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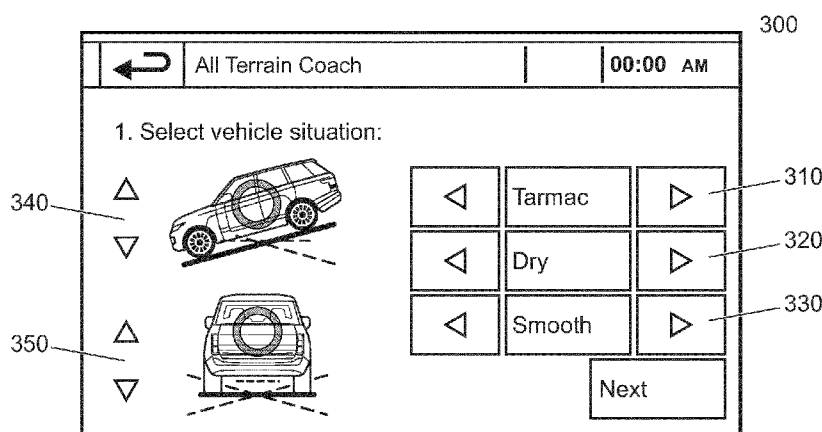


Fig. 3

(57) Abstract: The invention relates to a system and method for controlling at least one vehicle subsystem, in particular in off-road mode. The driver enters a plurality of attributes, e.g. surface material, wetness and bounciness, possibly inclination, via a user interface. A processor determines the appropriate configuration based on the input.

System and Method for Driving Scenario Configuration

TECHNICAL FIELD

The present disclosure relates to a system and method for determining a configuration of at least one vehicle sub-system of a vehicle. Aspects of the invention relate to a system, to a method and to a vehicle.

BACKGROUND

Vehicles often comprise various sub-systems which are each operable in a variety of configurations. The configurations may each suit different driving conditions. For example, a vehicle may comprise a throttle control sub-system which is operable in a plurality of different modes each having a different response characteristic. The vehicle may also comprise a suspension control sub-system which may be operable in different modes relating to a height and response of the suspension.

It can be complex for a driver to configure a vehicle comprising different sub-systems to a particular driving scenario. The driving scenario, particular off-road driving, may encompass many different attributes relating to, for example, the surface type e.g. grass, snow, sand etc., surface conditions, surface topology etc., which may be difficult for a driver, particularly an inexperienced driver, to consider and configure the vehicle accordingly.

It is an object of embodiments of the invention to at least mitigate one or more of the problems of the prior art. It is an object of embodiments of the invention to facilitate configuration of a vehicle according to a driving scenario. It is an object of some embodiments of the invention to provide to a driver driving advice associated with a particular driving scenario. Other aims and advantages of the invention will be inferred from the following description, claims and drawings.

SUMMARY OF THE INVENTION

According to an aspect of the present invention there is provided a system for a vehicle having at least one vehicle sub-system, the system comprising a user interface means for receiving from a user an indication of a plurality of attributes of a driving scenario, and a processing means arranged to determine a configuration of the at least one vehicle sub-system based on the attributes of the driving scenario. The user interface means may comprise a plurality of user operable controls to each respectively receive an indication of a respective attribute of the driving scenario

According to an aspect of the present invention there is provided a method of determining a configuration of at least one vehicle sub-system, comprising receiving, from a user, an indication of a plurality of attributes of a driving scenario, and determining a configuration of the at least one vehicle sub-system based on the attributes of the driving scenario.

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According to an aspect of the present invention there is provided a system for a vehicle having at least one vehicle sub-system, the system comprising a user interface means for receiving from a user an indication of a plurality of attributes indicative of off-road driving characteristics of a driving scenario, and a processing means arranged to determine a configuration of the at least one vehicle sub-system based on the plurality of attributes of the driving scenario. Advantageously, the selection of the configuration based on a plurality of attributes allows the configuration to be accurately determined.

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The system may comprise a communication means for communicating the determined configuration to the at least one vehicle sub-system, such that the sub-system operates according to the configuration. The configuration may be used to operate the at least one sub-system appropriate for the driving scenario.

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The characteristics may be indicative of one or more of: vehicle orientation, a surface type, surface conditions and surface topology; optionally the vehicle orientation is indicative of one or both of vehicle pitch and roll.

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The user interface means may be arranged to output a graphical user interface (GUI) which may comprise a plurality of user operable controls to each respectively receive an indication of a respective attribute of the driving scenario.

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The GUI may be configured to sequentially output a plurality of screens, each of said screens being configured to receive at least one of said user operable controls. Alternatively, the GUI may be configured to output a single screen comprising said plurality of user operable controls.

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The processing means may be arranged to compare the determined configuration against a current configuration of the at least one sub-system and may determine whether it is necessary to change the configuration of the at least one sub-system. Advantageously, the configuration is only changed when necessary.

It may be necessary to change the configuration of the at least one sub-system when the current configuration does not match the determined configuration.

It may be necessary to change the configuration of the at least one sub-system when the current configuration does not have a predetermined degree of similarity to the determined configuration. Advantageously, the current configuration is only changed when the current
5 configuration is unacceptable with respect to the determined configuration.

The predetermined degree of similarity may be determined as the current configuration being identified as at least one alternate configuration or being within a range of acceptable configurations for the at least one sub-system.

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The system may comprise a data storage means for storing a data structure associating attributes of driving scenarios and configurations of the at least one vehicle sub-system, wherein the processing means is arranged to determine the configuration of the at least one vehicle sub-system using the data storage means.

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The processing means may be arranged to retrieve from the data storage means the configuration of the at least one sub-system corresponding to the received plurality of attributes.

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The data storage means may store information indicative of at least one alternate configuration or a range of acceptable configurations for the at least one sub-system.

The processing means may be arranged to provide an output indicative of the determined configuration of the at least one vehicle sub-system and to receive, via the user interface means, a user input indicative of an acceptance of the configuration.

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The determined configuration may be communicated to the at least one vehicle sub-system in response to receiving the input indicative of the acceptance.

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The processing means may be arranged to select driving advice media from amongst a library of driving advice media based on the attributes of the driving scenario.

The driving advice media may comprise one or more of textual information, one or more images and video information, providing driving advice to the user related to the driving
35 scenario.

According to an aspect of the present invention there is provided a method of determining a configuration of at least one vehicle sub-system, comprising receiving, from a user, an indication of a plurality of attributes indicative of off-road driving characteristics of a driving

scenario, and determining a configuration of the at least one vehicle sub-system based on the attributes of the driving scenario.

5 The method may comprise communicating the determined configuration to the at least one vehicle sub-system and operating the at least one sub-system according to the configuration.

10 The characteristics may be indicative of one or more of: vehicle orientation, a surface type, surface conditions and surface topology; optionally the vehicle orientation is indicative of one or both of vehicle pitch and roll.

The method may comprise outputting a graphical user interface (GUI) comprising a plurality of user operable controls, and receiving, via at least some of the controls, an indication of a respective attribute of the driving scenario.

