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(54) Title of the Invention: **Touch-sensitive input device compatibility notification**
 Abstract Title: **Touch sensitive input device compatibility notification when a mobile device is connected to an In-Vehicle device**

(57) A method comprising connecting a mobile device having a touch-sensitive input device to an in-vehicle device having a touch-sensitive input device, wherein, when the mobile device and the in-vehicle device are connected, the mobile device is remotely operable from the in-vehicle device using at least user inputs from the touch-sensitive input device of the in-vehicle device; receiving at the in-vehicle device specification information for the mobile device from the mobile device; obtaining one or more touch-sensitive input device capabilities for the in-vehicle device; obtaining one or more touch-sensitive input device capabilities for the mobile device based on the specification information; determining whether incompatibility exists between the one or more touch-sensitive input device capabilities for the in-vehicle device and the one or more touch-sensitive input device capabilities for the mobile device for remotely operating the mobile device from the in-vehicle device; and if an incompatibility has been identified, presenting, using the in-vehicle device, a notification regarding the identified incompatibility.

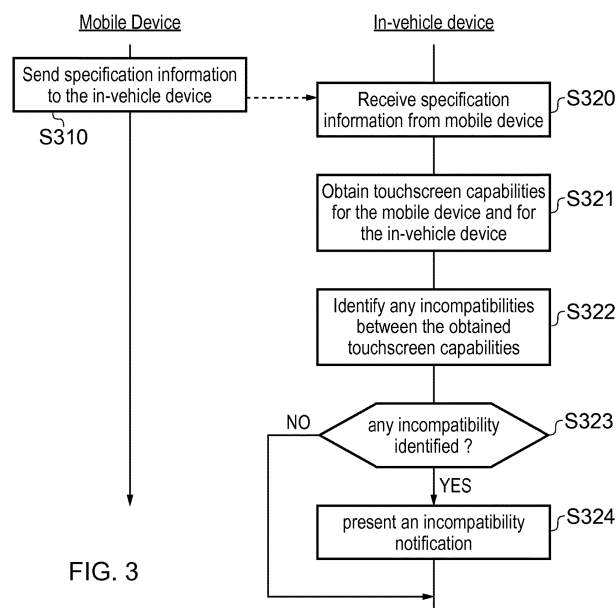


FIG. 3

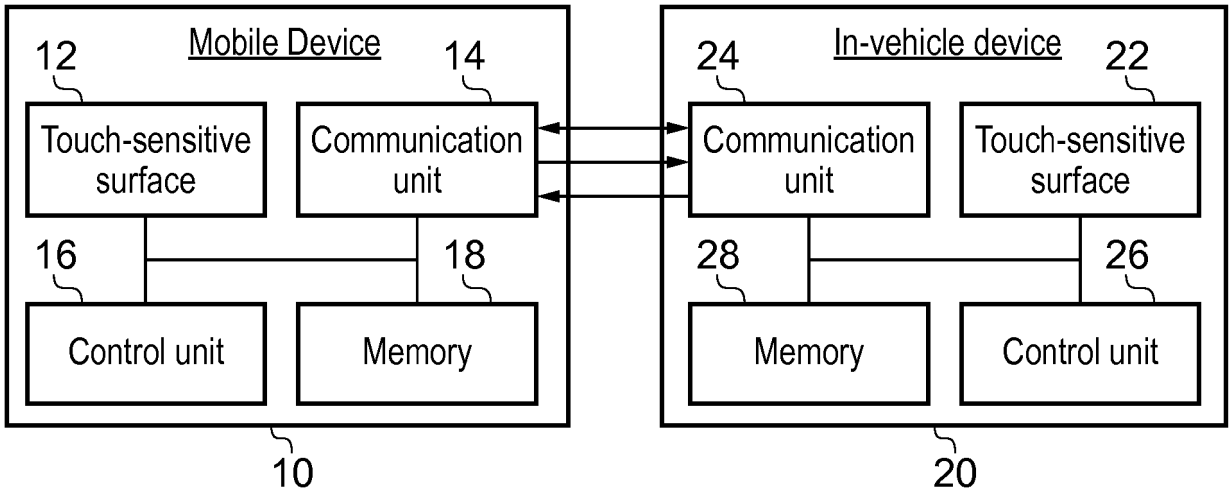


FIG. 1

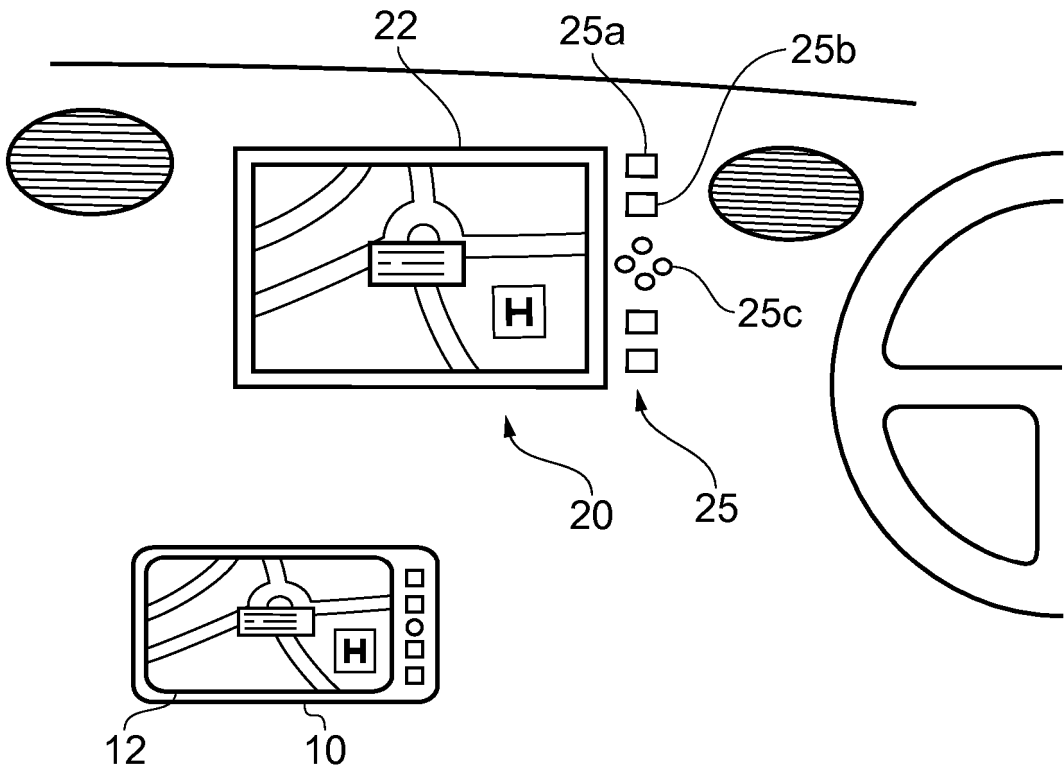


FIG. 2

02 08 12

02 08 12

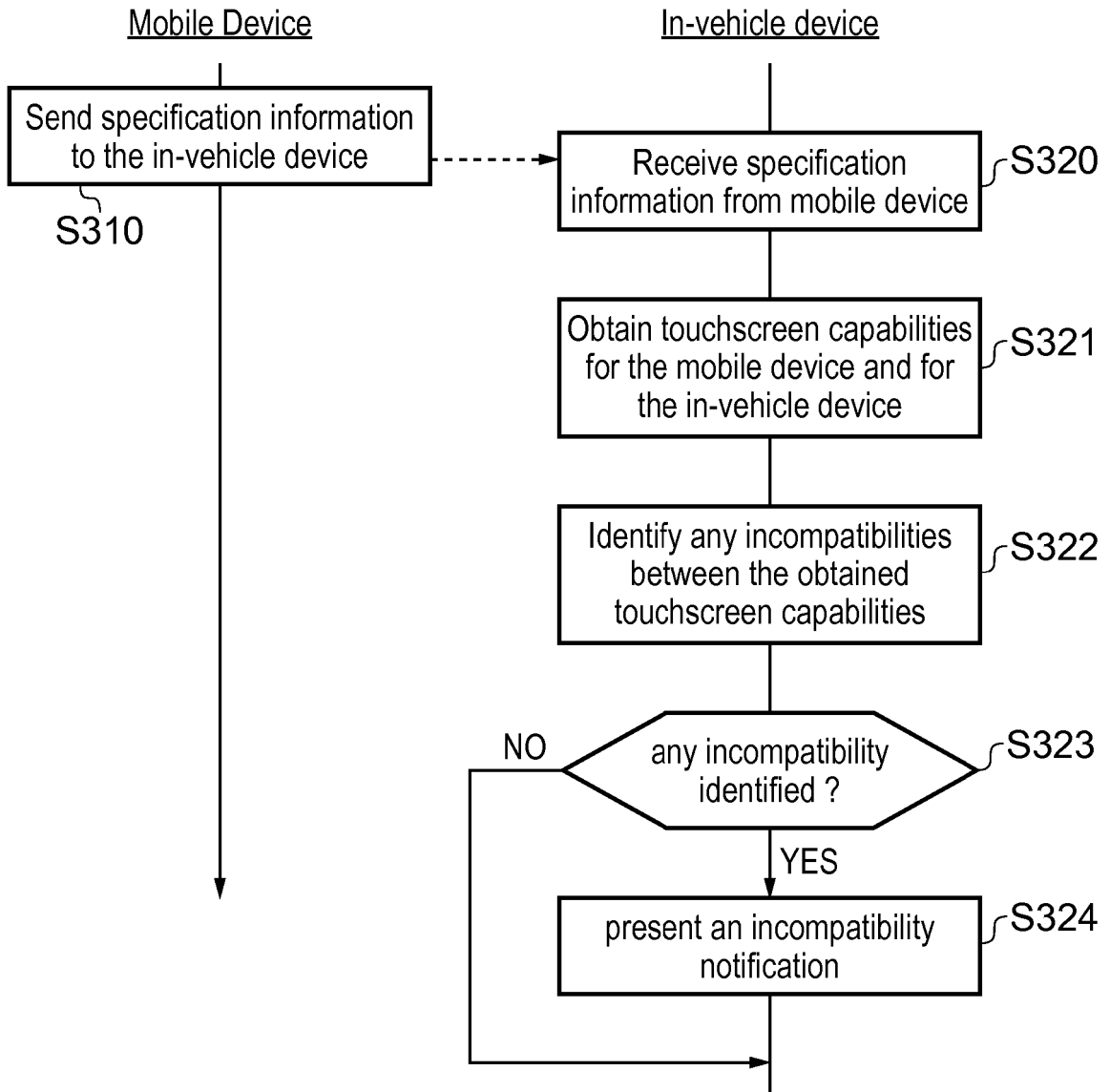


FIG. 3

02 08 12

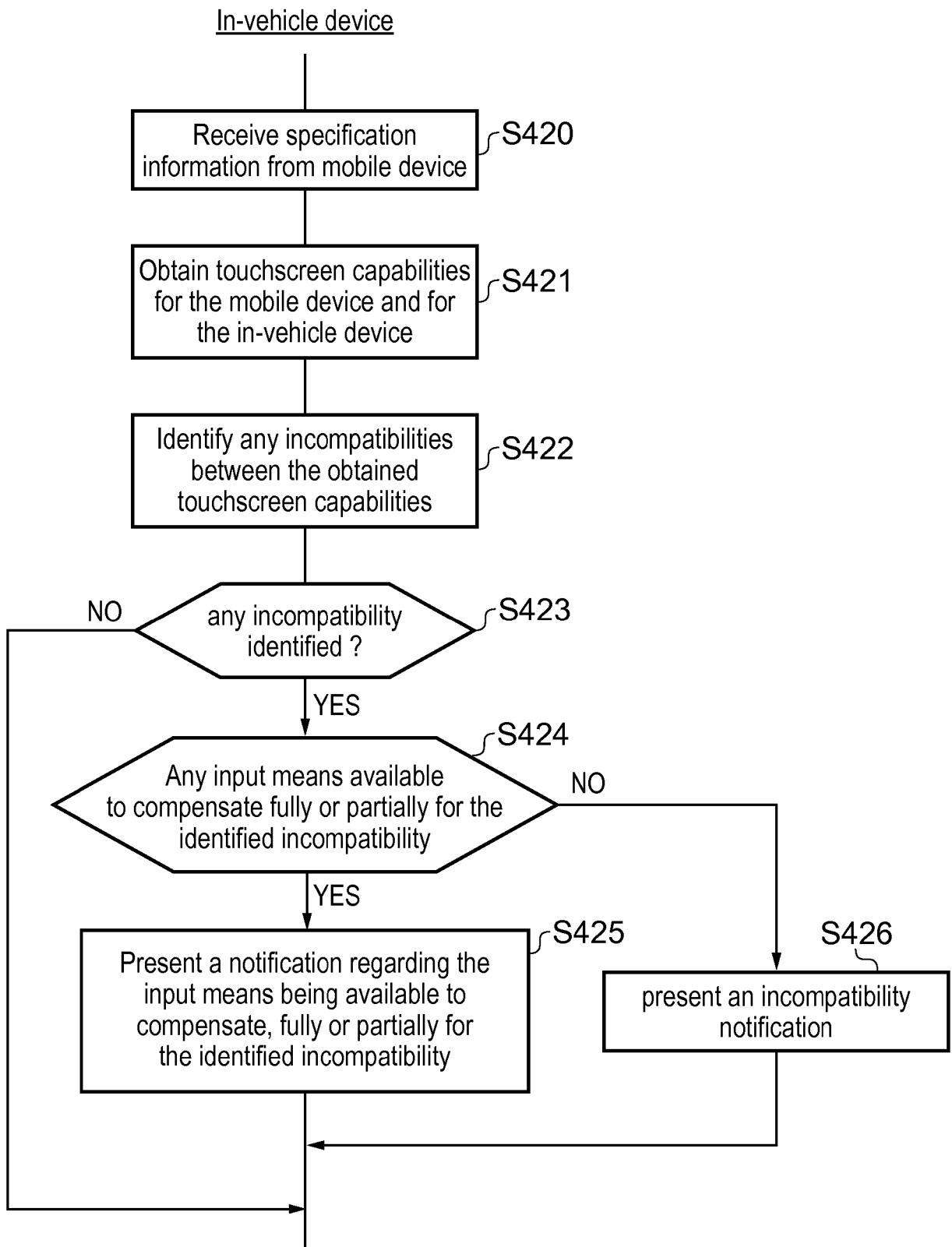
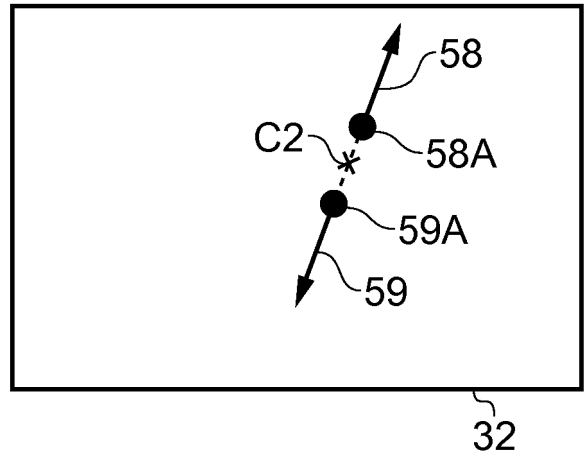
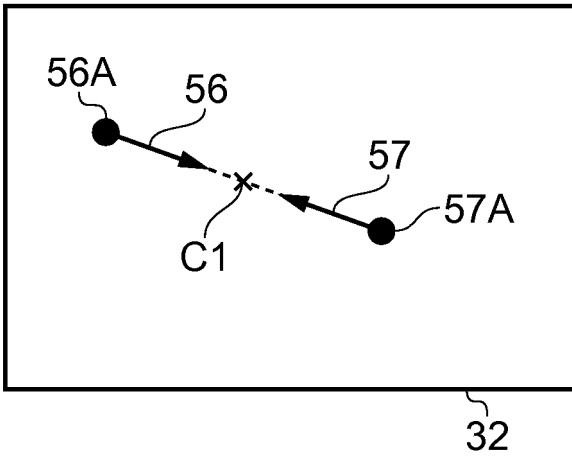
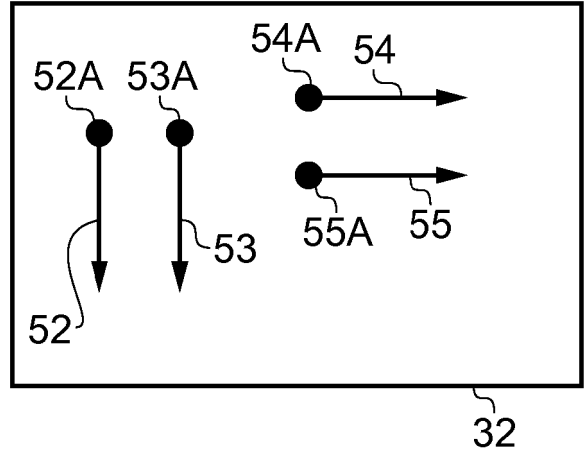
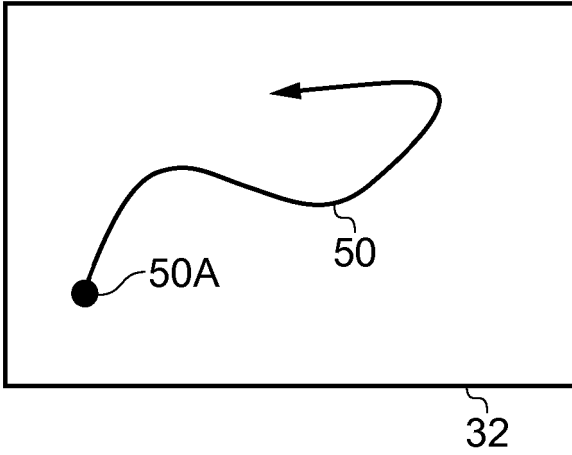


