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(54) Title: METHOD AND APPARATUS FOR PROVIDING A DRIVER WITH SUPPORT FOR TAKING DECISIONS BEFORE OVERTAKING

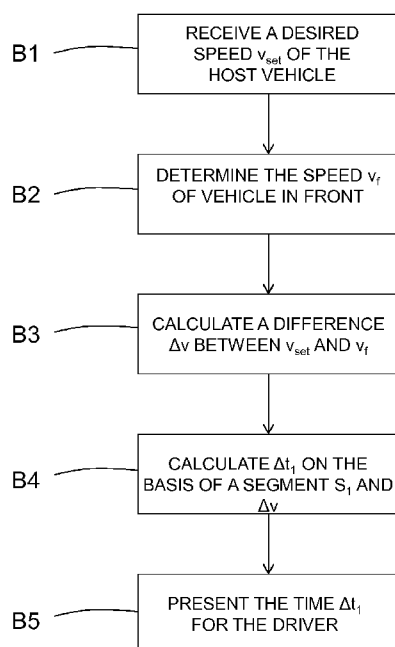


FIG. 6

(57) Abstract: Method and apparatus for providing a driver of a host vehicle with support for decisions before overtaking a preceding vehicle. The method comprises receiving a speed v_{set} which denotes the host vehicle's desired speed, and determining a speed v_f of the preceding vehicle. This is followed by calculating a difference Δv between v_{set} and v_f and by using the calculated difference Δv as a basis for calculating for at least one segment S_1 of its journey how much more time Δt_1 the host vehicle would take to travel the segment S_1 at the speed v_f instead of at v_{set} . The time Δt_1 is thereafter presented for the driver of the host vehicle.



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Method and apparatus for providing a driver with support for taking decisions before overtaking

Field of the invention

- 5 The present invention relates to a method and an apparatus for providing a driver with support when deciding whether to overtake.

Background to the invention

- Vehicles such as trucks are often subject to speed limits and are driven at an approximately uniform speed on roads. Some trucks for example travel at 80
10 km/h, others somewhere between 80 and 89 km/h. Those travelling slightly faster than others will often be tempted to overtake, which may take quite a long time and result in the formation of queues of other vehicles such as cars on the road behind the trucks. A truck driver is usually required to reach a final destination at
15 a certain time, which may cause him/her to feel stressed and therefore wish to overtake.

- In the future most trucks will be equipped with adaptive cruise control based on automatically following another vehicle. The vehicles may thus form a so-called
20 vehicle train in which they travel close together and can therefore save fuel because of the reduced air resistance.

- For a haulage enterprise it is generally desirable that a vehicle which is part of its fleet be driven as fuel-economisingly as possible, subject to reaching the final
25 destination within a stated time. There is however a lack of support to help a driver in a potential overtaking situation to reach a correct decision about whether to overtake, or stay behind, a vehicle in front. The driver will not know whether he/she can reach the final destination on time without overtaking.

- 30 A known practice from EP2060466B1 is to provide driver assistance in an overtaking situation whereby the driver is advised against overtaking if the difference in speed between his/her vehicle and those in front is too small.

However, the object is to prevent traffic stacking and the driver is not provided with any basis for knowing whether he/she will reach the final destination on time.

It is therefore an object of the present invention to provide the driver with support
5 for taking decisions in an overtaking situation, on the basis of minimising fuel consumption but reaching the final destination on time.

Summary of the invention

In a first aspect, the above object is at least partly achieved by a method
10 according to the attached claims for providing a driver of a host vehicle with support for taking decisions before overtaking a vehicle in front. The method comprises receiving a speed v_{set} which denotes the host vehicle's desired speed, and determining a speed v_f of the preceding vehicle. A difference Δv between v_{set} and v_f is determined and serves as a basis for calculating for at least one segment
15 S_1 of its journey how much more time Δt_1 the host vehicle would take to travel the segment S_1 at the speed v_f instead of at v_{set} . The method also comprises presenting the time Δt_1 for the driver of the host vehicle.

In a second aspect, the above object is at least partly achieved by an apparatus
20 according to the attached claims for providing a driver of a host vehicle with support for decisions before overtaking a vehicle in front. The apparatus comprises a processor unit configured to receive speed data which represent a speed v_{set} which denotes the host vehicle's desired speed, and to determine a speed v_f of the preceding vehicle. The processor unit is also configured to
25 calculate a difference Δv between v_{set} and v_f , and to calculate on the basis of the difference Δv for at least one segment S_1 of its journey how much more time Δt_1 the host vehicle would take to travel the segment S_1 at the speed v_f instead of at v_{set} . The processor unit is further configured to generate a first presentation signal α_1 which represents the time Δt_1 , and to send it to a presentation unit which
30 then presents the time Δt_1 for the driver.

In either of these aspects the driver of the host vehicle is helped to make judicious choices whereby he/she can balance the requirement for delivery precision and the desire to save fuel. This may lead rather to choosing not to overtake vehicles in front and to consequent fuel saving and/or better traffic flow.