15 The method may comprise comparing the determined configuration against a current configuration of the at least one sub-system and may comprise determining whether it is necessary to change the configuration of the at least one sub-system.

20 The method may comprise determining that it is necessary to change the configuration of the at least one sub-system when the current configuration does not match the determined configuration.

25 The method may comprise determining that it is necessary to change the configuration of the at least one sub-system when the current configuration does not have a predetermined degree of similarity to the determined configuration.

30 The predetermined degree of similarity may be determined as the current configuration being identified as at least one alternate configuration or being within a range of acceptable configurations for the at least one sub-system.

The determining the configuration of the at least one vehicle sub-system may comprise retrieving the configuration from a data storage means based on the plurality of attributes.

35 The method may comprise outputting an indication of the configuration of the at least one vehicle sub-system and receiving a user input indicative of an acceptance of the configuration.

The determined configuration may be communicated to the at least one vehicle sub-system in response to receiving the input indicative of the acceptance.

5 The method may comprise selecting driving advice media from amongst a library of driving advice media based on the attributes of the driving scenario.

The driving advice media may comprise one or more of textual information, one or more images and video information, providing driving advice to the user related to the driving scenario.

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Within the scope of this application it is expressly intended that the various aspects, embodiments, examples and alternatives set out in the preceding paragraphs, in the claims and/or in the following description and drawings, and in particular the individual features thereof, may be taken independently or in any combination. That is, all embodiments and/or

15 features of any embodiment can be combined in any way and/or combination, unless such features are incompatible. The applicant reserves the right to change any originally filed claim or file any new claim accordingly, including the right to amend any originally filed claim to depend from and/or incorporate any feature of any other claim although not originally claimed in that manner.

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BRIEF DESCRIPTION OF THE DRAWINGS

One or more embodiments of the invention will now be described by way of example only, with reference to the accompanying figures, in which:

25 Figure 1 shows a system according to an embodiment of the invention;

Figure 2 shows a method according to an embodiment of the invention;

Figure 3 shows a screenshot of a GUI according to an embodiment of the invention;

30

Figure 4 shows a further screenshot of a GUI according to an embodiment of the invention;

Figure 5 shows another screenshot of a GUI according to an embodiment of the invention; and

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Figure 6 shows a further screenshot of a GUI according to an embodiment of the invention.

DETAILED DESCRIPTION

Embodiments of the invention are configured to receive, from a user of a vehicle, an indication of a plurality of attributes of a driving scenario and to determine a configuration of at least one vehicle sub-system based on the attributes.

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Figure 1 illustrates a system 100 according to an embodiment of the invention. The system 100 is for use with a vehicle having at least one vehicle sub-system. The system 100 comprises a processing means 110, a user interface means 120 and a data storage means 130. The system 100 is communicably coupled to one or more sub-systems 10, 20, 30, 40 of the vehicle. The sub-systems 10, 20, 30, 40 may include, without limitation, a gearbox of the vehicle, a suspension system of the vehicle, a throttle system of the vehicle, an engine management system of the vehicle, a traction control system and a brake control system, such as an anti-lock brake control system. It will be realised that the sub-systems may include other sub-systems of the vehicle and, furthermore, whilst Figure 1 illustrates there being four sub-systems this is merely illustrative and there may be more or less sub-systems. The system 100 may be communicatively coupled to the sub-systems by a communication means such as a communication bus of the vehicle. The communication bus may be a CAN bus or based on another communication protocol such as Ethernet or FlexRay as defined in ISO standards 17458-1 to 17458-5.

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The user interface means 120 may be formed by a user interface device comprising an input device for receiving user input and an output device for outputting information to the user. The user input may be received responsive to touch, audibly or visually. The output may be a visual or audible output. The input and output devices may be integrated, such as into a touch-sensitive display device for outputting images to the user and receiving a user input responsive thereto at a location upon the display device. However it will also be realised that, in some embodiments of the invention, the user interface means may receive a user input in form of a voice command. For example the voice command may be indicative of an attribute of the driving scenario. Alternatively the user interface means may receive a user input in the form of a gesture or movement of a user's body-part such as a hand. For example the user may select from amongst a plurality of displayed attributes by moving their hand in proximity to the user interface means. The user input may be determined by the processing means based on image data of the user's movement such as from one or more cameras within the vehicle. For the purpose of illustrating the present invention a touch sensitive display device will be described, although it will be realised that this is merely exemplary.

35

In one embodiment the user interface means is controlled by the processing means to output a graphical user interface (GUI) comprising one or more user activatable controls. The user interface device is arranged to output information indicative of received user inputs, such as the controls activated by the user, to the processing means.

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The processing means 110 may be formed by a processing device 110 which is arranged to execute instructions stored in a memory associated therewith. The instructions are arranged to perform a method according to an embodiment of the invention such as a method illustrated in Figure 2. The processing means 110 is communicably coupled with the data storage means 130 storing a data structure associating attributes of one or more driving scenarios and configurations of the vehicle sub-systems 10, 20, 30, 40. The data storage means may be implemented by a database 130. The processing means 110 is arranged to determine the configuration of the at least one vehicle sub-system 10, 20, 30, 40 using the data storage means 130 based on the driving scenario attributes received from the user, for example by retrieving the configuration using the attributes as an index to the database 130.

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The user interface device 120 is arranged to receive, from the user, an indication of a plurality of attributes of a driving scenario. A driving scenario relates to a situation which is, or will shortly be, encountered by the vehicle. In particular the driving scenario relates to off-road environmental conditions. The attributes are indicative of one or more of a surface type, surface conditions, surface topology and environment. It will be realised that these attributes are merely indicative and that other attributes may be considered.

20

In one embodiment the surface type attribute may be indicative of the type of surface or terrain which the vehicle is required to navigate and may be selected from amongst all or some of grass, gravel, mud, tarmacadam, rock and sand. It will be realised that embodiments of the invention may only include some of the above options, or may include alternative options.

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In one embodiment the surface conditions may be indicative of a condition of the surface. The condition may indicate a weather-related condition of the surface. The conditions may comprise some or all of wet, dry, ice, snow, and waterlogged or wading.

30

In one embodiment the surface topology may be indicative of a topology of the surface such as smooth, compact, rough, loose, rutted or deep.

35

In one embodiment the environment may be indicative of a general environment of the driving scenario such as hilly or flat.

5 Further attributes of the driving scenario which may be considered relate to an orientation of the vehicle. The orientation may include one or both of a pitch and roll of the vehicle. The pitch of the vehicle is defined about a lateral axis i.e. nose up or down. The roll of the vehicle is defined about a longitudinal axis i.e. sideways rotation. The attributes relating to the orientation of the vehicle may be received from the user via the user interface device 120, or may be automatically determined by the processing device such as from one or more
10 sensors of the vehicle. The one or more sensors may include a gyroscope associated with the vehicle.