FIG. 4

02 08 12



TOUCH-SENSITIVE INPUT DEVICE COMPATIBILITY NOTIFICATION

FIELD AND BACKGROUND

The present invention relates to touch-sensitive input device compatibility notification and in particular but not exclusively to a method, device and system for touch-sensitive input device compatibility notification.

In view of the increasing number of services available from mobile devices and in particular vehicle- and driving- related services, arrangements have been provided where a mobile device can be connected to a vehicle to use these services in the vehicle.

For example, JP 2003-244343 discusses an arrangement where the image on the screen of a portable terminal is displayed on a screen of an in-vehicle device when the portable terminal is in the vehicle and connected to the in-vehicle device. The portable terminal can be remotely operated from the in-vehicle display. This arrangement is designed for keypad-controlled terminals.

Due to the variety of specifications for mobile devices, the input means of the in-vehicle device may not be compatible with all available mobile devices' input means. The user experience can thus be degraded depending on the type of mobile device used.

SUMMARY

Particular aspects and embodiments are set out in the accompanying claims.

Viewed from a first aspect, there can be provided an approach whereby an in vehicle device can identify a touch interface capability of a connected mobile device and can take account of this compatibility when facilitating user interaction with the mobile device via the in vehicle device. This can take the form, for example, of notifying a user of incompatibilities, of restricting user interactions, or of providing an interpretative interface to translate inputs to the in vehicle device into a form compatible with the mobile device. Thereby a variety of mobile devices, for example mobile devices having a touch-sensitive input device, can be satisfactorily connected to and controlled by an in-vehicle device.

Viewed from another aspect, there can be provided a method comprising connecting a mobile device having a touch-sensitive input device to an in-vehicle device having a touch-sensitive input device, wherein, when the mobile device and the in-vehicle device are connected, the mobile device is remotely operable from the in-vehicle device using at least user inputs from the touch-sensitive input device of the in-vehicle device; receiving at the in-vehicle device specification information for the mobile device from the mobile device; obtaining one or more touch-sensitive input device capabilities for the in-vehicle device; obtaining one or more touch-sensitive input device capabilities for the mobile device based

on the specification information; determining whether incompatibility exists between the one or more touch-sensitive input device capabilities for the in-vehicle device and the one or more touch-sensitive input device capabilities for the mobile device for remotely operating the mobile device from the in-vehicle device; and if an incompatibility has been identified, presenting, using the in-vehicle device, a notification regarding the identified incompatibility. Such a method facilitates the use of touch-sensitive input device mobile devices with in-vehicle devices as the user may be able to determine whether a feature is not working because of an error at the mobile device and/or at the in-vehicle device, or because of an incompatibility between the touch-sensitive input devices of the mobile and in-vehicle devices. For example, if the in-vehicle device's screen is only capable of detecting one input at a point in time but the mobile device's screen is capable of detecting at least two inputs at a point in time (e.g. includes multi-touch screen), the incompatibility can be identified and the user can be notified that the in-vehicle device can not control the mobile device using a multi-touch interface. Owing to such a method, a usable and functional remote control connection for a touch-sensitive input device mobile device from an in-vehicle device can provided.

Presenting a notification may include at least one of displaying a message on a display of the in-vehicle device; displaying an icon on a display of the in-vehicle device and playing a sound. It may for example be considered as appropriate to display a visual notification on a touchscreen that will be used to control the mobile device remotely, and/or to play a message so that a driver can be safely notified while driving.

The specification information may include at least one of a model number, a serial number, a manufacturer, screen identification information, a touch-sensitive input device technology, and a touch-sensitive input device capability for the mobile device. This can help with efficiently obtaining of the one or more touch-sensitive input device capabilities of the mobile device.

The one or more touch-sensitive input device capabilities may include at least one of single-touch; multi-touch; and one or more recognised touch operations. For example, in some situations, it may be appropriate not only to determine whether the touch-sensitive input device can detect single and/or multi-touch inputs, but also which operations it can detect for an improved incompatibility check.

Part of the touch-sensitive input device of the mobile device and/or part of the touch-sensitive input device of the in-vehicle device may comprise at least one of a touchscreen and a touch panel. For example, the touch-sensitive input device may or may not be operable to display content.

Obtaining one or more touch-sensitive input device capabilities for the mobile device may include retrieving at least part of the one or more touch-sensitive input device capabilities for the mobile device from a capabilities table using the specification information for the mobile device. For example, a table may be maintained in a storage, located for
5 example in the car or in a remote location, and the in-vehicle device can use the table to retrieve a mobile device's one or more touch-sensitive input device capabilities based on a phone model included in the specification information.

