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(54) DYNAMIC HUMAN-MACHINE INTERFACE DEVICE AND METHOD

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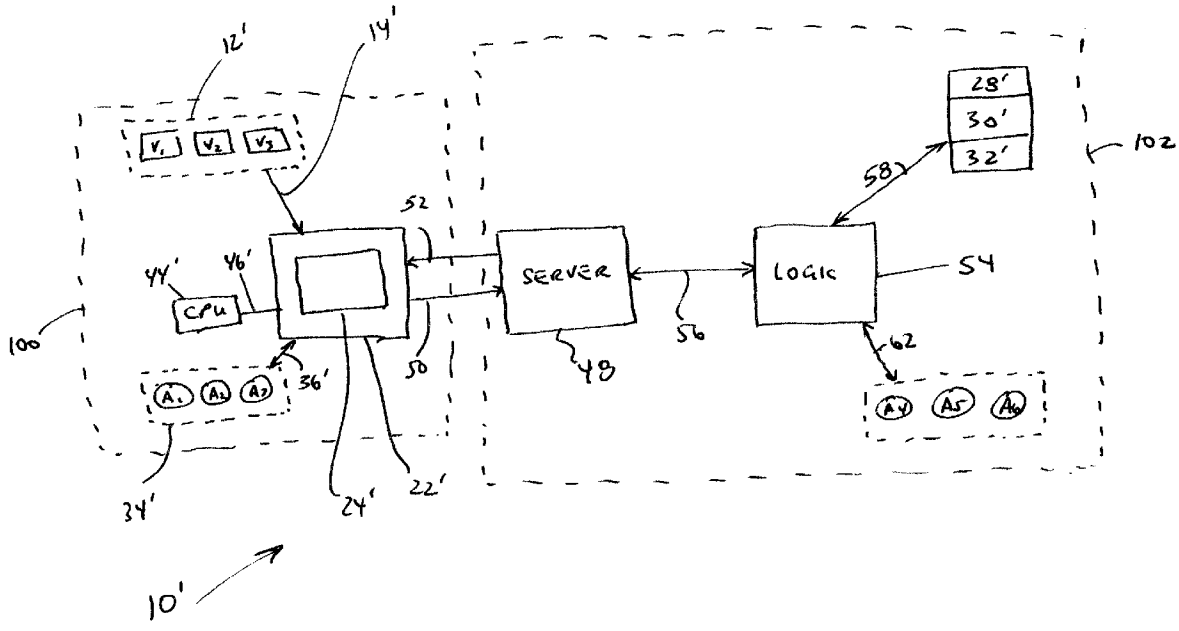
(57) ABSTRACT

A dynamic HMI device includes an interface section, which is configured to display an interface of at least one applet configured to control at least one function of a motor vehicle. The dynamic HMI device further includes a memory unit, which includes: a first memory section configured to store data representing at least one vehicle-specific parameter; a second memory section configured to store data for each of a plurality of vehicles representing a respective appearance of the at least one applet; and a third memory section configured to store data representing at least one application, each application corresponding to a respective applet. The interface section is configured to display the interface of the at least one applet in accordance with one of the plurality of vehicles corresponding to the vehicle-specific parameter represented by the data stored in the first memory section.

A method for providing a dynamic human-machine interface includes the steps of: storing data representing at least one vehicle-specific parameter in a first memory section of a memory unit; storing data for each of a plurality of vehicles representing a respective appearance of at least one applet in a second memory section of the memory unit; storing data representing at least one application in a third memory section of the memory unit, each application corresponding to a respective applet; reading the data from the first memory section; reading the data from the second memory section representing the appearance of the at least one applet corresponding to one of the plurality of vehicles in accordance with the data read from the first memory section; reading the data from the third memory section corresponding to the at least one applet; and displaying the interface of the at least one applet corresponding to the one of the plurality of vehicles in accordance with the data read from the first, second and third memory sections.