Based on the attributes of the driving scenario the processing device 110 is arranged to determine a configuration of the at least one vehicle sub-system. The processing device
15 may determine the configuration in combination with the database 130.

Figure 2 illustrates a method 200 according to an embodiment of the invention. The method 200 may be performed by the system 100 illustrated in Figure 1. The method will be described with reference to Figures 3 to 5 which show screenshots of a visual display device
20 according to embodiments of the invention.

The method 200 comprises a step 210 of outputting a graphical user interface (GUI). The GUI may be output by a display device forming part of the user interface device 120. The user interface device 120 is controlled to display the GUI by the processing device 110
25 communicating information thereto indicative of the GUI for display.

The GUI 300 may be as shown in Figure 3. The GUI 300 comprises a plurality of user activatable controls 310, 320, 330, 340, 350 to input attributes indicative of the driving scenario.

30 The GUI 300 illustrated in Figure 3 comprises a first control 310 indicative of the surface type attribute. The illustrated selected surface type shown in Figure 3 is "tarmac" although it will be realised that this is merely exemplary. The first control comprises first and second arrow indicators which are operable responsive to the user's touch to select from amongst a
35 plurality of surface types supported by the system 100. The surface types may comprise those noted above, although it will be realised that this is not limiting.

The GUI 300 illustrated in Figure 3 comprises a second control 320 indicative of the surface conditions. The second control 320 comprises first and second arrow indicators which are operable responsive to the user's touch to select from amongst a plurality of surface conditions supported by the system 100. The surface conditions may comprise those noted
5 above, although it will be realised that this is not limiting.

The GUI 300 illustrated in Figure 3 comprises a third control 330 indicative of the surface topology. The third control 330 comprises first and second arrow indicators which are operable responsive to the user's touch to select from amongst a plurality of surface
10 topologies supported by the system 100. The surface topologies may comprise those noted above, although it will be realised that this is not limiting.

The GUI 300 illustrated in Figure 3 comprises a vehicle orientation portion 340, 350 indicative of the vehicle orientation. In particular, the GUI 300 illustrated in Figure 3
15 comprises a portion indicative of the vehicle pitch i.e. nose up or down, and vehicle roll i.e. a lateral rotation of the vehicle. The vehicle orientation portion 340, 350 shown in Figure 3 comprises first and second representations of the vehicle each indicative of one of vehicle pitch and vehicle roll from a representative viewpoint. The first representation 340 shown in Figure 3 is indicative of the vehicle pitch and comprises first and second arrow indicators
20 which are operable responsive to the user's touch to increase or decrease, respectively, the pitch of the vehicle. The second representation 350 shown in Figure 3 is indicative of the vehicle roll and comprises first and second arrow indicators which are operable responsive to the user's touch to increase or decrease, respectively, the roll of the vehicle. The vehicle orientation, as shown in the GUI 300, may be determined from one or more sensors
25 associated with the vehicle (not shown in Figure 1). For example, an initial orientation (pitch and/or roll) may be determined from respective sensors responsive to the current orientation of the vehicle. The arrow indicators associated with the orientation portion 340, 350 may be controlled by the user to alter or adjust the orientation as determined by the sensors to be indicative of the driving scenario to be encountered by the vehicle. For example the
30 determined orientation may be adjusted to be indicative of an upcoming incline which will be encountered in the driving scenario. Responsive to the user input the vehicle orientation shown in the GUI 300 changes to be indicative of the input orientation.

Although the GUI 300 illustrated in figure 3 shows a single GUI screen having a plurality of
35 controls for receiving user inputs indicative of the vehicle situation, it will be appreciated that the system could alternatively be configured to sequentially display a plurality of different GUI screens, each GUI screen being configured to receive one or more user inputs

indicative of the current vehicle situation. For example, a first screen may be configured to receive a user input indicative of a surface type, a second screen may be configured to receive a user input indicative of a surface condition, a third screen may be configured to receive a user input indicative of a surface topology and a fourth screen may be configured to receive a user input indicative of the orientation of the vehicle. After displaying the plurality of different GUI screens and receiving the respective user input on each screen the system may be configured to output a final screen showing the suggested configuration, which screen may be similar to that shown in figure 4, which is described in more detail below.

Returning to Figure 2, the user input indicative of the driving scenario is received in step 220. As noted above, the user input may be received by sensing physical contact or a proximity of an input device, such as the user's finger, from the user at the user input device.

In step 230 a configuration of the one or more sub-systems 10, 20, 30, 40 of the vehicle is determined. The configuration is determined based upon the plurality of attributes of the driving scenario received in step 220. The processor 110 retrieves from the database 130 the configuration of the one or more vehicle sub-systems 10, 20, 30, 40. The processor 110 uses the plurality of attributes to look up a stored configuration in the database. For example, the configuration may be stored in the database 130 associated with the attributes "tarmac", "dry", "smooth" of the driving scenario as shown in Figure 3. The configuration may also be associated with the inclination and roll attributes received in step 220. The configuration may determine, for example, a setting of a traction control system and an anti-lock braking system (ABS) of the vehicle, although it will be realised that this is merely exemplary and that the configuration of other sub-systems of the vehicle may be determined.

In step 240 an indication of the configuration determined in step 230 is output to the user. The indication of the configuration may be output by being displayed on the display device of the user interface 120. The configuration is displayed to the user as a recommended setting for the one or more vehicle sub-systems 10, 20, 30, 40 appropriate for the driving scenario.

Figure 4 illustrates a GUI screen 360 providing the indication 370 of the configuration determined in step 230. The indication comprises a plurality of portions of the GUI each indicative of a configuration of a respective sub-system 10, 20, 30, 40. For example a first portion is indicative of a continuation of a gearbox, which may be a selection of a low or high-range gear system of the vehicle, a second portion may be an indication of a configuration of a suspension system of the vehicle, which may be a selection of a ride-height of the vehicle, a third portion may be indicative of a selected program, such as a

program for driving on sand, which may include a configuration of a plurality of sub-systems such as the throttle and brake sub-systems, and a fourth portion may be indicative of a configuration of a hill-descent sub-system of the vehicle. It will be realised that the layout and choice of sub-systems illustrated in Figure 4 is merely exemplary.

5

In step 250 it is determined whether the user has accepted the configuration the one or more vehicle sub-systems 10, 20, 30, 40 output in step 240. The output in step 240 may comprise a selectable graphical control which, when a user input is received corresponding to the control, is indicative of acceptance of the output configuration. For example, the GUI
10 output in step 240 may comprise a button marked "Execute" 380 as shown in Figure 4 which, when a user input is received corresponding to the location of the button, causes acceptance of the output configuration and the method moves to step 260.

15

The Execute control 380 may have a plurality of operative states, wherein the state is determined in step 250 depending on a current configuration of the vehicle's sub-systems 10, 20, 30, 40. A first operative state of the control 380 may be inactive i.e. it is not possible for the user to accept the currently displayed configuration of the sub-systems.