The determining step may include detecting whether a first touch-sensitive input device capability is available for the mobile device and is not available for the in-vehicle
10 device; and, if a first capability has been detected, determining whether a first input means is available at the in-vehicle device to compensate fully or partially for the lack of the first capability for the in-vehicle device and, if a first input means is available, presenting a notification includes presenting a notification regarding the first input means being available
15 to compensate fully or partially, respectively, for the lack of the first capability in the in-vehicle device. This can be used to inform the user on alternative input means that can be used if an incompatibility has been identified. For example a zoom in/out button can be used to compensate for the lack of a pinch in/out operation on the in-vehicle device's touch-sensitive input device and the user can be informed of the alternative input means, thereby
20 facilitating a full interaction with the remote device via the in vehicle device.

Viewed from another aspect, there can be provided an in-vehicle device comprising
25 a communication element operable to send and receive messages; a touch-sensitive input device; a connection element operable to control a connection with a mobile device, wherein the connection element is operable to control remotely a mobile device using at least user inputs from the touch-sensitive input device; and a compatibility element operable
30 to receive from a mobile device having a touch-sensitive input device specification information for the mobile device; to obtain one or more touch-sensitive input device capabilities for the in-vehicle device; to obtain one or more touch-sensitive input device capabilities for the mobile device based on the specification information; to determine whether incompatibility exists between the one or more touch-sensitive input device
35 capabilities for the in-vehicle device and the one or more touch-sensitive input device capabilities for the mobile device for remotely operating the mobile device from the in-vehicle device; and to present, if an incompatibility has been identified, a notification regarding the identified incompatibility using the in-vehicle device.

Viewed from another aspect there can be provided a system comprising an in-
35 vehicle device having a touch-sensitive input device; and a mobile device having a touch-sensitive input device, the mobile device being connectable to the mobile device and being

remotely operable, when the mobile device and the in-vehicle device are connected, from the in-vehicle device using at least user inputs from the touch-sensitive input device of the in-vehicle device. The mobile device is operable to send specification information to in-vehicle device; the in-vehicle device is operable to obtain one or more touch-sensitive input device capabilities for the in-vehicle device and to obtain, upon reception of the specification information, one or more touch-sensitive input device capabilities for the mobile device based on the specification information; and the in-vehicle device is operable to determine whether incompatibility exists between the one or more touch-sensitive input device capabilities for the in-vehicle device and the one or more touch-sensitive input device capabilities for the mobile device for remotely operating the mobile device from the in-vehicle device; and to present, if an incompatibility has been identified, a notification regarding any identified incompatibility.

Further feature combinations provided by the present teachings will be understood from the following detailed description and the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

Example embodiments will now be described by way of example only, with reference to the following drawings, which merely illustrate example arrangements in accordance with the presently disclosure and cannot be considered as limiting the scope of the present disclosure.

Fig. 1 is a schematic illustration of a mobile device and an in-vehicle device;

Fig. 2 is an illustration of a mobile device connected to an in-vehicle device via a remote control connection.

Fig. 3 is a flowchart illustrating a method for presenting an incompatibility notification;

Fig. 4 is a flowchart illustrating a further method for presenting an incompatibility notification; and

Fig. 5A-5D are illustrations of possible single or multi-touch operations.

While the invention is described herein by way of example for several embodiments and illustrative drawings, those skilled in the art will recognize that the invention is not limited to the embodiments or drawings described. It should be understood, that the drawings and detailed description thereto are not intended to limit the invention to the particular form disclosed, but on the contrary, the intention is to cover all modifications, equivalents and alternatives falling within the spirit and scope of the present invention. The headings used herein are for organizational purposes only and are not meant to be used to limit the scope of the description. As used throughout this application, the word "may" is used in a permissive sense (i.e. meaning "might") rather than the mandatory sense (i.e., meaning "must"). Similarly, the words "include", "including", and "includes" mean including, but not limited to.

DESCRIPTION

The present disclosure discusses interactions between mobile devices and vehicles. In the present disclosure, mobile device may refer to any mobile and/or portable device, for example a mobile phone (including a smartphone), a satellite navigation ("sat-nav") device, a tablet, a netbook, an audio player, a video player or a portable computer. Also, the term "vehicle" may refer to any transport, for example any form of car, lorry or motorcycle. Other clarifications as to the meaning of certain terms used herein can be found throughout the present disclosure.

Fig. 1 is a schematic illustration of a mobile device 10 and an in-vehicle device 20 which may be used in accordance with the present disclosure. The mobile device 10 is connectable to an in-vehicle device 20, and may include the following elements: a communication unit 14, a control unit 16 for controlling processes running on the mobile device 10, and a memory unit 18. On the other hand, the in-vehicle device 20 may include a touch-sensitive input device 22 for displaying content to a user, a communication unit 24 for communicating with at least the mobile device 10, a control unit 26 for controlling processes running on the in-vehicle device 20 and a memory unit 28. The mobile device 10 and the in-vehicle device 20 may be connected via their respective communication units so that the mobile can be remotely controlled from the in-vehicle device 20 and so that display information is received at the in-vehicle device 20 to be displayed on the display unit 22 of the in-vehicle device 20. Such a connection may be referred to as a remote control connection. The physical connections between the mobile device 10 and the in-vehicle device 20 may be a wired connection such as a USB or FireWire connection or, alternatively, may be a wireless connection such as Bluetooth, Wi-Fi or IR.

Fig. 2 is an illustration of a mobile device 10 connected to an in-vehicle device 20 via a remote control connection. The display unit 22 of the in-vehicle device 20 in this example shows the same image as the display unit 12 of the mobile device 10. Once connected, the mobile device 10 can be remotely controlled from the in-vehicle device 20, for example with the use of a touch-sensitive input device of the display unit 22 and/or the use of a one or more buttons 25. Any other suitable input means, for example voice command input means, may be used. It is noteworthy that, in the illustration of Fig. 2, the screen of the mobile device 10 is turned on at least for the ease of illustrating an example comparison between the displays of the mobile device 10 and of the in-vehicle device 20. However, in other examples the screen of the mobile device 10 may sometimes or always be turned off and/or locked, for example to save battery and/or for security reasons, either because it is connected to the in-vehicle device 20 or because the mobile device 10 has not been used

for a predetermined time. Once the mobile device 10 and the in-vehicle device 20 are connected, the user can control the mobile device 10 from the in-vehicle device 20. For example, the user may be able to use buttons, such as buttons 25a and 25b and directional pad 25c, to enter menus that are native menus of the mobile device 10 and to use the mobile device 10 as if the user was using the mobile device's native input means and display.

Also, once connected, the mobile device 10 can send display information to the in-vehicle device 20 and the in-vehicle device 20 can display at least part of the display information on its in-vehicle display 22 (or on a part of it), wherein display information includes information as to what can be displayed on the remote display, in this case the in-vehicle display. In some examples, the display information sent by the mobile device 10 will correspond exactly to what is or would have been displayed on the mobile device's display 12. In these cases, the display information can have the same pixel and colour resolution as the mobile device's display. In other cases, the display information may correspond to a display which differs from the mobile device's display. In that event, the display information may for example have a lower pixel and/or colour resolution so that less information has to be transmitted. In some cases, the display information may have a higher pixel and/or colour resolution, for example if the in-vehicle display 22 has a higher pixel and/or colour resolution than the mobile device's display 12. In the event that the in-vehicle display 22 has a different pixel and/or colour resolution than that of the display information received from the mobile device 10, adjustments may be made when displaying the display information on the in-vehicle display 22. This is known to the skilled person and may for example involve pixel resolution or colour resolution up-scaling or down-scaling, or displaying only a part of the mobile device's display (with for example the option to show another part of the mobile device's screen by moving a cursor to the sides of the in-vehicle display).