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In a third aspect, the object is at least partly achieved by a computer programme P which comprises programme code for causing an apparatus to perform steps according to the method. In a fourth aspect, the object is at least partly achieved by a computer programme product comprising a programme code stored on a
10 computer-readable non-volatile medium for conducting the method when said programme code is run on an apparatus.

Preferred embodiments are described in the dependent claims and the detailed description.

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Brief description of the attached drawings

The invention is described below with reference to the attached drawings, in which:

Fig. 1 depicts an example of a host vehicle with which the method may be
20 employed and in which the apparatus may be integrated.

Fig. 2 depicts a host vehicle and a preceding vehicle travelling along a road.

Fig. 3 depicts the apparatus according to an embodiment of the invention.

Fig. 4 illustrates examples of average fuel savings for all of the vehicles in a train made up of sundry different vehicles.

25 Fig. 5 illustrates what may in one embodiment be displayed on the host vehicle's presentation unit.

Fig. 6 depicts a flowchart for the method according to an embodiment.

Detailed description of preferred embodiments of the invention

30 Fig. 1 depicts an example of a vehicle 1 in which an apparatus 2 for providing the vehicle's driver with support in making decisions may be integrated. The vehicle here depicted takes the form of a truck but may instead be for example a car or

other suitable vehicle. The vehicle 1 is provided with a presentation unit 3 which may comprise a display screen and/or a loudspeaker. The vehicle may also be provided with a detector unit 4 which may be intended to determine a distance d_{diff} from a preceding vehicle 5, and/or a speed difference v_{diff} between the vehicle 1 and the preceding vehicle 5. Preceding vehicle means a vehicle travelling immediately in front of the host vehicle. The detector unit 4 may for example comprise a radar unit, a camera unit and/or a laser unit. The host vehicle may further be provided with a cruise control 10, e.g. an adaptive cruise control, which the driver can set to maintain a certain desired speed v_{set} for the host vehicle.

10 The cruise control will thus be configured to ensure that the host vehicle maintains a certain time gap t_{set} between the host vehicle and the preceding vehicle. The desired speed v_{set} may also be called the vehicle's set speed. The cruise control may then be configured to calculate on the basis of the host vehicle's speed the time gap t_{set} which needs to be maintained relative to the preceding vehicle on the

15 basis of the host vehicle's speed, and to generate reference values for an engine system of the host vehicle which regulates the host vehicle on the basis of the reference values so that the time gap between the vehicles 1, 5 is maintained. The reference values may for example be speed reference values which denote the speed at which the vehicle 1 needs to travel to maintain the time gap, or

20 energy reference values which denote the amount of fuel which needs to be injected into the vehicle's engine for the time gap to be maintained. The host vehicle may also be provided with a navigation system 11 configured to use the vehicle's current location p_{ego} and final destination as a basis for determining the whole segment which the vehicle is to travel. Whole segment means the length of

25 the segment between the host vehicle's current location and its final destination. The host vehicle's current location may for example be determined by a positioning unit 15 on board which is configured to determine the vehicle's location. The positioning unit 15 may for example be configured to receive signals from a global positioning system such as GNSS (Global Navigation Satellite

30 System), GPS (Global Positioning System), GLONASS, Galileo or Compass. Alternatively, the positioning unit may for example be configured to receive signals from one or more detectors 4 on board the host vehicle which measure relative

distances from such objects as a road intersection, vehicles in the surroundings or the like with known locations. The positioning unit may then use these relative distances as a basis for determining the host vehicle's location. A detector may also be configured to monitor for example signage, e.g. at a road intersection, which represents a certain location. The positioning unit may then be configured to determine its location by monitoring the signage. The positioning unit may instead be configured to determine the strength of one or more signals from a plurality of base stations and/or road intersections etc. with known locations, and thereby determine the host vehicle's location by triangulation. The above techniques may of course be combined to verify the vehicle's location. The vehicle's final destination may for example be indicated by the driver or be communicated by a haulage enterprise, e.g. via a server. The navigation system may then be configured to use map data to determine a road for the host vehicle from its current location to its final destination, and to determine the length of the segment between the vehicle's current location and its final destination. The navigation system may also be configured to determine how much time the vehicle would take to travel the specific segment, allowing for speed limits etc. The navigation system may base its calculations either on a predetermined speed for the vehicle or by having information about the vehicle's desired speed, e.g. from the cruise control 10.

The various units on board the vehicle 1 may communicate internally with one another and the apparatus 2 via for example a bus, e.g. a CAN (controller area network) bus, which employs a message-based protocol. Examples of other communication protocols which may be used are TTP (time-triggered protocol), Flexray etc. Signals and data herein described may thus be exchanged between various units on board the vehicle, e.g. they may be transmitted wirelessly between the various units and the apparatus 2. In one embodiment the apparatus 2 is a control unit, an ECU (electronic control unit). In one embodiment the apparatus may also comprise one or more of the units herein described.