20

Step 250 may comprise a step of comparing the configuration determined in step 230 against a current configuration of one or more vehicle sub-systems 10, 20, 30, 40. If the determined configuration is the same as the current configuration then the control 380 may be inoperative. In an embodiment of the invention if the configuration determined in step 230 has a predetermined degree of similarity, with respect to at least some of the sub-systems 10, 20, 30, 40, to the current configuration, then the control 380 may also be
25 inoperative. For example, the determined configuration of the suspension sub-system may be "normal ride height", such as suitable for a tarmac surface. If the current configuration of the suspension sub-system is "off road height", which is higher than normal ride height, then the current configuration may be deemed to be acceptable against the determined configuration for that sub-system. The configuration of each sub-system stored in the
30 database 130 may be associated with information identifying other acceptable configurations, or a boundary of acceptable configuration ranges, for at least some of the sub-systems 10, 20, 30, 40. In step 250 an arbitration between the determined configuration and other acceptable configurations of those sub-systems 10, 20, 30, 40 may be performed. It will be noted that some sub-systems may be required to match the determined
35 configuration, whilst other sub-systems may have other acceptable configurations for the plurality of attributes indicative of the driving scenario. The control 380 may be operative only when the current configuration of one or more sub-systems 10, 20, 30, 40 is not

acceptable with respect to the determined configuration. The control 380 may indicate its operative nature in one embodiment by virtue of its colour i.e. being green when in an operative state.

- 5 Although not shown in Figure 4, a further control may be displayed in step 240 indicative of the user's refusal to accept the displayed configuration which, when activated, causes the method to move to step 270 i.e. omitting step 260.

- 10 A control may also be provided to revert the configuration of the one or more sub-systems to a previous configuration or a default configuration. The default configuration may be, for example, a start-up configuration of the one or more sub-systems.

- 15 In step 260, following acceptance of the configuration by the user in step 250, information indicative of the configuration is communicated to each of the vehicle the one or more vehicle sub-systems 10, 20, 30, 40. The information may be communicated from the processor 110 to the one or more vehicle sub-systems 10, 20, 30, 40 via the communication bus of the vehicle. For example, information may be communicated from the processor to the traction control system of the vehicle indicative of a setting of the traction control determined to be appropriate for the driving scenario. The information is used by each of the respective sub-systems 10, 20, 30, 40 to configure the sub-system appropriately. Prior to the information indicative of the configuration being communicated step 260 may comprise a safety check step whereby the configuration is checked to ensure that the configuration of one or more safety-critical sub-systems 10, 20, 30, 40 is not to be changed to a potentially unsafe state. For example the configuration of the braking sub-system may be checked to ensure it continues to operate in a safe configuration.

- 30 In step 270 it is determined whether a user requests advice appropriate for the driving scenario. Step 270 may comprise receiving an indication from the user requesting driving advice, for example responsive to a displayed question. For example the GUI 300 may output a selectable control labelled "Advice?" although it will be realised that this is merely exemplary. If the user desires to receive driving advice they may activate the control which causes the method to move to step 280. If the user does not desire to receive driving advice, for example the user may activate a displayed control of the GUI labelled "No Advice", the method then ends.

- 35 If the user desires to receive driving advice, the method moves to step 280. Step 280 may comprise offering the user one or a plurality of driving advice media. The media may be

appropriate for the driving scenario as indicated by the attributes of the driving scenario received in step 220. That is, the driving advice media may be selected from amongst a library of driving advice media based on the plurality of attributes of the driving scenario received in step 220. The processor may retrieve the one or more driving advice media from the database 130 based on the plurality of attributes. The driving advice media may comprise one or more of textual information, one or more images and video information. The driving advice media is intended to provide driving advice to the user related to the driving scenario.

Referring to Figure 5, a screen 400 of the GUI is illustrated which provides the user with a plurality of items of driving advice media 410, 420, only some of which are given reference numerals for clarity. For example, first driving advice media 410 is provided which advises the user on navigating, or driving the vehicle across, a dry uphill. Similarly second driving advice media 420 is provided which advises the user on navigating dry side slopes. It will be realised that the driving advice media illustrated in Figure 5 is merely exemplary. The user may select from amongst the plurality of displayed items of driving advice media to be provided with further advice related to the indicated conditions, such as by viewing video information. As illustrated in Figure 6 the user may select from amongst the plurality of items of media 410, 420 displayed in Figure 5 to be provided with the video information 500 as illustrated in Figure 6. It will be realised that embodiments of the invention may omit the selection of driving advice media illustrated in Figure 5 and may provide driving advice media as shown in Figure 5 directly based on the attributes received in step 220.

It will be appreciated from the above that embodiments of the invention receive from a user an indication of a plurality of attributes of a driving scenario and determine a configuration of the at least one vehicle sub-system based on the attributes of the driving scenario. The at least one vehicle sub-system may be operated according to the determined configuration such that the vehicle operates appropriate for the driving scenario. Furthermore, in some embodiments, driving advice media may be provided to the user appropriate for the driving scenario.

It will be appreciated that embodiments of the present invention can be realised in the form of hardware, software or a combination of hardware and software. Any such software may be stored in the form of volatile or non-volatile storage such as, for example, a storage device like a ROM, whether erasable or rewritable or not, or in the form of memory such as, for example, RAM, memory chips, device or integrated circuits or on an optically or magnetically readable medium such as, for example, a CD, DVD, magnetic disk or magnetic

tape. It will be appreciated that the storage devices and storage media are embodiments of machine-readable storage that are suitable for storing a program or programs that, when executed, implement embodiments of the present invention. Accordingly, embodiments provide a program comprising code for implementing a system or method as claimed in any preceding claim and a machine readable storage storing such a program. Still further, embodiments of the present invention may be conveyed electronically via any medium such as a communication signal carried over a wired or wireless connection and embodiments suitably encompass the same.

10 All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

15 Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

20 The invention is not restricted to the details of any foregoing embodiments. The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed. The claims should not be construed to cover merely the foregoing embodiments, but also any
25 embodiments which fall within the scope of the claims.

Further aspects of the invention are set out in the following numbered paragraphs:

30 1. A system for a vehicle having at least one vehicle sub-system, the system comprising:

a user interface device for receiving from a user an indication of a plurality of attributes indicative of off-road driving characteristics of a driving scenario;

35 a processing device arranged to determine a configuration of the at least one vehicle sub-system based on the plurality of attributes of the driving scenario.

