motor vehicle driver assistance system according to any one of the preceding claims, wherein the Waypoint Learning function is designed to terminate when a certain criterion is satisfied, in particular when the number of passages of the motor vehicle through the Waypoints is greater than a certain threshold.

9. A motor vehicle driver assistance system according to any one of the preceding claims, wherein the Route Optimization function is executed for a route only after the Learning phase has been completed for a predetermined number of Waypoints belonging to that route.

10. A motor vehicle driver assistance system according to any one of the preceding claims, wherein the Route Identification function is designed to perform a concatenation of the Waypoints based on:

• sequence in which the Waypoints are defined, i.e. their progressive sequence number,

• distance between one Waypoint and the next one, such that beyond a certain value, the route is interrupted and a Waypoint becomes a final Waypoint, and

• typical sequence in which the Waypoints are matched during the journeys.

11. A motor vehicle driver assistance system according to any one of the preceding claims, wherein the Route Identification function is further designed to compute attributes of each identified recurrent route comprising:

• Route Identifier

• Route Name

• Geographic Attributes: Waypoints belonging to the route, route start Waypoint, route end Waypoint, total distance, partial distances between adjacent Waypoints, gradients, etc.

• Use: learning, optimization, etc.

• Driver Attributes: average journey time, Waypoint influence area crossing times, namely elapsed time from when Waypoint Matching function determines that a Waypoint is the one closest to the current the motor vehicle position to when it determines that another one has become the closest Waypoint to the current the motor vehicle position, journey average fuel consumption, etc.

• Optimized attributes: typically, the optimal speed profile and, in greater detail:

• optimal accelerator pedal position

• optimal gear.

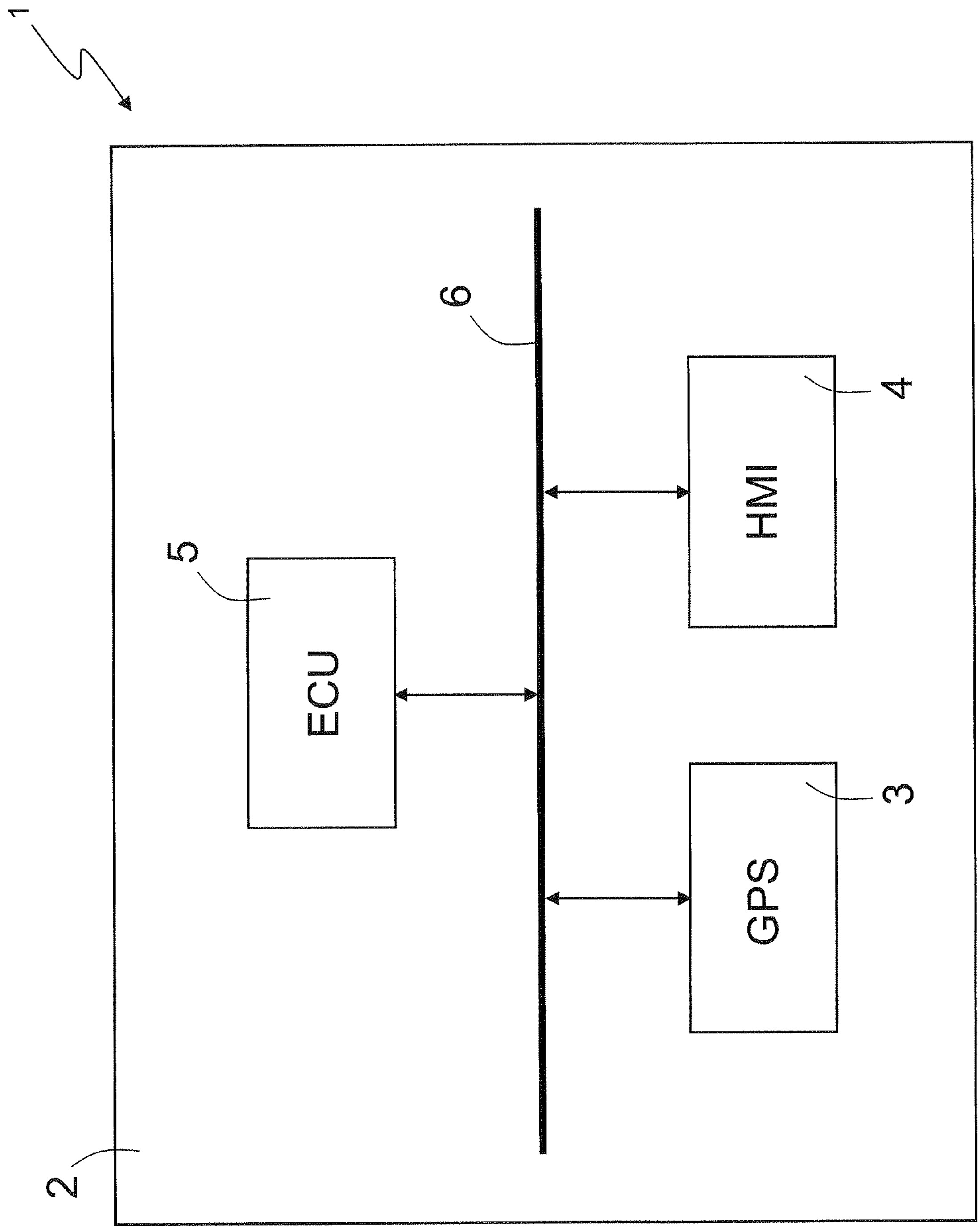
12. A motor vehicle driver assistance system according to any one of the preceding claims, wherein the Route Management function comprises the following function:

• Route Organization, which is designed to identify and cleanse the route collection of route segments that are too short, formed by single Waypoints or by sequences of a few consecutive Waypoints, and unused routes, namely routes that are sufficiently long routes, but with too low a number of passages in relation to the time that has passed since these routes were defined.

13. A motor vehicle driver assistance system according to any one of the preceding claims, wherein the Route Optimization function is further designed to identify characteristic route points by searching for minimum Waypoints, namely those Waypoints that satisfy a predetermined condition in term of Waypoint crossing speed.

14. A motor vehicle comprising a motor vehicle driver assistance system according to any one of the preceding claims.

15. A motor vehicle driver assistance software loadable in an automotive electronic control system and designed to cause, when executed, the system to become configured as claimed in any one of the preceding claims.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ECU
HMI
GPS

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2014/061474

A. CLASSIFICATION OF SUBJECT MATTER
INV. G01C21/26 B60W50/14 B60W40/09 G06F17/30 G08G1/09
G07C5/08
ADD.

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)
G01C B60W G06F G08G G07C

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 973 078 A1 (HEUSCH CHRISTIAN [CH]) 24 September 2008 (2008-09-24) paragraphs [0003] - [0034]; figure 7	1-15
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A	US 2007/027593 A1 (SHAH BAIJU [US] ET AL) 1 February 2007 (2007-02-01) paragraphs [0021] - [0030]	1-15

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
8 October 2014	17/10/2014

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Gagin, Thibaut

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

International application No
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