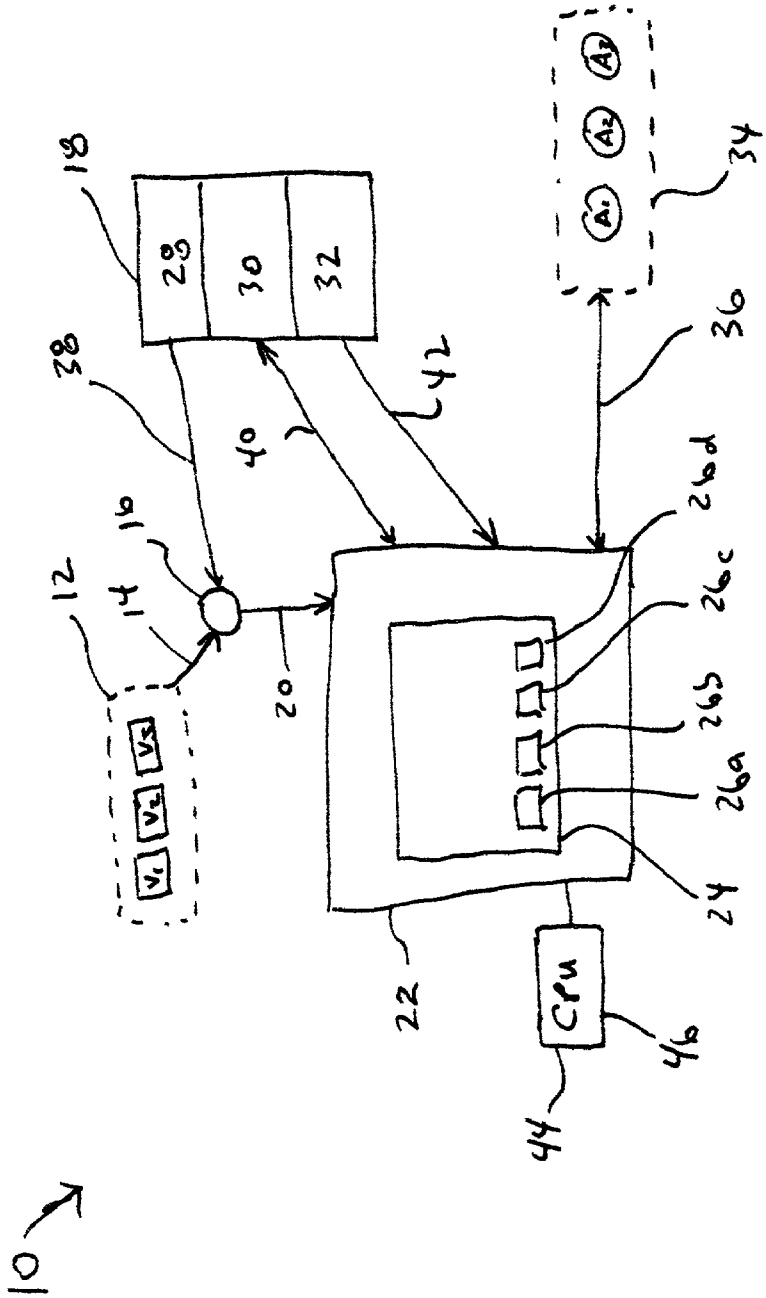
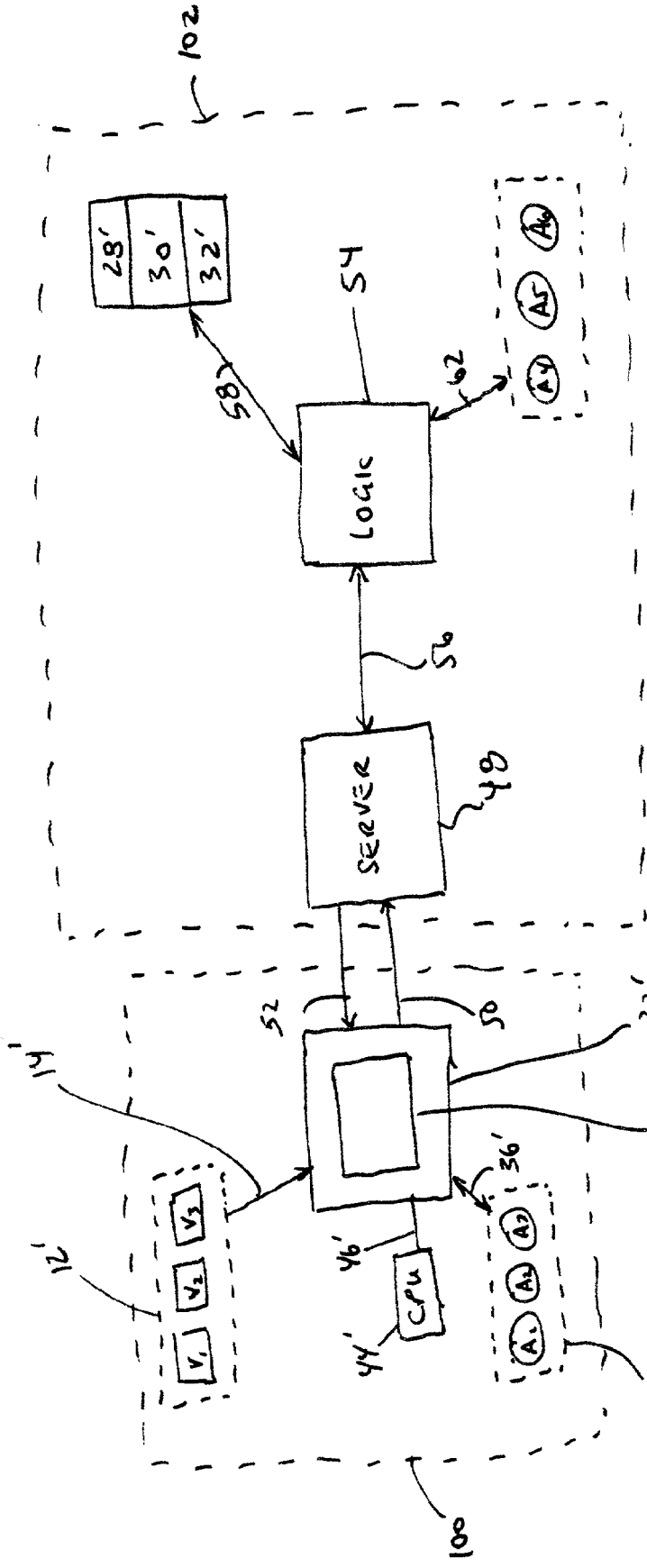