2. The system of paragraph 1, comprising a communication device for communicating the determined configuration to the at least one vehicle sub-system, such that the sub-system operates according to the configuration.
- 5 3. The system of paragraph 1, wherein the characteristics are indicative of one or more of: vehicle orientation, a surface type, surface conditions and surface topology; optionally the vehicle orientation is indicative of one or both of vehicle pitch and roll.
- 10 4. The system of paragraph 1, wherein the user interface device is arranged to output a graphical user interface (GUI) comprising a plurality of user operable controls to each respectively receive an indication of a respective attribute of the driving scenario.
- 15 5. The system of paragraph 1, wherein the processing device is arranged to compare the determined configuration against a current configuration of the at least one sub-system and to determine whether it is necessary to change the configuration of the at least one sub-system.
- 20 6. The system of paragraph 5, wherein it is necessary to change the configuration of the at least one sub-system when the current configuration does not match the determined configuration.
- 25 7. The system of paragraph 5, wherein it is necessary to change the configuration of the at least one sub-system when the current configuration does not have a predetermined degree of similarity to the determined configuration.
- 30 8. The system of paragraph 7, wherein the predetermined degree of similarity is determined as the current configuration being identified as at least one alternate configuration or being within a range of acceptable configurations for the at least one sub-system.
- 35 9. The system of paragraph 1, comprising a data storage device for storing a data structure associating attributes of driving scenarios and configurations of the at least one vehicle sub-system, wherein the processing device is arranged to determine the configuration of the at least one vehicle sub-system using the data storage device.
10. The system of paragraph 9, wherein the processing device is arranged to retrieve from the data storage device the configuration of the at least one sub-system corresponding to the received plurality of attributes.

11. The system of paragraph 9, wherein the data storage device stores information indicative of at least one alternate configuration or a range of acceptable configurations for the at least one sub-system.
- 5 12. The system of paragraph 1, wherein the processing device is arranged to provide an output indicative of the determined configuration of the at least one vehicle sub-system and to receive, via the user interface device, a user input indicative of an acceptance of the configuration.
- 10 13. The system of paragraph 12, wherein the determined configuration is communicated to the at least one vehicle sub-system in response to receiving the input indicative of the acceptance.
- 15 14. The system of paragraph 1, wherein the processing device is arranged to select driving advice media from amongst a library of driving advice media based on the attributes of the driving scenario.
- 20 15. The system of paragraph 14, wherein the driving advice media comprises one or more of textual information, one or more images and video information, providing driving advice to the user related to the driving scenario.
- 25 16. A method of determining a configuration of at least one vehicle sub-system, comprising:

receiving, from a user, an indication of a plurality of attributes indicative of off-road driving characteristics of a driving scenario;

determining a configuration of the at least one vehicle sub-system based on
30 the attributes of the driving scenario.
- 35 17. The method of paragraph 16, comprising communicating the determined configuration to the at least one vehicle sub-system and operating the at least one sub-system according to the configuration.
18. The method of paragraph 16, wherein the characteristics are indicative of one or more of: vehicle orientation, a surface type, surface conditions and surface topology; optionally the vehicle orientation is indicative of one or both of vehicle pitch and roll.

19. The method of paragraph 16, comprising outputting a graphical user interface (GUI) comprising a plurality of user operable controls, and receiving, via at least some of the controls, an indication of a respective attribute of the driving scenario.
- 5 20. The method of paragraph 16, comprising comparing the determined configuration against a current configuration of the at least one sub-system and determining whether it is necessary to change the configuration of the at least one sub-system.
- 10 21. The method of paragraph 20, comprising determining that it is necessary to change the configuration of the at least one sub-system when the current configuration does not match the determined configuration.
- 15 22. The method of paragraph 20, comprising determining that it is necessary to change the configuration of the at least one sub-system when the current configuration does not have a predetermined degree of similarity to the determined configuration.
- 20 23. The method of paragraph 22, wherein the predetermined degree of similarity is determined as the current configuration being identified as at least one alternate configuration or being within a range of acceptable configurations for the at least one sub-system.
- 25 24. The method of paragraph 16, wherein the determining the configuration of the at least one vehicle sub-system comprises retrieving the configuration from a data storage device based on the plurality of attributes.
- 30 25. The method paragraph 16, comprising outputting an indication of the configuration of the at least one vehicle sub-system and receiving a user input indicative of an acceptance of the configuration.
- 35 26. The method of paragraph 25, wherein the determined configuration is communicated to the at least one vehicle sub-system in response to receiving the input indicative of the acceptance.
- 40 27. The method of paragraph 16, comprising selecting driving advice media from amongst a library of driving advice media based on the attributes of the driving scenario.
28. The method of paragraph 27, wherein the driving advice media comprises one or more of textual information, one or more images and video information, providing driving advice to the user related to the driving scenario.

CLAIMS

1. A system for a vehicle having at least one vehicle sub-system, the system comprising:
 - 5 a user interface means for receiving from a user an indication of a plurality of attributes indicative of off-road driving characteristics of a driving scenario, the user interface means comprising a plurality of user operable controls to each respectively receive an indication of a respective attribute of the driving scenario; and
 - 10 a processing means arranged to determine a configuration of the at least one vehicle sub-system based on the plurality of attributes of the driving scenario.
2. The system of claim 1, comprising a communication means for communicating the determined configuration to the at least one vehicle sub-system, such that the sub-system operates according to the configuration.
- 15 3. The system of claim 1, wherein the characteristics are indicative of one or more of: vehicle orientation, a surface type, surface conditions and surface topology; optionally the vehicle orientation is indicative of one or both of vehicle pitch and roll.
- 20 4. The system of any preceding claim, wherein the user interface means is arranged to output a graphical user interface (GUI).
5. A system as claimed in claim 4, wherein the GUI is configured to sequentially output a plurality of screens, each of said screens being configured to display at least one of said user operable controls.
- 25 6. A system as claimed in claim 4, wherein the GUI is configured to output a single screen comprising said plurality of user operable controls.
- 30 7. The system of any preceding claim, wherein the processing means is arranged to compare the determined configuration against a current configuration of the at least one sub-system and to determine whether it is necessary to change the configuration of the at least one sub-system.
- 35 8. The system of claim 7, wherein it is necessary to change the configuration of the at least one sub-system when the current configuration does not match the determined configuration.

9. The system of claim 7 or claim 8, wherein it is necessary to change the configuration of the at least one sub-system when the current configuration does not have a predetermined degree of similarity to the determined configuration.
- 5 10. The system of claim 9, wherein the predetermined degree of similarity is determined as the current configuration being identified as at least one alternate configuration or being within a range of acceptable configurations for the at least one sub-system.
- 10 11. The system of any preceding claim, comprising a data storage means for storing a data structure associating attributes of driving scenarios and configurations of the at least one vehicle sub-system, wherein the processing means is arranged to determine the configuration of the at least one vehicle sub-system using the data storage means.
- 15 12. The system of claim 11, wherein the processing means is arranged to retrieve from the data storage means the configuration of the at least one sub-system corresponding to the received plurality of attributes.
- 20 13. The system of claim 11 or claim 12, wherein the data storage means stores information indicative of at least one alternate configuration or a range of acceptable configurations for the at least one sub-system.
- 25 14. The system of any preceding claim, wherein the processing means is arranged to provide an output indicative of the determined configuration of the at least one vehicle sub-system and to receive, via the user interface means, a user input indicative of an acceptance of the configuration.
- 30 15. The system of claim 4 when dependent upon claim 2 or any claim dependent thereon, wherein the determined configuration is communicated to the at least one vehicle sub-system in response to receiving the input indicative of the acceptance.
- 35 16. The system of any preceding claim, wherein the processing means is arranged to select driving advice media from amongst a library of driving advice media based on the attributes of the driving scenario.
17. The system of claim 16, wherein the driving advice media comprises one or more of textual information, one or more images and video information, providing driving advice to the user related to the driving scenario.