The connection between the mobile device 10 and in-vehicle device 20 may be used for example to use a sat-nav function of the mobile-device from the in-vehicle device 20, or any other function of the mobile device 10. For example the user may use a web browser, games, mobile apps, etc. of the mobile device 10 from the in-vehicle device 20. In other words, the remote control connection between the mobile device 10 and the in-vehicle device 20 can be considered as a VNC or VNC-like connection. Examples of suitable systems can also include an X-Windows (or X11) type approach or a MirrorLink™ approach.

Fig. 3 is a flowchart illustrating a method for presenting an incompatibility notification. The example method of Fig. 3 is illustrated showing steps performed at the

mobile device 10 and steps performed at the in-vehicle device 20. In other examples, only steps performed at the mobile device 10 or at the in-vehicle device 20 may be considered and/or additional or fewer steps may be considered. Once the mobile device 10 and in-vehicle device 20 are connected, for example according to a connection as discussed above, the mobile device 10 sends specification information to the in-vehicle device 20 at step S310. For example, the specification information may include at least one of: a model number, a serial number, a manufacturer, and screen identification information. In some examples, the specification information may also include touch-sensitive input device capability information. Also, the model number, serial number and manufacturer may be in respect of the mobile device 10 or in respect of any element involved for the touch-sensitive input device, such as a graphic card, a GPU, and/or the touch-sensitive input device itself. The specification information is received by the in-vehicle device 20 at S320.

The in-vehicle device 20 then obtains at S321 one or more touch-sensitive input device capabilities for the mobile device 10, based on the specification information, and one or more touch-sensitive input device capabilities for the in-vehicle device 20. In some examples, this step may be carried out as two separate steps, for example obtaining one or more capabilities for a first of the two devices, and then obtaining one or more capabilities for the second of the two devices. Different methods may be used to obtain one or more touch-sensitive input device capabilities for the mobile device 10 based on the specification information. For example, if the specification information includes a serial number, the in-vehicle device 20 may retrieve the one or more touch-sensitive input device capabilities from an element, for example a table, a database or any other organised form of data store. In one example, the element may be part of the in-vehicle device 20, e.g. a table stored in the memory 28. In another example, the element may be a remote element, for example, the in-vehicle device 20 may include wireless (e.g. GPRS, 3G, 4G, WiMAX, etc.) communication means and may query the remote element for one or more touch-sensitive input device capabilities for the mobile device 10. In another example, the one or more touch-sensitive input device capabilities may be based more directly on the specification information, for example the specification information may include at least a part of the one or more touch-sensitive input device capabilities. The specification information may include at least one of resistive screen; capacitive screen; and any other touch-sensitive technology. For example, resistive screens are generally single-touch screens (although resistive technology may be used to provide multi-touch screens). It may therefore be appropriate, for example if no other information is available, to consider that a touch-sensitive input device having a resistive screen is a single-touch surface. It may also be appropriate, for example if there is no indication to the contrary, to consider that a capacitive

screen is a multi-touch screen. The one or more touch-sensitive input device capabilities may include at least one of single touch, multi-touch, and the detection of a touch-operation. Additionally, the touch-sensitive input device capabilities may include recognised touch operations, which can for example be recognised by the touch-sensitive input device and/or
5 by a system processing the touch-sensitive input device inputs. For example, in one arrangement, the touch-sensitive input device may have a multi-touch detection capability but may only be able to detect one point operations (for example as illustrated on Fig. 5A) and a two-point parallel sliding operation (for example as illustrated in Fig. 5B) and may not be able to detect and/or process other multi-touch inputs. In this arrangement, the touch-
10 sensitive input device may thus for example not be operable to detect, or may not be used with a system operable to detect, a pinch-in or pinch-out operation (as illustrated in Fig. 5C-5D). A touch-sensitive input device which may be according to this arrangement may include a touch panel on a computer (e.g. a netbook, laptop or tablet) which can be used as a mouse for any one point touch operation and as scrolling means for two points, up/down
15 or right/left sliding operations. In other examples, the touch-sensitive input device may be operable to detect, and/or used with a system operable to detect, possibly any multi-touch operations or most well-known multi-point operations, for example parallel sliding and pinch-in/out. In conclusion, the one or more touch-sensitive input device capabilities may include any appropriate touch-sensitive input device capability.

20 At step S322, the in-vehicle device 20 identifies any incompatibility between the one or more touch-sensitive input device capabilities obtained for the mobile device 10 and for the in-vehicle device 20. For example it may be detected that the mobile device 10 has a multi-touch capability (or if it is an assumed capability if for example the surface is a capacitive screen, per the discussion above), and that the in-vehicle does not have a multi-
25 touch capability, this may be identified as an incompatibility. For example, the user may then not be able to control the mobile device 10 from the in-vehicle device 20 in the same manner as when controlling the mobile device 10 directly without a remote control connection. In some examples, if the in-vehicle device 20 has a multi-touch screen and the mobile device 10 has a single-touch screen, this may not be identified as an incompatibility.
30 For example, because the user may be able to control the mobile device 10 via the remote control connection in the same manner as when controlling the mobile device 10 directly, it may be appropriate to consider that this does not affect remote operation of the mobile device 10 and that this is thus not an incompatibility. In other cases, this may be considered as an incompatibility because the touch-sensitive input device capabilities differ
35 between the mobile device 10 and the in-vehicle device 20 and this may therefore affect the remote operation of the mobile device 10 from the in-vehicle device 20 for example by

causing the mobile device 10 not to be able to process user inputs received from the in-vehicle device 20 and which are multi-touch user inputs. In some examples, an incompatibility may be identified if the mobile device 10 can detect pinch-in/out operations while the in-vehicle device 20 can not detect these operations (e.g. if it can detect one or more multi-touch operations but not a pinch-in or pinch-out operation).

Based on the outcome of step S322, at step S323, if any incompatibility has been identified, the method proceeds to step S324 where an incompatibility notification is presented using the vehicle device. For example the in-vehicle device 20 may cause a sound system to play a sound, such as a voice message, a bleeping sound or any other suitable sound. In one example, a voice message may be played which notifies the user of an incompatibility, and optionally, of the type of incompatibility, for example that multi-touch is not available from the in-vehicle device 20. Alternatively or additionally, the presenting a notification may comprise displaying a visual notification on an in-vehicle display. This in-vehicle display may be at least a part of the in-vehicle touch-sensitive input device 22 or at least a part of a different display. For example, if the in-vehicle touch-sensitive input device 22 is a touch panel and can not display content, the notification may be displayed on different element. In another example, the touch-sensitive input device 22 may be operable to display content and the notification may be displayed on this and/or a different display. Possible in-vehicle displays include a central dashboard screen (e.g. used for the vehicle's configuration and/or sat-nav), a head-up display, an icon or symbol on the dashboard (e.g. behind the wheel or in a more central position in the vehicle). The notification may include one or more different types of notification, for example, it may include displaying an icon on a display and playing a sound.

In the event that, at step S323, no incompatibility has been identified, the method skips step S324 and carries on (for example ends or carries on with additional steps).