10
12
14
16
18
20
22
24
26a
26b
26c
26d
28
30
32
34
36
40
42
44
46
CPU
V1
V2
V3
A1
A2
A3

FIGURE 1


102
28'
30'
32'
54
58'
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Logic
56
Server
48
52
50
22'
24'
14'
12'
V1
V2
V3
46'
CPU
44'
36'
A1
A2
A3
A4
A5
A6
34'
10'
100

FIGURE 2

DYNAMIC HUMAN-MACHINE INTERFACE DEVICE AND METHOD

FIELD OF THE INVENTION

[0001] The present invention relates to a dynamic human-machine interface device and method.

BACKGROUND INFORMATION

[0002] Static human-machine interface (HMI) devices and methods are generally used in numerous applications, including automotive applications. These static HMI devices and methods rely on a hard-programmed display, which is directly and inseparably linked to the application programs that operate the display. Such devices and methods, therefore, cannot be used in combination with a client/server architecture. Furthermore, software applications written for operating these devices cannot generally be reused for other devices.

[0003] It is therefore an object of the present invention to provide a dynamic HMI device and method in which the application is independent of the display.

[0004] It is a further object of the present invention to provide a dynamic HMI device and method in which the applications may be displayed in accordance with a selective one of a plurality of vehicles.

SUMMARY

[0005] The above and other beneficial objects of the present invention are achieved by providing a dynamic HMI device and method as described herein. In one embodiment, the dynamic HMI device includes an interface section, which is configured to display an interface of at least one applet configured to control at least one function of a motor vehicle. The dynamic HMI device further includes a memory unit, which includes: a first memory section configured to store data representing a vehicle-specific parameter; a second memory section configured to store, for each of a plurality of vehicles, data representing a respective appearance of the at least one applet; and a third memory section configured to store data representing at least one application, each application corresponding to a respective applet, each application including at least one function. The interface section is configured to display the interface of the at least one applet in accordance with one of the plurality of vehicles corresponding to the vehicle-specific parameter represented by the data stored in the first memory section.

[0006] The method according to the present invention includes the steps of: storing data representing at least one vehicle-specific parameter in a first memory section of a memory unit; storing data for each of a plurality of vehicles representing an appearance of at least one applet in a second memory section of the memory unit; storing data representing at least one application in a third memory section of the memory unit, each application corresponding to a respective applet, each application including at least one function; reading the data from the first memory section; reading the data from the second memory section representing the appearance of the at least one applet corresponding to one of the plurality of vehicles in accordance with the data read from the first memory section; reading the data from the third memory section corresponding to the at least one applet; and displaying the interface of the at least one applet corresponding to the one of the plurality of vehicles in accordance with the data read from the first, second and third memory sections.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] **FIG. 1** is a schematic view of a first example embodiment of a dynamic human-machine interface device according to the present invention; and

[0008] **FIG. 2** is a schematic view of a second example embodiment of the dynamic human-machine interface device according to the present invention.