18. A method of determining a configuration of at least one vehicle sub-system, comprising:
receiving, from a user, an indication of a plurality of attributes indicative of off-road driving characteristics of a driving scenario; and
5 determining a configuration of the at least one vehicle sub-system based on the attributes of the driving scenario.
19. The method of claim 18, comprising communicating the determined configuration to the at least one vehicle sub-system and operating the at least one sub-system
10 according to the configuration.
20. The method of claim 18 or claim 19, wherein the characteristics are indicative of one or more of: vehicle orientation, a surface type, surface conditions and surface topology; optionally the vehicle orientation is indicative of one or both of vehicle pitch
15 and roll.
21. The method of any of claims 18 to 20, comprising outputting a graphical user interface (GUI) comprising a plurality of user operable controls, and receiving, via at least some of the controls, an indication of a respective attribute of the driving
20 scenario.
22. The method of any of claims 18 to 21, comprising comparing the determined configuration against a current configuration of the at least one sub-system and determining whether it is necessary to change the configuration of the at least one
25 sub-system.
23. The method of claim 22, comprising determining that it is necessary to change the configuration of the at least one sub-system when the current configuration does not match the determined configuration.
30
24. The method of claim 22 or claim 23, comprising determining that it is necessary to change the configuration of the at least one sub-system when the current configuration does not have a predetermined degree of similarity to the determined configuration.
35
25. The method of claim 24, wherein the predetermined degree of similarity is determined as the current configuration being identified as at least one alternate configuration or being within a range of acceptable configurations for the at least one sub-system.

26. The method of any of claims 18 to 25, wherein the determining the configuration of the at least one vehicle sub-system comprises retrieving the configuration from a data storage means based on the plurality of attributes.

5

27. The method of any of claims 18 to 26, comprising outputting an indication of the configuration of the at least one vehicle sub-system and receiving a user input indicative of an acceptance of the configuration.

10

28. The method of claim 27 when dependent upon claim 19 or any claim dependent thereon, wherein the determined configuration is communicated to the at least one vehicle sub-system in response to receiving the input indicative of the acceptance.

15

29. The method of any of claims 18 to 28, comprising selecting driving advice media from amongst a library of driving advice media based on the attributes of the driving scenario.

20

30. The method of claim 29, wherein the driving advice media comprises one or more of textual information, one or more images and video information, providing driving advice to the user related to the driving scenario.