The vehicle 1 may also be provided with a wireless communication unit 12 adapted to receiving and/or sending data to other vehicles and/or infrastructures and/or servers. Fig. 2 depicts an example of a host vehicle 1 travelling immediately behind a preceding vehicle 5. The vehicles 1, 5 are each equipped to be able to communicate wirelessly via an antenna 6 on each vehicle. The two vehicles may be configured to communicate directly with one another, so-called “vehicle to vehicle” communication, or via a roadside unit 7 or some other central unit, so-called “vehicle to infrastructure” communication, or via a server, so-called “vehicle to server” communication. Where the host vehicle 1 employs adaptive cruise control, the cruise control 10 will ensure that a time gap t_{set} is maintained between the vehicles 1, 5.

Fig. 3 illustrates how the apparatus 2 receives data from the units described above, and the function of the apparatus will now be described in more detail. It comprises a processor unit 8 configured to receive speed data which represent a speed v_{set} which denotes the desired speed of the host vehicle 1. The speed v_{set} may for example be obtained from the cruise control 10. The processor unit comprises in one embodiment a CPU (central processing unit). The apparatus 2 comprises also a memory unit 9 which in one embodiment comprises a non-volatile memory (NVM), e.g. a flash memory. The memory unit contains a computer programme P with programme instructions for causing the apparatus 2 to perform the steps described below when the instructions are run on the processor unit in the apparatus. The memory unit 9 may be described as a form of computer programme product. The programme instructions are therefore stored on a medium which is readable by a computer system. The programme instructions may also be stored on a CD or the like.

The processor unit 8 is configured to determine a speed v_f of the preceding vehicle 5, which may be done in various different ways. If the host vehicle 1 and the preceding vehicle 5 are provided with wireless communication equipment, the host vehicle may receive information about the preceding vehicle's speed v_f via the wireless communication unit 12. Another way of determining the preceding

vehicle's speed v_f is to detect the speed difference v_{diff} between the vehicles 1, 5 by means of the detector 4 on board the host vehicle 1. The processor unit may also be configured to receive data about the host vehicle's current speed v_{ego} , which will not necessarily be the same as the desired speed v_{set} . The data on the

5 host vehicle's speed v_{ego} may for example come from a speed sensor on board the host vehicle. The preceding vehicle's speed v_f may then be calculated by subtracting the speed difference v_{diff} from the host vehicle's speed v_{ego} . Another alternative is to quite simply wait until the host vehicle's speed has stabilised and the host vehicle is travelling behind the preceding vehicle, whereupon the two

10 vehicles may be assumed to be travelling at the same speed. This may for example be determined by detecting that there is no change in the distance d_{diff} between the two vehicles. The host vehicle's speed v_{ego} will then be equal to the preceding vehicle's speed v_f , and v_{ego} may be used as an indication of v_f .

15 The processor unit 8 is further configured to calculate a difference Δv between v_{set} and v_f and to use the difference as a basis for calculating for at least one segment S_1 of its journey how much more time the host vehicle would take to travel the segment S_1 at the speed v_f instead of at v_{set} . In general terms, the time Δt_1 may be calculated by the equation

20
$$\Delta t_k = \frac{S_k}{\Delta v} \quad (1)$$

In which "k" may range from "1" to a desired number "n" of segments. The processor unit is further configured to generate a first presentation signal α_1 which represents the time Δt_1 and to send it to the presentation unit 3 which then

25 presents the time Δt_1 for the driver, enabling him/her to see how much longer the journey will take on different segments. He/she is thus provided with a basis for determining whether the host vehicle 1 will still arrive on time even if it stays behind the preceding vehicle 5.

30 In one embodiment the processor unit 8 is configured to receive data which represent the time gap t_{set} . The data may for example be received via the host

vehicle's cruise control 10. The processor unit is further configured to determine a reduction Δb in the host vehicle's fuel consumption on the basis of the time gap t_{set} . The reduction Δb may for example be determined by using a predetermined table of the relationship between fuel saving and the time gap t_{set} . The table may
5 for example be stored in the memory unit 9 so that the processor unit can retrieve data from it. Fig. 4 illustrates an example of a diagram of the relationship between fuel saving and the time gap t_{set} . The data in the diagram in Fig. 4 may therefore be set out in the table instead. The diagram has on one axis the time gap t_{set} in
10 seconds. On the other axis it has the average fuel saving Δb as a percentage (%) of the average fuel consumption which the vehicles in the train would achieve if they did not travel in a train but separately, for all of the vehicles in a train. To illustrate the advantages of staying behind the preceding vehicle 5, the average saving where the train also comprises more vehicles than the preceding vehicle is illustrated. In front of the preceding vehicle 5 there may thus be a plurality of
15 vehicles which are part of the same train as the preceding vehicle. The larger the number of vehicles involved, the greater will be the average saving for each vehicle in the train. The host vehicle 1 may therefore in one embodiment choose to be part of a train together with at least the preceding vehicle 5. In Fig. 4, the curve A2 represents the average fuel saving Δb if the host vehicle 1 is expected to be the second vehicle in the train. The preceding vehicle 5 will then be the lead
20 vehicle, and the vehicles 1, 5 will together form a train. The curve A3 represents the average fuel consumption Δb if the host vehicle 1 is expected to be third in the train, A4 the average fuel consumption Δb if the host vehicle is expected to be fourth, and A5 the average fuel saving Δb if it is expected to be fifth. The host
25 vehicle may receive information that the preceding vehicle 5 is part of a train, and also how many vehicles there are in the train, by wireless communication with the preceding vehicle 5 or with a central unit or a server. The apparatus 2 and the processor unit 8 may thus know which position in the vehicle queue the host vehicle 1 would occupy if it joins a train which the preceding vehicle 5 is part of,
30 and may retrieve from the table correct data about the potential fuel saving Δb . Another embodiment uses only data concerning the curve A2 and assumes that