DETAILED DESCRIPTION

[0009] Those skilled in the art will gain an appreciation of the present invention from a reading of the following description when viewed in conjunction with the accompanying drawings of **FIGS. 1 and 2**. The individual reference characters designate the same or similar elements throughout the several views.

[0010] Referring to **FIG. 1**, there is seen a schematic view of a first example embodiment of a dynamic human-machine interface device **10** according to the present invention. The dynamic HMI device **10** includes a memory unit, which includes a first memory section **12**, a second memory section **18** and a third memory section **34**. The first memory section **12** is configured to store data representing at least one vehicle-specific parameter, such as, for example, data representing a make, a model, a trim level, an option package, etc. of a vehicle, e.g., an automobile. It should be understood that although **FIG. 1** illustrates that the first memory section **12** is configured to store the vehicle-specific parameter corresponding to one of three vehicle v_1, v_2, v_3, the first memory section **12** may be configured to store data representing the vehicle-specific parameter corresponding to one of any number of vehicles. The first memory section **12** may store the data representing the vehicle-specific parameter in accordance with an XSL (eXtensible Stylesheet Language) standard. The dynamic HMI device **10** also includes a transform section **16**, which may be configured, for example, according to an XSLT (eXtensible Stylesheet Language Transformation) function. The transform section **16** is configured to read the data from the first memory section **12** via line **14**.

[0011] The second memory section **18** is configured to store first data **28**, second data **30** and third data **32**. The first data **28** represents a generic HMI, the second data **30** represents a definition of an applet appearance, as more fully described below, and the third data **32** represents a destination link, as also more fully described below. The second memory section **18** may be configured to store the first data **28**, the second data **30** and/or the third data **32** in accordance with an XML (eXtensible Markup Language) standard. As illustrated in **FIG. 1**, the transform section **16** is configured to read the first data **28** from the second memory section **18** via line **38**.

[0012] The dynamic HMI device includes a browser section **22**. The transform section **16**, which, as indicated above, is configured to read the data from the first memory section **12** and from the second memory section **18**, is further configured to output data to the browser section **22** via line

20. The transform section **16** may be configured to output data to the browser section **22** in accordance with an HTML (HyperText Markup Language) standard.

[**0013**] The browser section **22** is configured to read the second data **30** from the second memory section **18** via line **40** and to output to the second memory section **18** via the line **40**. As indicated above, the second data **30** may include data representing the definition of an applet appearance. Thus, the browser section **22** displays an applet **24** in accordance with the second data **30** read from the second memory section **18**. The second data **30** may include data representing the definition of a plurality of applet appearances, each applet appearance corresponding to a respective one of the plurality of vehicles representable by the data stored in the first memory section **12**. Thus, the browser section **22** may be configured to read the second data **30** stored in the second memory section **18** in accordance with the data read from the first memory section **12** by the transform section **16**.

[**0014**] The applet **24** may include interface elements, such as, for example, buttons. The applet **24** illustrated in **FIG. 1** includes four buttons **26***a*, **26***b*, **26***c*, **26***d*. It should be appreciated that any appropriate number of interface elements may be provided. Each interface element, such as the buttons **26***a*, **26***b*, **26***c*, **26***d*, may correspond to a predetermined function and/or to a predetermined link. The second memory section **18** stores the second data **32**, which represent the destination links or functions corresponding to the interface elements. The browser section **22** is configured to read the third data **32** from the second memory section **18** via line **42**. The browser section **22** may be configured to read the second data **30** from the second memory section **18**, output to the second memory section **18** and/or read the third data **32** from the second memory section via the lines **40**, **42** in accordance with a DOM (Document Object Model) standard.