31. A vehicle comprising a system of any of claims 1 to 17 or arranged to execute a method of any of claims 18 to 30.

25

32. A system substantially as described hereinbefore with reference to the accompanying drawings.

33. A method substantially as described hereinbefore with reference to the accompanying drawings.

30

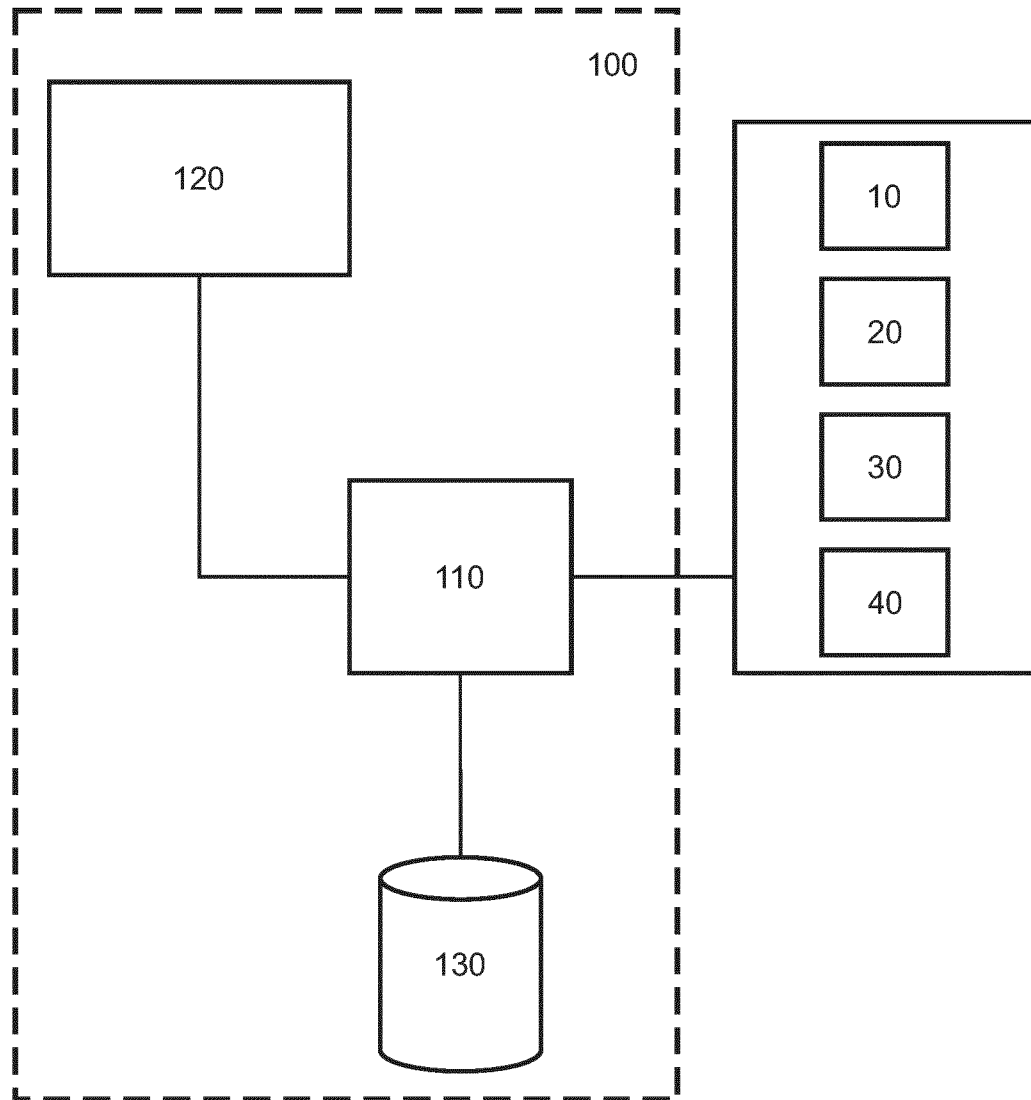


Fig. 1

2/4

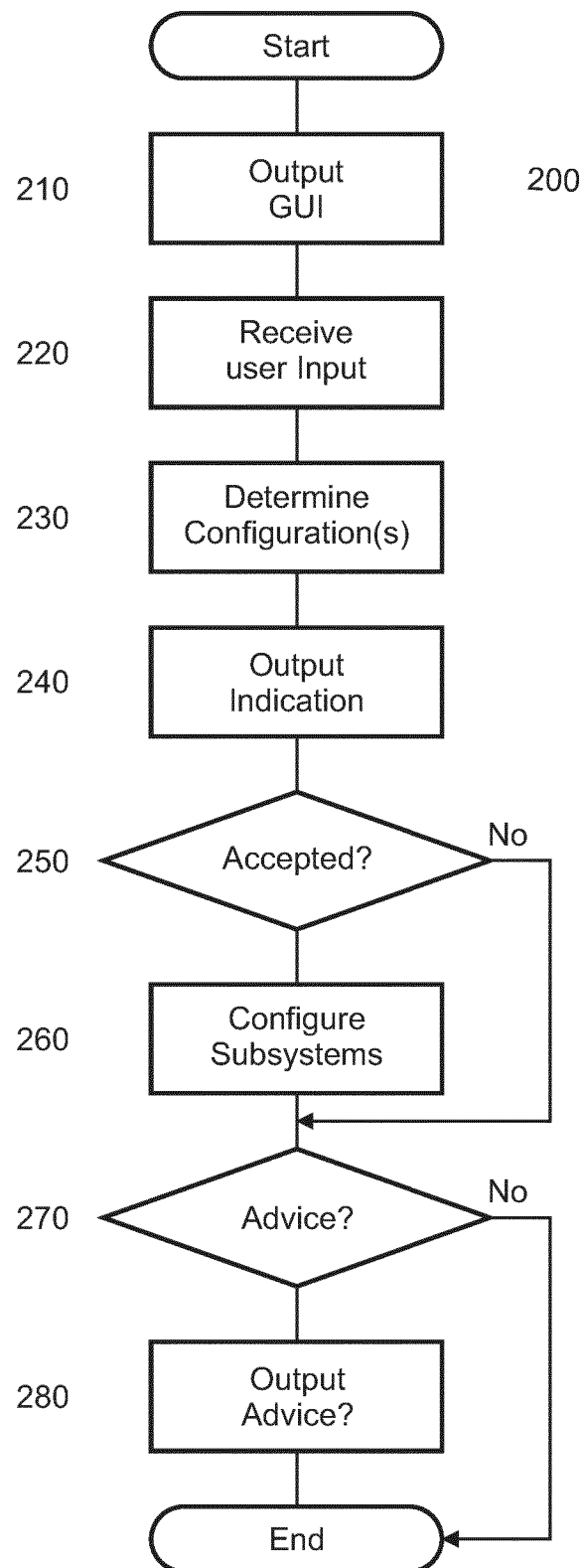


Fig. 2

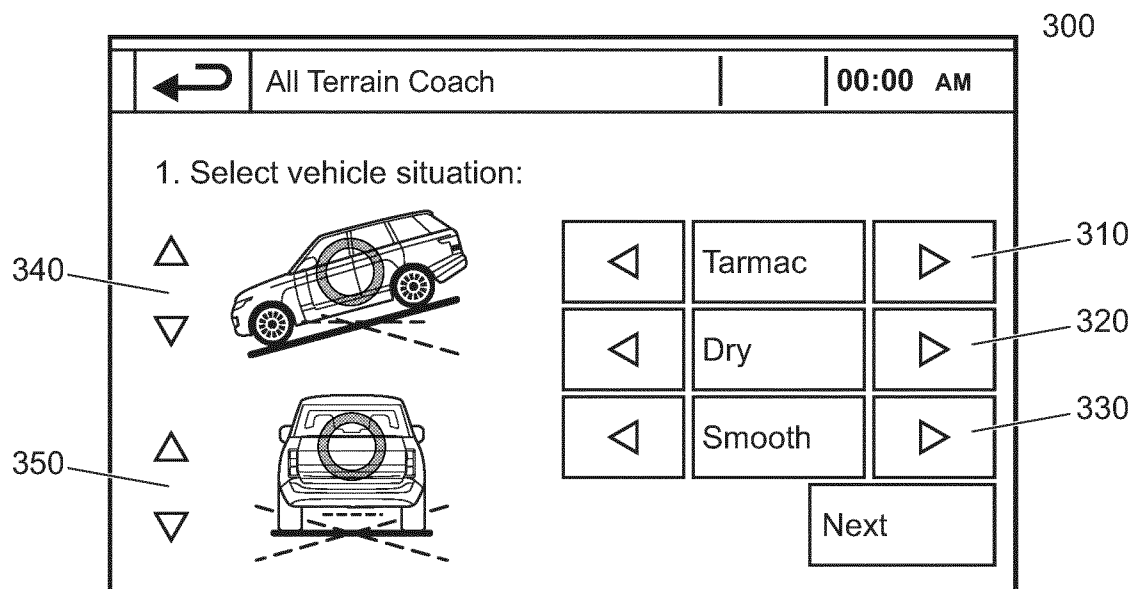


Fig. 3

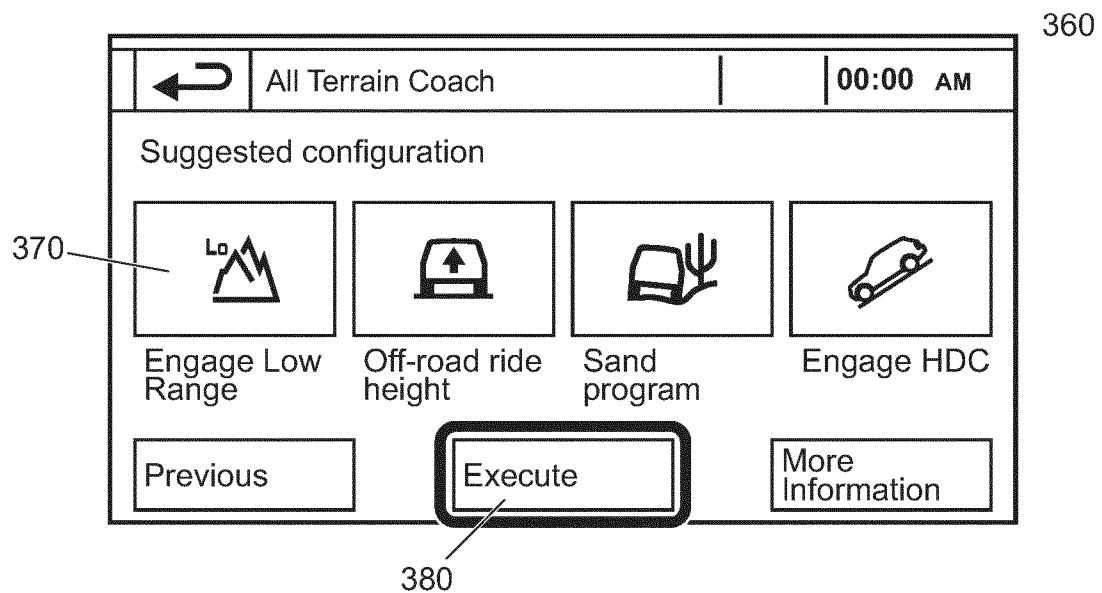


Fig. 4

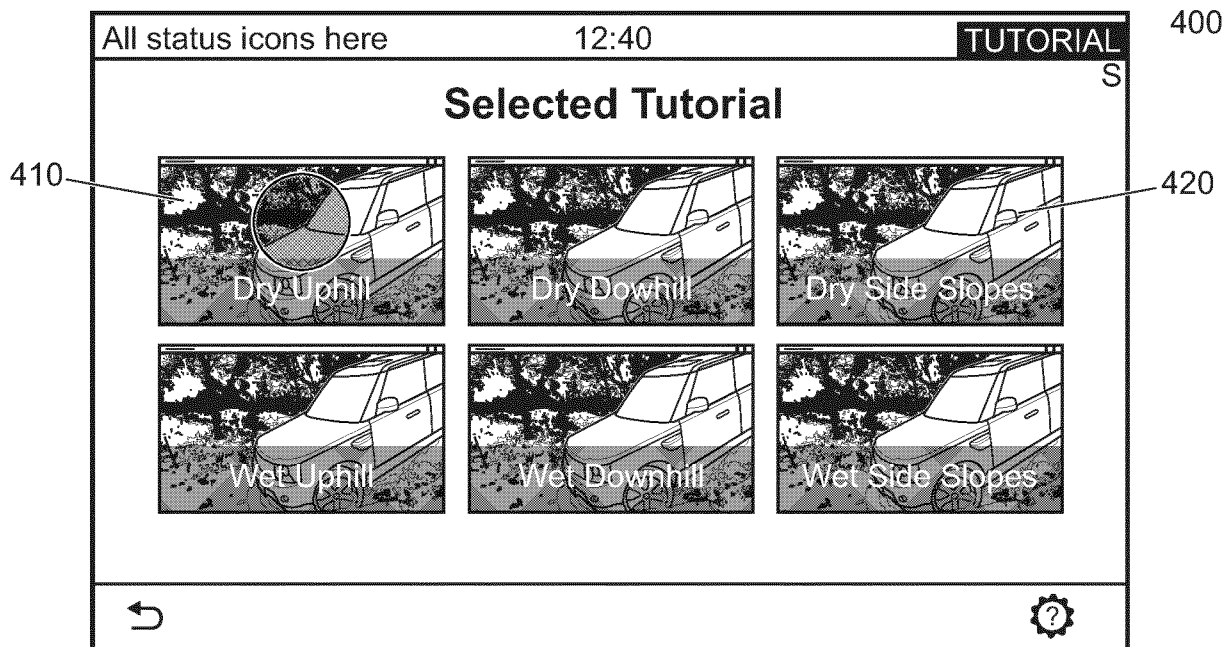


Fig. 5

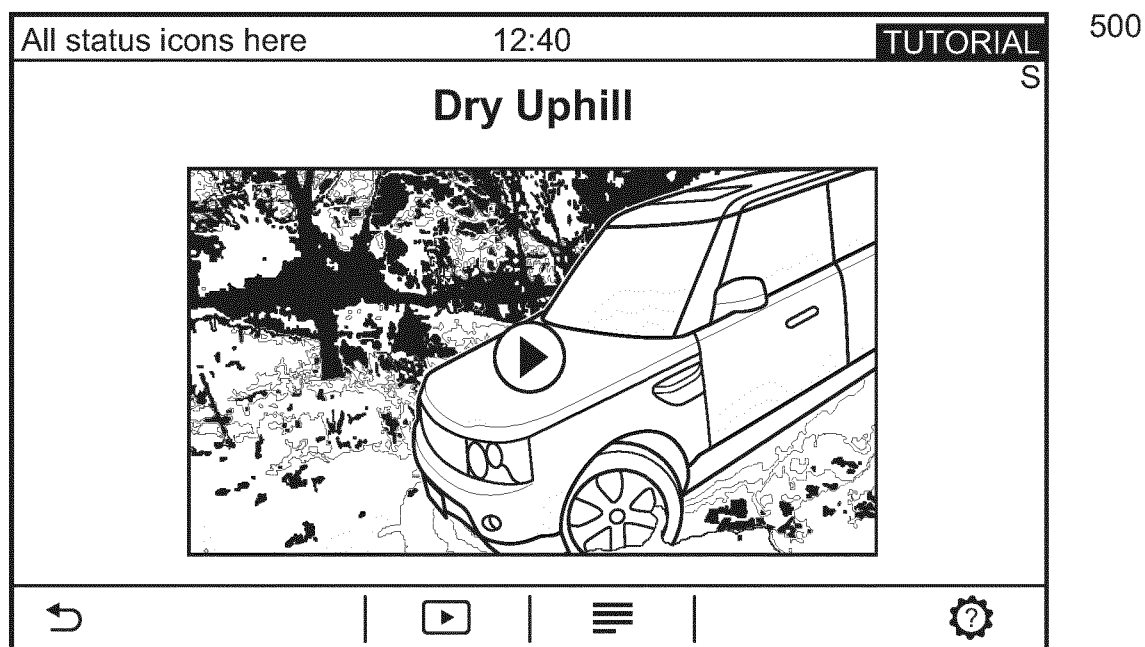


Fig. 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/057301

A. CLASSIFICATION OF SUBJECT MATTER

INV. B60W50/08 B60W50/14
ADD. B60W50/00

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)

B60W B60K

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	<p>EP 1 355 209 A1 (FORD GLOBAL TECH LLC [US]) 22 October 2003 (2003-10-22)</p> <p>paragraphs [0074], [0075]; figure 4 paragraphs [0096] - [0098]; figure 13 the whole document</p> <p>-----</p>	<p>1-6,11, 12, 18-21, 26,31</p>



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

26 May 2015

Date of mailing of the international search report

13/08/2015

Name and mailing address of the ISA/

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Authorized officer

Plenk, Rupert

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2015/057301

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 32, 33
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-6, 11, 12, 18-21, 26, 31

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-6, 11, 12, 18-21, 26, 31

system and method for adapting at least one vehicle
subsystem, relying on user input

2. claims: 7-10, 13, 22-25

selection of configuration and decision on change of
configuration

3. claims: 14, 15, 27, 28

confirmation by user

4. claims: 16, 17, 29, 30

tutorial function

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 32, 33

Claims 32 and 33 rely exclusively on the drawings, contrary to Rule 6.2(a) PCT. The claims do not include technical features.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guidelines C-IV, 7.2), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2015/057301

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
EP 1355209	A1	22-10-2003	EP 1355209 A1	22-10-2003
			US 2003200016 A1	23-10-2003