Fig. 4 is a flowchart illustrating a further method for presenting an incompatibility notification. In this illustration, the method is represented from the point of view of the in-vehicle device 20, but in other examples it may be represented including more and/or different elements and may include more or fewer steps. At step S420, the in-vehicle device 20 receives specification information from the mobile device 10. At step S421, the in-vehicle device 20 obtains one or more touch-sensitive input device capabilities for the mobile device 10, based on the specification information, and one or more touch-sensitive input device capabilities for the in-vehicle device 20. The in-vehicle device 20 then identifies any incompatibility between the obtained touch-sensitive input device capabilities at S422. The above-discussion of steps S320-S323 applies equally to steps S420-S423 of the method illustrated in Fig. 4. If any incompatibility has been identified (S423), the

method moves on to step S424, where it is determined whether any input means are available to compensate fully or partially for the identified incompatibility. For example, in a situation where the mobile device's display 12 is a multi-touch touchscreen and the in-vehicle display 22 is a single-touch touchscreen, the in-vehicle display can not be used for pinch-in (see Fig. 5C) or pinch-out (see Fig. 5D) operations, for example to zoom out or in on a map. However, if for example the in-vehicle device 20 includes buttons 25a and 25b which can be used on the in-vehicle device 20 to zoom in or out on a map displayed on the in-vehicle display 22, the user may be able to use zooming buttons 25a and 25b to compensate at least partially for the lack of detection of pinch-in/pinch-out operations on the in-vehicle display 22. In this situation, it could be detected at step S424 that input means are available to compensate at least partially for the multi-touch/single-touch incompatibility detected at step S423. If such means are available, the method moves on to step S425 where a notification is presented regarding the availability of this input means to compensate fully or partially for the incompatibility. For example a message could be displayed on an in-vehicle display to notify the user that alternative input means are available, and optionally, the notification may indicate what the incompatibility is, what the alternatives input means is and/or how the alternative input means may be used to compensate for the incompatibility.

If however it has been determined at S424 that no such input means is available, the method moves on to step S426, where a notification is presented regarding the incompatibility. In some examples, the notification may clarify that no alternative input means has been identified to compensate (fully or partially) for the incompatibility. The notification discussion in respect of S324 applies equally to the notifications of S425 and/or S426.

Fig. 5A-5D are illustrations of possible single or multi-touch operations on a touch-sensitive input device 32. Fig. 5A is an example of a user input that can be entered on a single-touch or multi-touch touch-sensitive input device. The starting point 50A indicates where the input started and the arrow 50 indicates the path followed by the user (e.g. using his finger or a stylus) while keeping in contact with the touch-sensitive input device 32. In other examples, only a point can be input (e.g. only point 50A) for example to simulate a click or double-click (e.g. two subsequent points in the same area), or different paths may be followed, such as a loop, a line, etc.

Fig. 5B illustrates two possible multi-touch operations, with two parallel sliding paths on a touch-sensitive input device 32. Paths 52 and 53, starting from 52A and 53A respectively, can be followed substantially simultaneously by the user for example to encode a "scroll down" on a display. Likewise, paths 54 and 55, starting from 54A and 55A

respectively, can be followed substantially simultaneously by the user for example to encode a "scroll left".

Fig. 5C illustrates another possible multi-touch operation, sometimes referred to as "pinch in". Starting from points 56A and 57A, the two paths 56 and 57 are substantially
5 along the same direction and move towards each other. This can be used to encode a "zoom out" operation. For example, the centre C1 may be estimated based on point 56A, point 57A, the path directions, and/or the speed along the paths, and the zoom out operation may be centred on point C1.

Fig. 5D illustrates a possible multi-touch operation, sometimes referred to as "pinch
10 out". Starting from points 58A and 59A, the two paths 58 and 59 are substantially along the same direction and move away from each other. This can be used to encode a "zoom in" operation. For example, the centre C2 may be estimated based on point 58A, point 59A, the path directions, and/or the speed along the paths, and the zoom in operation may be centred on point C2.

15 Other modifications and/or additions can be carried out to any of the previously discussed methods or arrangements as described below.

For example, the representation of the mobile device 10 and of the in-vehicle device 20 in Fig. 1 is not intended to be limiting, for example on the physical and/or logical structure of the mobile device 10 and in-vehicle device 20. For example, this representation
20 can be viewed from a logical point of view, wherein the elements represented may illustrate the function of the devices, which may for example all be performed by the same hardware and/or software (if any). In other examples they may also be viewed as physical elements and they may be physically separate elements.

Also, touch inputs are not limited to a single- or dual-touch inputs and any number of
25 simultaneous input may be considered under the present disclosure, for example one, two, three or more. Additionally, the single or multi touch operations are not limited to the operations illustrated in Fig. 5A-5C and any other suitable touch input may be used.

In some examples, a touch-sensitive input device may be any appropriate touch-sensitive input device, such as a touchscreen (e.g. both a touch-sensitive input device and
30 a display), a touch panel (e.g. which does not include a display) or any touch-sensitive surface. The touch-sensitive display may use any appropriate touch technology. Examples of such technologies include capacitive (e.g. surface capacitance or projected capacitance), resistive, surface acoustic wave, or acoustic pulse recognition technologies. In some examples, the touch-sensitive input device may be operable to detect single touch and/or
35 multi touch operations; may be operable to do so with the use of a neutral stylus, a conductive stylus, and/or any other suitable neutral or non-neutral input means (e.g. a

user's finger); and may be operable to detect the strength of the contact on the touch-sensitive input device. The touch-sensitive display may also include a controller, for example for processing electrical changes on the surface and/or for outputting touch coordinates, e.g. to the control unit of the in-vehicle device 20 or of the mobile device 10 in the example of Fig. 1. In other examples, the function provided by such a controller may be provided by the control unit.

In some examples, most or all of the method steps may be carried out by the control units of the in-vehicle device 20 and of the mobile device 10, as appropriate. However, in other examples, for at least one of the mobile and in-vehicle devices, some or all of the steps may be carried out by a physically and/or logically different element of the devices.

Presenting a notification includes presenting a notification in any appropriate manner. For example it may include playing sound; e.g. a bleeping sound; playing a voice message, e.g. to inform a user of an incompatibility between the obtained touchscreen capabilities; displaying a message, for example on an in-vehicle device's screen, on a head-up display or any other suitable display; and presenting any other visual signal, for example lighting a symbol on the dashboard, displaying an icon on an in-vehicle display (e.g. a head-up display), turning on and/or off one or more lights of any colour, flashing one or more lights of any colour and at any frequency, etc.

Additionally, the selection of the type of notification presented may depend on one or more parameters, for example fixed (e.g. pre-configured), configurable (e.g. by the user and/or another party), and/or dynamic parameters. For example, it may be decided that, if the vehicle's speed is higher than a threshold, then a message notification will be presented on a head-up display only, but if the vehicle speed is less than the threshold, then a message notification will be presented on an in-vehicle display and on a head-up display, so that the message notification can be appropriately presented depending on the situation. In some example, a notification may or may not be presented depending on a parameter, e.g. if the vehicle speed is considered as high, presenting any notification may be considered as unsafe and it can thus be appropriate not to present any notification, or only a discreet notification (e.g. turning on or off small icon in an in-vehicle display in a central position in the vehicle and not directly in front of the driver). In other examples, one or more notifications may be delayed until a certain condition is met, for example a condition in respect of the vehicle and/or the vehicle's environment. For example, an icon notification may be presented as soon as the incompatibility has been detected, but an audio message (e.g. voice message or other sound) may be delayed until the vehicle speed has decreased below a certain limit (e.g. the vehicle has stopped) or until the vehicle has exited a particular zone (e.g. a high-speed or -risk zone). In this illustrative example, the driver is not disturbed

by the audio message while driving for example at high speed. And when the vehicle speed has been decreased to a lower value, the audio message may be played to the user.