[**0015**] The dynamic HMI device **10** further includes a third memory section **34**, which is configured to store data representing a plurality of applications A_1, A_2, A_3, each including at least one function. It should be appreciated that although **FIG. 1** illustrates the third memory section **34** storing data representing three applications A_1, A_2, A_3, the third memory section **34** may be configured to store data representing any appropriate number of applications. The applications A_1, A_2, A_3 may include, for example, an audio control application, a navigation application, an e-mail application, etc. The data representing the applications A_1, A_2, A_3 may be stored in the third memory section **34** in the form of, for example, JAVA code. The browser section **22** is configured to communicate with the third memory section **34** via line **36**. It should be appreciated that a data processing unit (CPU) **44** may be provided to control the functions of the dynamic HMI device **10** via line **46** and that at least one input device may be provided for receiving an input from a user. The input device may include, for example, a touch screen, a mouse, a keyboard, a voice input device, etc. Furthermore, at least one output device may be provided for providing an output to the user. The output device may include, for example, a display device, an audio output device, etc.

[**0016**] By providing data representing the applet appearance in the second data **30** of the second memory section **18** for each of a plurality of vehicles v_1, v_2, v_3, one of which is corresponds to the data stored in the first memory section **12**, along with data representing the generic HMI in the first data **28** of the second memory section **18**, the dynamic HMI device **10** according to the present invention may display the applications A_1, A_2, A_3 in accordance with the vehicle v_1, v_2, v_3 in which the dynamic HMI device **10** is installed based on the vehicle-specific parameter represented by the data stored in the first memory section **12**.

[**0017**] The first data **28** of the second memory section **18** may include data representing, for example, images, text, background graphics, etc. The data stored in the first memory section **12** may define, for example, the appearance of the applet **24** that is vehicle-specific and independent of the applications A_1, A_2, A_3 represented by the data stored in the third memory section **34**. Thus, the applications A_1, A_2, A_3, when being executed as applets **24** by the browser section **22**, appear in a common format in accordance with the data representing the vehicle-specific parameter stored in the first memory section **12**. Thus, a corporate identity, for example, may be maintained for all applications A_1, A_2, A_3 corresponding to each vehicle v_1, v_2, v_3. That is, each application A_1, A_2, A_3 may be executed and displayed by the browser section **22** according to vehicle model line, brand line, trim level, option package, etc.

[**0018**] It should be appreciated that any one or more of the first memory section **12**, the second memory section **18** and the third memory section **34** may be integrated into a single logical or physical memory unit, such as, for example, an electronic memory device, a magnetic memory device, an optical memory device, a magneto-optical memory device, etc. Any one or more of the first memory section **12**, the second memory section **18** and the third memory section **34** may be wholly or partially removable, semipermanent, permanent, etc. Furthermore, any one or more of the first memory section **12**, the second memory section **18** and the third memory section **34** may be installed in the vehicle in which the dynamic HMI device **10** is installed or located remotely therefrom.

[**0019**] Referring to **FIG. 2**, there is seen a schematic view of a second example embodiment of the dynamic HMI device **10'**. In **FIG. 2**, like elements are noted with an accompanying prime. As illustrated in **FIG. 2**, the dynamic HMI device **10'** includes a first memory section **12'**, a browser section **22'**, a third memory section **34'** and a CPU **44'**. The CPU **44'** communicates with the browser section **22'** via line **46'**, the browser section **22'** communicates with first memory section **12'** via line **14'**, and the browser section **22'** communicates with third memory section **34'** via line **36'**. These components are illustrated as being provided in vehicle **100**. External to vehicle **100** is an infrastructure **102**, which includes a server device **48** configured to communicate with the browser section **22'** via request line **50** and via response line **52**. The server device **48** may include, for example, a web server, and the request line **50** and response line **52** may be configured as wireless communication lines, such as, for example, RF communication lines. The server device **48** is further configured to communicate with a logic unit **54** via line **56**, and the logic unit **54** is configured to communicate with second memory section **18'** via line **58**. The second memory section **18'** is configured to store the first data **28'**, the second data **30'** and the third data **32'**, as more fully described above. The browser section **22'** is

configured to communicate with the second memory section **18'** via the server device **48** and logic device **54**. The infrastructure **102** further includes a fourth memory section **60**, which is configured to communicate with the logic unit **54** via line **62**. The fourth memory section **60** may be configured to store data representing, for example, additional or revised applications A_4, A_5, A_6. Thus, it should be appreciated that the dynamic HMI device **10'** may provide access to the applications A_1, A_2, A_3, A_4, A_5, A_6 for administrative purposes, may provide for the addition and/or maintenance of dynamic content, such as, for special event, may provide for changing, updating and/or maintaining the appearance of the HMI and may provide for the addition of new services without access to the individual vehicles.