the host vehicle 1 is always number two in the train. The host vehicle will thus need no information about the position it would occupy in the train. In a further embodiment the processor unit 8 is also configured to calculate the fuel saving which the host vehicle 1 will make if it travels at the lower speed of the preceding

5 vehicle 5, rather than travelling the same segment at the higher speed v_{set} . How much fuel the host vehicle will consume at different speeds is often predefined, which means that its fuel consumption on a given segment can be calculated.

The fuel saving achieved by travelling at a lower speed may then be calculated by comparing the host vehicle's fuel consumption when travelling at the speed v_{set}

10 with travelling at v_f . A fuel saving for the host vehicle may thus be determined on the basis of the speed difference Δv , i.e. $v_f - v_{\text{set}}$. This further fuel saving may be added to that achieved by travelling in a train, and be included in Δb . The

processor unit is thus configured to determine a reduction Δb in fuel consumption for the host vehicle on the basis of both the time gap t_{set} and the speed difference

15 Δv . It is further configured to generate a second presentation signal α_2 which represents the reduction Δb and to send it to the presentation unit 3 which then presents the reduction Δb for the driver. He/she may thus receive information about how much fuel will be saved by staying behind the preceding vehicle 5 instead of overtaking and continuing at the desired speed v_{set} .

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In one embodiment the processor unit 8 is configured to use the difference Δv as a basis for calculating for a plurality of segments S_k of its journey how much more time Δt_k the host vehicle would take to travel each segment at the speed v_f instead of at v_{set} , and to generate a first presentation signal α_1 which represents the times

25 Δt_k and send it to the presentation unit 3 which then presents the times Δt_k for the driver. The processor unit then performs a plurality of calculations according to the equation (1). The segments S_k may for example be 1 km, 10 km and 100 km long. In one embodiment the segments S_k are predetermined and are stored on the memory unit 9. "k" may therefore range from "1" to a desired number of
30 segments "n". In the above example $n=3$.

In one embodiment the segment S_1 is the host vehicle's whole segment from its current location to its final destination, which in one embodiment is predetermined by another system, e.g. the previously described navigation system 11, which provides it to the apparatus 2 and the processor unit 8.

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In another embodiment the apparatus 2 is provided with an input unit 14 to enable the driver to feed in a desired segment or segments S_k .

Fig. 5 depicts an example of the screen 13 on a presentation unit 3 (Fig. 3). The screen displays data from the first and second presentation signals α_1, α_2 . In one embodiment the segment or segments S_k are also presented for the driver by the presentation unit. Fig. 5 illustrates an example of this, with the distances 1, 10 and 100 km at the top of the screen, and below them how much more time Δt_k the various segments would take than if the host vehicle 1 travelled at its desired speed v_{set} instead. The bottom of the screen shows the fuel saving Δb which the host vehicle 1 achieves if it stays behind the preceding vehicle 5. Fig. 5 is just one example of what the display might look like, and the order and/or positions of the calculated values may be different from those depicted. It is for example possible to display only the whole segment S_1 and the extra time Δt_1 taken to travel it, and the potential fuel saving percentage Δb . The processor unit 8 is then configured to determine the reduction Δb in fuel consumption for the host vehicle's whole segment S_1 from its current location to its final destination. It is of course possible to only display on the presentation unit 3 the extra time Δt_1 taken to travel the whole segment and the total fuel saving Δb . The fuel saving may also be presented in litres or in litres per 1, 10 or 100 km and so on. One embodiment displays the total fuel saving for the whole segment S_1 in litres. The host vehicle's fuel consumption when it is not part of a train is then used for comparison.