The parameters discussed in the above-paragraph, and the type of incompatibility required to trigger the presentation of a notification (hereinafter called "incompatibility requirements") may be configurable. For example, a party may be provided with the option to overwrite one or more of the parameters and/or incompatibility requirements. For example, in an event where a single-touch mobile device 10 has been connected to a multi-touch in-vehicle device 20 and that it is has been detected that the touch-sensitive input devices have different capabilities, the user may overwrite the incompatibility requirements for this mobile device 10 so that this type of incompatibility is no longer notified. In some examples, this may be done temporarily (e.g. for the duration of the connection) or permanently (e.g. the incompatibility is no longer notified unless this requirement is overwritten at a later point in time). Optionally, the overwriting information may be sent to a remote element. This may be appropriate for example to keep track of any user preference regarding incompatibilities to be notified. Also, in some examples overwriting instructions may be sent from a remote element to the in-vehicle device 20. For example if it has been detected that the assumed user preferences in respect of notifications could be improved, overwriting instructions may be sent to the in-vehicle device 20 to update the in-vehicle device 20 remotely and re-configure the notification parameters. Also, in an example where the in-vehicle device 20 obtained one or more capabilities for a mobile device which appear to be incorrect (e.g. "single-touch" when it should be "multi-touch"), it may be possible to change at least one of these capabilities accordingly, for example by overwriting the incorrect capability(ies) by the user or by a remote element.

The specification information sent to the in-vehicle device 20 may be sent automatically (for example as part of a discovery message exchange once the in-vehicle and mobile devices are connected) or on request. For example the in-vehicle device 20 may be operable to detect that a mobile device 10 is connected via a remote-control connection and send a specification information request to the mobile device 10. In some examples, when a mobile device 10 is connected to an in-vehicle device 20 via a remote control connection, the mobile device 10 may not have a touch-sensitive input device. The in-vehicle device may then first determine whether the mobile device 10 comprises a touch-sensitive input device. This may be based on the specification information received. For example, the specification information may specify that the mobile device does not include any touch-sensitive input device or it may be derivable from the brand and model of the mobile device 10 that the mobile device 10 does not comprise any touch-sensitive input device. Alternatively, it may be first determined by other means (e.g. sending a request to

the mobile device 10). Then, in the event that the mobile device 10 comprises a touch-sensitive input device, the in-vehicle device 20 may receive, automatically or on request, the specification information (e.g. a single/multi touch capability indication).

Claims

1. A method comprising:

5 connecting a mobile device having a touch-sensitive input device to an in-vehicle device having a touch-sensitive input device, wherein, when the mobile device and the in-vehicle device are connected, the mobile device is remotely operable from the in-vehicle device using at least user inputs from the touch-sensitive input device of the in-vehicle device;

10 receiving at the in-vehicle device specification information for the mobile device from the mobile device;

obtaining one or more touch-sensitive input device capabilities for the in-vehicle device;

obtaining one or more touch-sensitive input device capabilities for the mobile device based on the specification information;

15 determining whether incompatibility exists between the one or more touch-sensitive input device capabilities for the in-vehicle device and the one or more touch-sensitive input device capabilities for the mobile device for remotely operating the mobile device from the in-vehicle device; and

20 if an incompatibility has been identified, presenting, using the in-vehicle device, a notification regarding the identified incompatibility.

2. The method of claim 1 wherein presenting a notification includes at least one of displaying a message on a display of the in-vehicle device; displaying an icon on a display of the in-vehicle device and playing a sound.

25 3. The method of any preceding claim wherein the specification information includes at least one of a model number, a serial number, a manufacturer, screen identification information, a touch-sensitive input device technology, and a touch-sensitive input device capability for the mobile device.

30 4. The method of any preceding claim wherein the one or more touch-sensitive input device capabilities include at least one of single-touch; multi-touch; and one or more recognised touch operations.

5. The method of any preceding claim, wherein part of the touch-sensitive input device of the mobile device and/or part of the touch-sensitive input device of the in-vehicle device comprises at least one of a touchscreen and a touch panel.

5 6. The method of any preceding claim wherein obtaining one or more touch-sensitive input device capabilities for the mobile device includes retrieving at least part of the one or more touch-sensitive input device capabilities for the mobile device from a capabilities table using the specification information for the mobile device.

10 7. The method of any preceding claim wherein the determining step includes detecting whether a first touch-sensitive input device capability is available for the mobile device and is not available for the in-vehicle device; and
if a first capability has been detected,
determining whether a first input means is available at the in-vehicle device
15 to compensate fully or partially for the lack of the first capability for the in-vehicle device and,
if a first input means is available, presenting a notification includes
presenting a notification regarding the first input means being available to
compensate fully or partially, respectively, for the lack of the first capability in the in-
20 vehicle device.

8. A in-vehicle device comprising:
a communication element operable to send and receive messages;
a touch-sensitive input device;
25 a connection element operable to control a connection with a mobile device, wherein the connection element is operable to control remotely a mobile device using at least user inputs from the touch-sensitive input device; and
a compatibility element operable to receive from a mobile device having a touch-sensitive input device specification information for the mobile device; to obtain one or more
30 touch-sensitive input device capabilities for the in-vehicle device; to obtain one or more touch-sensitive input device capabilities for the mobile device based on the specification information; to determine whether incompatibility exists between the one or more touch-sensitive input device capabilities for the in-vehicle device and the one or more touch-sensitive input device capabilities for the mobile device for remotely operating the mobile
35 device from the in-vehicle device; and to present, if an incompatibility has been identified, a notification regarding the identified incompatibility using the in-vehicle device.

9. The device of claim 8 wherein the compatibility element being operable present a notification includes at least one of the compatibility element being operable to display a message on a display of the in-vehicle device; the compatibility element being operable to display an icon on a display of the in-vehicle device and the compatibility element being operable to play a sound.

10. The device of claim 8 or 9 wherein the specification information includes at least part of a model number, a serial number, a manufacturer, screen identification information, a touch-sensitive input device technology, and a touch-sensitive input device capability for the mobile device

11. The device of any one of claims 8 to 10, wherein the one or more touch-sensitive input device capabilities include at least one of single-touch; multi-touch; and one or more recognised touch operations.

12. The device of any one of claims 8 to 11, wherein part of the touch-sensitive input device of the mobile device and/or part of the touch-sensitive input device of the in-vehicle device comprises at least one of a touchscreen and a touch panel.

13. The device of any one of claims 8 to 12 wherein the compatibility element is operable to retrieve at least part of the one or more touch-sensitive input device capabilities for the mobile device from a capabilities table using the specification information for the mobile device.

14. The device of any one of claims 8 to 13 wherein the compatibility element is operable:

to detect whether a first touch-sensitive input device capability is available for the mobile device and is not available for the in-vehicle device;

upon a first capability being detected, to determine whether a first input means is available at the in-vehicle device to compensate fully or partially for the lack of the first capability at the in-vehicle device and to present, if a first input means is available, a notification regarding the first input means being available to compensate fully or partially, respectively, for the lack of the first capability in the in-vehicle device.

15. A system comprising:

an in-vehicle device having a touch-sensitive input device; and

a mobile device having a touch-sensitive input device, the mobile device being connectable to the mobile device and being remotely operable, when the mobile device and the in-vehicle device are connected, from the in-vehicle device using at least user inputs

5 from the touch-sensitive input device of the in-vehicle device;

wherein:

the mobile device is operable to send specification information to in-vehicle device;

the in-vehicle device is operable to obtain one or more touch-sensitive input device capabilities for the in-vehicle device and to obtain, upon reception of the specification
10 information, one or more touch-sensitive input device capabilities for the mobile device based on the specification information; and

the in-vehicle device is operable to determine whether incompatibility exists between the one or more touch-sensitive input device capabilities for the in-vehicle device and the one or more touch-sensitive input device capabilities for the mobile device for remotely
15 operating the mobile device from the in-vehicle device; and to present, if an incompatibility has been identified, a notification regarding any identified incompatibility.