[**0020**] Thus, the aforementioned objects and advantages of the present invention are most effectively attained. Although two example embodiments of the present invention have been disclosed and described herein, it should be understood that this invention is in no sense limited thereby and that its scope is to be determined by that of the appended claims. It should be further understood that numerous modifications may be made to the present invention without departing from the spirit and scope thereof.

What is claimed is:

1. A dynamic human-machine interface device, comprising:

an interface section, the interface section being configured to display an interface of at least one applet, the applet being configured to control at least one function of a motor vehicle; and

a memory unit, the memory unit including:

a first memory section configured to store data representing at least one vehicle-specific parameter;

a second memory section configured to store data for each of a plurality of vehicles representing a respective appearance of the at least one applet; and

a third memory section configured to store data representing at least one application, each application corresponding to a respective applet;

wherein the interface section is configured to display the interface of the at least one applet in accordance with one of the plurality of vehicles corresponding to the at least one vehicle-specific parameter represented by the data stored in the first memory section.

2. The dynamic human-machine interface device according to claim 1, further comprising a data processing unit configured to execute the at least one applet.

3. The dynamic human-machine interface device according to claim 1, further comprising at least one output device.

4. The dynamic human-machine interface device according to claim 1, further comprising at least one input device.

5. The dynamic human-machine interface device according to claim 1, wherein the first memory section, the second memory section and the third memory section are provided in a motor vehicle.

6. The dynamic human-machine interface device according to claim 1, wherein at least one of the first memory section, the second memory section and the third memory section is provided in a motor vehicle and at least one of the first memory section, the second memory section and the third memory section is provided external to the motor vehicle.

7. The dynamic human-machine interface device according to claim 6, further comprising a server device configured to communicate between the interface section and the at least one of the first memory section, the second memory section and the third memory section provided external to the motor vehicle.

8. The dynamic human-machine interface device according to claim 6, wherein the first memory section and the third memory section are provided in the motor vehicle and the second memory section is provided external to the motor vehicle.

9. The dynamic human-machine interface device according to claim 8, further comprising a server device configured to communicate between the second memory section and the interface device.

10. The dynamic human-machine interface device according to claim 9, wherein the memory unit further comprises a fourth memory section provided external to the motor vehicle, the server device further configured to communicate between the fourth memory section and the interface device.

11. The dynamic human-machine interface device according to claim 10, wherein the fourth memory section is configured to store data representing at least one additional application, each additional application corresponding to a respective applet.

12. A method for providing a dynamic human-machine interface, comprising the steps of:

storing data representing at least one vehicle-specific parameter in a first memory section of a memory unit;

storing data for each of a plurality of vehicles representing a respective appearance of at least one applet in a second memory section of the memory unit;

storing data representing at least one application in a third memory section of the memory unit, each application corresponding to a respective applet, each application including at least one function;

reading the data from the first memory section;

reading the data from the second memory section representing the appearance of the at least one applet corresponding to one of the plurality of vehicles in accordance with the data read from the first memory section;

reading the data from the third memory section corresponding to the at least one applet; and

displaying the interface of the at least one applet corresponding to the one of the plurality of vehicles in accordance with the data read from the first, second and third memory sections.

13. The method according to claim 12, further comprising the step of providing an output via at least one output device.

14. The method according to claim 12, further comprising the step of receiving an input via at least one input device.

15. The method according to claim 12, wherein the first memory section, the second memory section and the third memory section are provided in a motor vehicle.

16. The method according to claim 12, wherein at least one of the first memory section, the second memory section and the third memory section is provided in a motor vehicle, and at least one of the first memory section, the second

memory section and the third memory section is provided external to the motor vehicle.

17. The method according to claim 16, wherein the first memory section and the third memory section are provided in the motor vehicle and the second memory section is provided external to the motor vehicle.

18. The method according to claim 17, further comprising the step of storing data representing at least one additional application in a fourth memory section, the fourth memory section being provided external to the motor vehicle, each additional application corresponding to a respective applet.

19. The method according to claim 12, further comprising the step of adding data to at least one of the first memory section, the second memory section and the third memory section.

20. The method according to claim 12, further comprising the step of revising the data stored in at least one of the first memory section, the second memory section and the third memory section.

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