In another embodiment the processor unit 8 is configured to receive from the preceding vehicle 5 route data β_f which indicate the route which the preceding vehicle is to take. The route data β_f may for example be received by wireless

communication from the preceding vehicle 5. The processor unit is further configured to receive from the host vehicle 1 route data β_{ego} which indicate the route which the host vehicle is to take. The route data β_{ego} from the host vehicle may for example be received via the navigation system 11. The processor unit is

5 further configured to compare the host vehicle's route data β_{ego} with the preceding vehicle's route data β_f and determine the segment S_1 to indicate on the basis of the comparison the length of the segment on which the two vehicles take the same route. Route data may for example indicate locations by longitude and latitude. The processor unit may then be configured to compare whether the

10 locations coincide with one another within a predefined radius range, e.g. 5, 10, 20, 50 or 100 m. If they do coincide within the respective range, the vehicles 1, 5 are regarded as taking the same route. On the basis of the route data for the two vehicles the driver will know how far the host vehicle 1 and the preceding vehicle 5 share the same route.

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Fig. 6 depicts a flowchart for a method for providing a driver of the host vehicle 1 with support for decisions before overtaking the preceding vehicle 5. The method will now be explained with reference to this diagram. The method may be implemented as computer instructions in a computer programme P. When the

20 programme is run on the processor unit 8, the various steps of the method will be performed. The method comprises receiving a speed v_{set} which denotes the host vehicle's desired speed (B1), and determining a speed v_f of the preceding vehicle 5 (B2). This is followed by calculating a difference Δv between v_{set} and v_f (B3) and by using the calculated difference Δv as a basis for calculating how much

25 more time Δt_1 the host vehicle would take to travel the segment S_1 at the speed v_f instead of at v_{set} (B4). Thereafter the time Δt_1 is then presented for the driver of the host vehicle (B5). The calculation of the difference Δt_1 may be by equation (1).

30 In one embodiment the host vehicle 1 is equipped with a cruise control 10, e.g. an adaptive cruise control, which is configured to maintain a certain time gap t_{set} between the host vehicle 1 and the preceding vehicle 5. In this case the method

may comprise determining on the basis of the time gap t_{set} and the speed difference Δv a reduction Δb in the host vehicle's fuel consumption, which reduction is then presented for the driver of the host vehicle.

- 5 In another embodiment the method comprises using the speed difference Δv as a basis for calculating for a plurality of segments S_k how much more time Δt_k the host vehicle would take to travel the segment S_k at the speed v_f instead of at v_{set} , and presenting the respective times Δt_k for the driver. In another embodiment the segment S_1 is the host vehicle's whole segment from its current location to its final
- 10 destination. This makes it possible to determine the total difference between the host vehicle's estimated arrival time when travelling at the speed v_{set} and when travelling at the speed v_f of the preceding vehicle 5, i.e. the total time difference Δt_1 . A navigation system 11 on board the host vehicle 1 may be configured to determine the whole segment for the host vehicle. In a further embodiment the
- 15 determination of the reduction Δb in fuel consumption comprises determining the reduction for the whole segment from the host vehicle's current location to its final destination. The total time difference Δt_1 and the reduction Δb in fuel consumption for the whole segment from the host vehicle's current location to its final destination may then be presented for the driver.
- 20 In another embodiment the host vehicle 1 and the preceding vehicle 5 are configured to communicate wirelessly and the method comprises receiving from the preceding vehicle 5 route data which indicate the route which the preceding vehicle is to take, and from the host vehicle 1 route data which indicate the route which the host vehicle is to take. The method comprises thereafter comparing the
- 25 host vehicle's route data with the preceding vehicle's route data and using the comparison as a basis for determining the segment S_1 to denote the length of the segment on which the host vehicle 1 and the preceding vehicle 5 take the same route.
- 30 The present invention is not restricted to the embodiments described above. Sundry alternatives, modifications and equivalents may be used. The aforesaid

embodiments therefore do not limit the invention's scope, which is defined by the attached claims.

Claims

1. A method for providing a driver of a host vehicle (1) with support for decisions before overtaking a preceding vehicle (5), the method comprises
 - 5 - receiving a speed v_{set} which denotes the set speed of the host vehicle (1);
 - determining a speed v_f of the preceding vehicle (5);
 - calculating a difference Δv between v_{set} and v_f ;
 - using the difference Δv as a basis for calculating for at least one
 - 10 segment S_1 of its journey how much more time Δt_1 the host vehicle (1) would take to travel the segment S_1 at the speed v_f instead of at v_{set} ;
 - presenting the time Δt_1 for the driver of the host vehicle.
2. The method according to claim 1, in which the host vehicle (1) is
 - 15 equipped with a cruise control (10) which is configured to maintain a certain time gap t_{set} between the host vehicle (1) and the preceding vehicle (5),
 - to determine on the basis of the time gap t_{set} and the speed difference Δv a reduction Δb in the fuel consumption for the host vehicle (1);
 - to present the reduction Δb for the driver of the host vehicle (1).
3. The method according to any one of the foregoing claims, comprising
 - 20 calculating for a plurality of segments S_k on the basis of the speed difference Δv how much more time Δt_k the host vehicle (1) would take to travel the segment S_k at the speed v_f instead of at v_{set} , and presenting the times Δt_k for the driver.
4. The method according to any one of the foregoing claims, in which
 - 25 the segment S_1 is the whole segment for the host vehicle (1) from its current location to its final destination.
5. The method according to claims 2 and 4, in which the determination
 - 30 of the reduction Δb in fuel consumption comprises determining the reduction Δb in

fuel consumption for the whole segment for the host vehicle (1) from its current location to its final destination.