16. A method substantially as hereinbefore described.

20 17. A device substantially as hereinbefore described.

18. A system substantially as hereinbefore described.

Amendments to the Claims have been filed as follows

Claims

1. A method comprising:

connecting a mobile device having a touch-sensitive input device to an in-vehicle
5 device having a touch-sensitive input device, wherein, when the mobile device and the in-
vehicle device are connected, the mobile device is remotely operable from the in-vehicle
device using at least user inputs from the touch-sensitive input device of the in-vehicle
device;

receiving at the in-vehicle device specification information for the mobile device from
10 the mobile device;

obtaining one or more touch-sensitive input device capabilities for the in-vehicle
device;

obtaining one or more touch-sensitive input device capabilities for the mobile device
based on the specification information;

15 determining whether incompatibility exists between the one or more touch-sensitive
input device capabilities for the in-vehicle device and the one or more touch-sensitive input
device capabilities for the mobile device for remotely operating the mobile device from the
in-vehicle device; and

if an incompatibility has been identified, presenting, using the in-vehicle device, a
20 notification regarding the identified incompatibility, wherein presenting a notification includes
at least one of displaying a message on a display of the in-vehicle device; displaying an
icon on a display of the in-vehicle device and playing a sound.

2. The method of claim 1 wherein the specification information includes at least one of
25 a model number, a serial number, a manufacturer, screen identification information, a
touch-sensitive input device technology, and a touch-sensitive input device capability for the
mobile device.

3. The method of any preceding claim wherein the one or more touch-sensitive input
30 device capabilities include at least one of single-touch; multi-touch; and one or more
recognised touch operations.

4. The method of any preceding claim, wherein part of the touch-sensitive input device
of the mobile device and/or part of the touch-sensitive input device of the in-vehicle device
35 comprises at least one of a touchscreen and a touch panel.

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5. The method of any preceding claim wherein obtaining one or more touch-sensitive input device capabilities for the mobile device includes retrieving at least part of the one or more touch-sensitive input device capabilities for the mobile device from a capabilities table using the specification information for the mobile device.

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6. The method of any preceding claim wherein the determining step includes detecting whether a first touch-sensitive input device capability is available for the mobile device and is not available for the in-vehicle device; and if a first capability has been detected,

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determining whether a first input means is available at the in-vehicle device to compensate fully or partially for the lack of the first capability for the in-vehicle device and,

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if a first input means is available, presenting a notification includes presenting a notification regarding the first input means being available to compensate fully or partially, respectively, for the lack of the first capability in the in-vehicle device.

7. A in-vehicle device comprising:

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a communication element operable to send and receive messages;

a touch-sensitive input device;

a connection element operable to control a connection with a mobile device, wherein the connection element is operable to control remotely a mobile device using at least user inputs from the touch-sensitive input device; and

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a compatibility element operable to receive from a mobile device having a touch-sensitive input device specification information for the mobile device; to obtain one or more touch-sensitive input device capabilities for the in-vehicle device; to obtain one or more touch-sensitive input device capabilities for the mobile device based on the specification information; to determine whether incompatibility exists between the one or more touch-sensitive input device capabilities for the in-vehicle device and the one or more touch-sensitive input device capabilities for the mobile device for remotely operating the mobile device from the in-vehicle device; and to present, if an incompatibility has been identified, a notification regarding the identified incompatibility using the in-vehicle device,

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wherein the compatibility element being operable present a notification includes at least one of the compatibility element being operable to display a message on a display of the in-vehicle device; the compatibility element being operable to display an icon on a

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display of the in-vehicle device and the compatibility element being operable to play a sound.

8. The device of claim 7 wherein the specification information includes at least part of a
5 model number, a serial number, a manufacturer, screen identification information, a touch-sensitive input device technology, and a touch-sensitive input device capability for the mobile device

9. The device of claim 7 or 8, wherein the one or more touch-sensitive input device
10 capabilities include at least one of single-touch; multi-touch; and one or more recognised touch operations.

10. The device of any one of claims 7 to 9, wherein part of the touch-sensitive input
15 device of the mobile device and/or part of the touch-sensitive input device of the in-vehicle device comprises at least one of a touchscreen and a touch panel.

11. The device of any one of claims 7 to 10 wherein the compatibility element is
operable to retrieve at least part of the one or more touch-sensitive input device capabilities
for the mobile device from a capabilities table using the specification information for the
20 mobile device.

12. The device of any one of claims 7 to 11 wherein the compatibility element is operable:

to detect whether a first touch-sensitive input device capability is available for the
25 mobile device and is not available for the in-vehicle device;

upon a first capability being detected, to determine whether a first input means is available at the in-vehicle device to compensate fully or partially for the lack of the first capability at the in-vehicle device and to present, if a first input means is available, a notification regarding the first input means being available to compensate fully or partially,
30 respectively, for the lack of the first capability in the in-vehicle device.

13. A system comprising:

an in-vehicle device having a touch-sensitive input device; and

a mobile device having a touch-sensitive input device, the mobile device being
35 connectable to the mobile device and being remotely operable, when the mobile device and

the in-vehicle device are connected, from the in-vehicle device using at least user inputs from the touch-sensitive input device of the in-vehicle device; wherein:

the mobile device is operable to send specification information to in-vehicle device;

5 the in-vehicle device is operable to obtain one or more touch-sensitive input device capabilities for the in-vehicle device and to obtain, upon reception of the specification information, one or more touch-sensitive input device capabilities for the mobile device based on the specification information; and

10 the in-vehicle device is operable to determine whether incompatibility exists between the one or more touch-sensitive input device capabilities for the in-vehicle device and the one or more touch-sensitive input device capabilities for the mobile device for remotely operating the mobile device from the in-vehicle device; and to present, if an incompatibility has been identified, a notification regarding any identified incompatibility,

15 wherein the in-vehicle device being operable present a notification includes at least one of the in-vehicle device being operable to display a message on a display of the in-vehicle device; the in-vehicle device being operable to display an icon on a display of the in-vehicle device and the in-vehicle device being operable to play a sound.

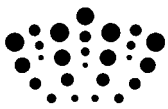
14. A method substantially as hereinbefore described.

15. A device substantially as hereinbefore described.

16. A system substantially as hereinbefore described.

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Application No: GB1209730.9

Examiner: Mr Euros Morris

Claims searched: All

Date of search: 24 September 2012

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1, 8, 15 at least	WO2009/073806 A2 (JOHNSON CONTROLS TECHNOLOGY CO): Whole document relevant, esp Figs 3, 12, 21 and related passages, esp 0055-0056, 0092, 0104 - 0123.
X	1, 8, 15 at least	US2011/0086678 A1 (SUZUKI): Whole document relevant, esp paragraphs 0005-0007, 0031, 0043, 0048.
X	1, 8, 15 at least	WO2005/025256 A1 (NOKIA CORP): Whole document relevant.
A	-	US2007/0294625 A1 (RASIN ET AL): Whole document relevant.
A	-	US2011/0227843 A1 (WANG): Whole document relevant.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

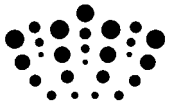
Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

Worldwide search of patent documents classified in the following areas of the IPC

G06F; H04M

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI



International Classification:

Subclass	Subgroup	Valid From
H04M	0001/60	01/01/2006
H04M	0001/725	01/01/2006