6. The method according to claim 5, in which the host vehicle (1) is
5 equipped with a navigation system (11) which is configured to use the current location and final destination of the host vehicle (1) as a basis for determining the whole segment for the host vehicle (1).

7. The method according to any one of the foregoing claims, in which
10 the host vehicle (1) and the preceding vehicle (5) are configured to communicate wirelessly, which method comprises

- receiving from the preceding vehicle (5) route data which indicate the route which the preceding vehicle (5) is to take;
- receiving from the host vehicle (1) route data which indicate the
15 route which the host vehicle (1) is to take;
- comparing the route data of the host vehicle (1) with the route data of the preceding vehicle (5);
- using the comparison as a basis for determining the segment S_1 to denote the length of the segment on which the host vehicle (1) and the preceding
20 vehicle (5) take the same route.

8. An apparatus (2) for providing a driver of a host vehicle (1) with support for decisions before overtaking a preceding vehicle (5), which apparatus (2) comprises a processor unit (8) which is configured

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- to receive speed data which represent a speed v_{set} which denotes the set speed of the host vehicle (1);
- to determine a speed v_f of the preceding vehicle (5);
- to calculate a difference Δv between v_{set} and v_f ;
- to use the difference Δv as a basis for calculating for at least one
30 segment S_1 how much more time Δt_1 the host vehicle (1) would take to travel the segment S_1 at the speed v_f instead of at v_{set} ; and

- to generate a first presentation signal α_1 which represents the time Δt_1 and send it to a presentation unit (3) by which the time Δt_1 is then presented for the driver.

5 9. The apparatus (2) according to claim 8, whereby the host vehicle (1) is equipped with a cruise control (10) which is configured to maintain a certain time gap t_{set} between the host vehicle (1) and the preceding vehicle (5), and the presentation unit (8) is configured

- to receive data which represent the time gap t_{set} ;

10 - to determine on the basis of the time gap t_{set} and the speed difference Δv a reduction Δb in the host vehicle's fuel consumption;

- to generate a second presentation signal α_2 which represents the reduction Δb and send it to the presentation unit (3) which then presents the reduction Δb for the driver.

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10. The apparatus (2) according to claims 8 or 9, whereby the processor unit (8) is configured to use the speed difference Δv as a basis for calculating for a plurality of segments S_k how much more time Δt_1 the host vehicle (1) would take to travel the segment S_k at the speed v_f instead of at v_{set} , and to generate a first presentation signal α_1 which represents the times Δt_k , and send it to the presentation unit (3) which then presents the times Δt_k for the driver.

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11. The apparatus (2) according to any one of claims 8 to 10, whereby the segment S_1 is the whole segment for the host vehicle (1) from its current location to its final destination.

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12. The apparatus (2) according to claims 9 and 11, whereby the processor unit (8) is configured to determine the reduction Δb in fuel consumption for the whole segment for the host vehicle (1) from its current location to its final destination.

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13. The apparatus (2) according to claim 12, whereby the host vehicle (1) is equipped with a navigation system (11) which is configured to use the current location and final destination of the host vehicle (1) as a basis for determining the whole segment for the host vehicle (1).

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14. The apparatus (2) according to any one of claims 8 to 13, whereby the host vehicle (1) and the preceding vehicle (5) are configured to communicate wirelessly, which method comprises

- receiving from the preceding vehicle (5) route data β_f which indicate the route which the preceding vehicle (5) is to take;
- receiving from the host vehicle (1) route data β_{ego} which indicate the route which the host vehicle (1) is to take;
- comparing the host vehicle's route data β_{ego} with the preceding vehicle's route data β_f ;
- using the comparison as a basis for determining the segment S_1 to denote the length of the segment on which the host vehicle (1) and the preceding vehicle (5) take the same route.

15. A computer programme programme P comprising programme code for causing an apparatus (2) to perform steps of the method according to any one of claims 1 to 7.

16. A computer programme product comprising a programme code stored on a computer-readable non-volatile medium for performing method steps according to any one of claims 1 to 7 when said programme code is run on an apparatus (2).

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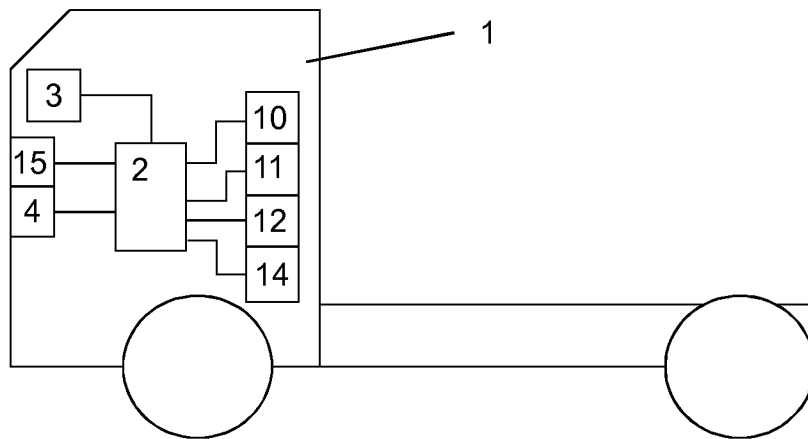


FIG. 1

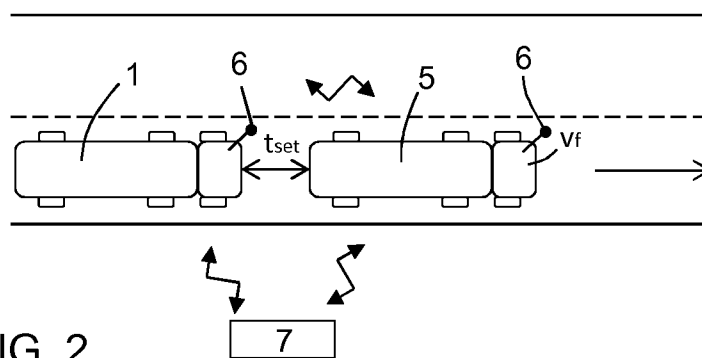


FIG. 2

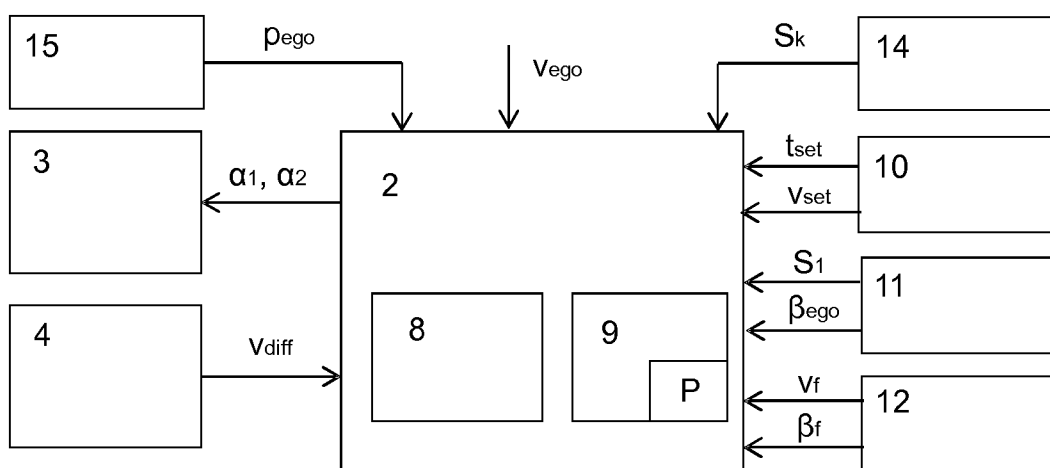


FIG. 3

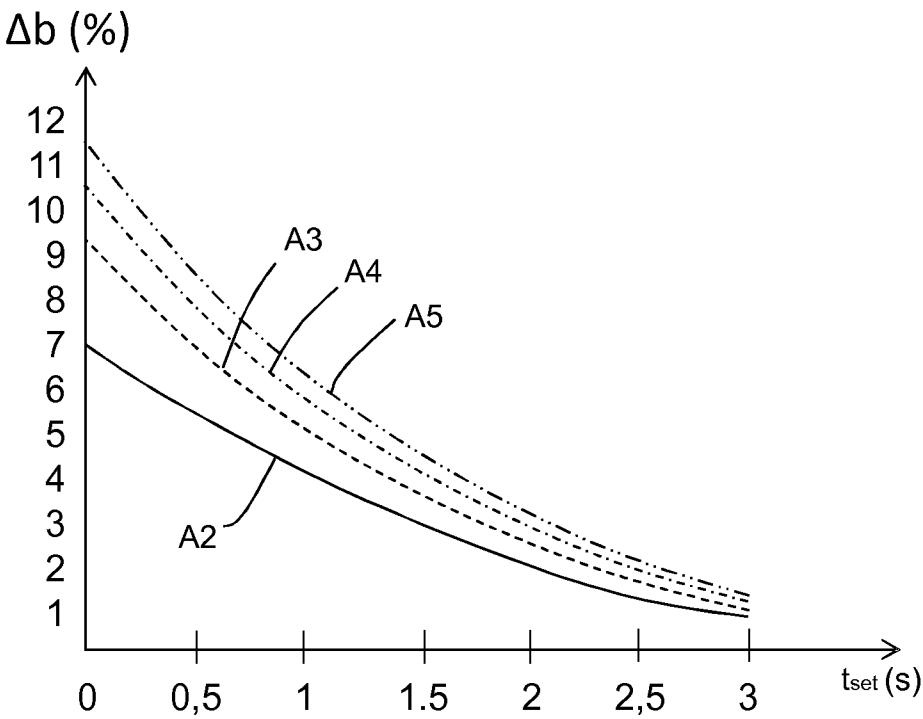


FIG. 4

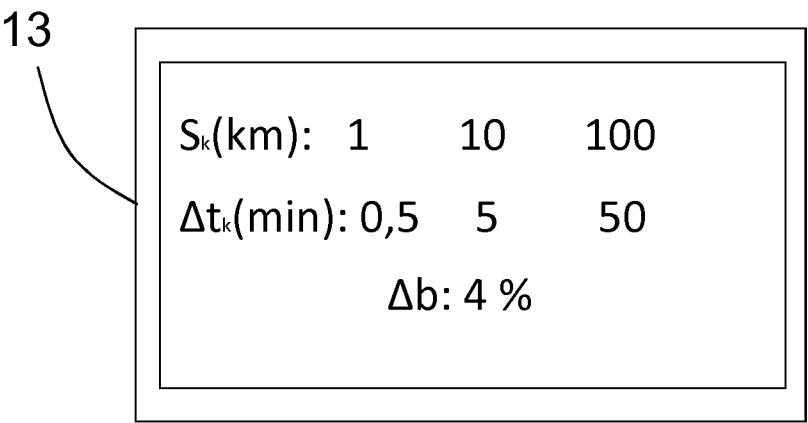


FIG. 5

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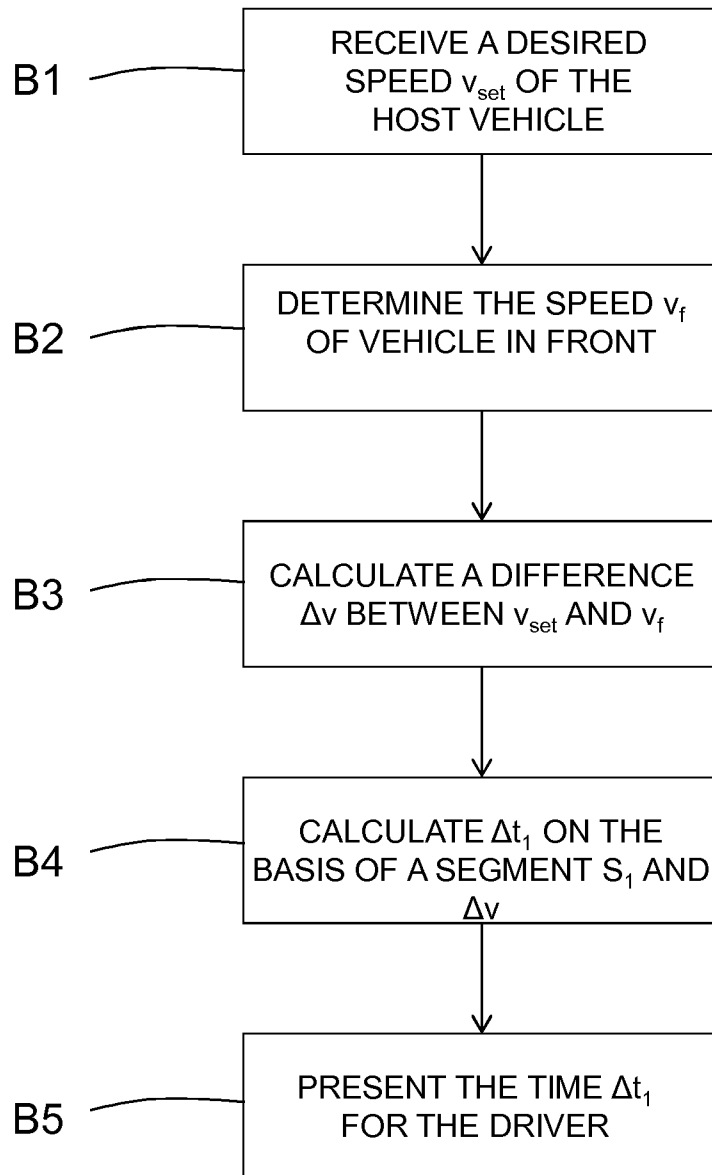


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2015/050020

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

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)

IPC: B60W, G08G

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

SE, DK, FI, NO classes as above

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

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 20080021600 A1 (SOHR JUERGEN), 24 January 2008 (2008-01-24); paragraphs [0030]-[0054] --	1-16
A	US 20130271295 A1 (HUELBUSCH KATJA), 17 October 2013 (2013-10-17); paragraphs [0030]-[0037] -- -----	1-16



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

“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

19-03-2015

Date of mailing of the international search report

20-03-2015

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Continuation of: second sheet

International Patent Classification (IPC)

B60W 30/18 (2012.01)

B60W 50/14 (2012.01)

G08G 1/16 (2006.01)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/SE2015/050020

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