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SYSTEM AND METHOD FOR PROVIDING PASSENGER EXIT ASSISTANCE

Abstract

A computer-implemented method that, when executed by data processing hardware, cause the data processing hardware to perform operations is provided. The operations include obtaining a rear passenger status, obtaining a seat belt status, obtaining a door lock status, determining whether exit assistance conditions are met based on the rear passenger status, the seat belt status, and the door lock status, and displaying an exit assistance on one or more displays.

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Background/Summary

INTRODUCTION

[0001] The information provided in this section is for the purpose of generally presenting the context of the disclosure. Work of the presently named inventors, to the extent it is described in this section, as well as aspects of the description that may not otherwise qualify as prior art at the time of filing, are neither expressly nor impliedly admitted as prior art against the present disclosure.

[0002] The present disclosure relates generally to a system and method for displaying passenger exit assistance and, more particularly, to a system and method for displaying passenger exit assistance for rear passengers of a vehicle.

[0003] In general, vehicles may be equipped with driver assistance systems for identifying nearby vehicles or pedestrians and notifying the driver of the same. Some driver assistance systems may notify drivers of nearby vehicles or pedestrians while the vehicle is in motion and while the vehicle is at rest (i.e., in a park mode), for example. It may be desirable to identify nearby vehicles or pedestrians and notify other passengers of the vehicle as well. Shortcomings of existing systems will be addressed by aspects of the present disclosure.

SUMMARY

[0004] In one configuration, a computer-implemented method that, when executed by data processing hardware, cause the data processing hardware to perform operations is provided. The operations include obtaining a rear passenger status, obtaining a seat belt status, obtaining a door lock status, determining whether exit assistance conditions are met based on the rear passenger status, the seat belt status, and the door lock status, and displaying exit assistance on one or more displays of a vehicle.

[0005] The method may include one or more of the following optional features. For example, the exit assistance conditions may include a first exit assistance condition that is met and the exit assistance may be displayed on a left rear display of the one or more displays when a passenger is detected in a left rear seat of the vehicle, a left rear seat belt is unfastened, and a left rear passenger compartment door is unlocked. The exit assistance conditions may include a second exit assistance condition that may be met and the exit assistance may be displayed on a right rear display of the one or more displays when a passenger is detected in a right rear seat of the vehicle, a right rear seat belt is unfastened, and a right rear passenger compartment door is unlocked. The exit assistance may be displayed on the left rear display as long as the first conditions are met and may be displayed on the right rear display as long as the second conditions are met. The exit assistance of the left rear display may include a driver side view from the vehicle when the first exit assistance conditions are met and the exit assistance of the right rear display may include a co-pilot side view from the vehicle when the second exit assistance conditions are met. The exit assistance may be displayed on the one or more displays while the exit conditions are met. The exit assistance may be displayed for a first duration after the exit assistance conditions are no longer met.

[0006] In one configuration, a system including data processing hardware and memory hardware in communication with the data processing hardware is provided, the memory hardware storing instructions that, when executed on the data processing hardware, cause the data processing hardware to perform operations. The operations include obtaining a rear passenger status, obtaining a seat belt status, obtaining a door lock status, determining whether exit assistance conditions are met based on the rear passenger status, the seat belt status, and the door lock status, and displaying exit assistance on one or more displays of a vehicle.

[0007] The system may include one or more of the following optional features. For example, the exit assistance conditions may include a first exit assistance condition that is met and the exit assistance may be displayed on a left rear display of the one or more displays when a passenger is detected in a left rear seat of the vehicle, a left rear seat belt is unfastened, and a left rear passenger compartment door is unlocked. The exit assistance condition that may be met and the exit assistance may be displayed on a right rear display of the one or more displays when a passenger is

detected in a right rear seat of the vehicle, a right rear seat belt is unfastened, and a right rear passenger compartment door is unlocked. The exit assistance may be displayed on the left rear display as long as the first conditions are met and may be displayed on the right rear display as long as the second conditions are met. The exit assistance of the left rear display may include a driver side view from the vehicle when the first exit assistance conditions are met and the exit assistance of the right rear display may include a co-pilot side view from the vehicle when the second exit assistance conditions are met. The exit assistance may be displayed on the one or more displays while the exit conditions are met. The exit assistance may be displayed for a first duration after the exit assistance conditions are no longer met.

[0008] In another configuration, a vehicle management system including a body control module, a video control unit in communication with the body control module, data processing hardware, and memory hardware in communication with the data processing hardware is provided, the memory hardware storing instructions that, when executed on the data processing hardware, cause the data processing hardware to perform operations. The operations include obtaining a rear passenger status using weight sensors in one or more rear seats, obtaining a seat belt status using seat belt sensors in one or more rear seats, obtaining a door lock status at the body control module, determining whether exit assistance conditions are met based on the rear passenger status, the seat belt status, and the door lock status, and displaying an exit assistance on one or more rear displays of a vehicle.

[0009] The vehicle management system may include one or more of the following optional features. The exit assistance conditions may include a first exit assistance condition that may be met and the exit assistance may be displayed on a left rear display of the one or more displays when a passenger is detected in a left rear seat of the vehicle, a left rear seat belt is unfastened, and a left rear passenger compartment door is unlocked. The exit assistance conditions may include a second exit assistance condition that may be met and the exit assistance may be displayed on a right rear display of the one or more displays when a passenger is detected in a right rear seat of the vehicle, a right rear seat belt is unfastened, and a right rear passenger compartment door is unlocked. The exit assistance may be displayed on the left rear display as long as the first conditions are met and may be displayed on the right rear display as long as the second conditions are met. The exit assistance of the left rear display may include a driver side view from the vehicle when the first exit assistance conditions are met and the exit assistance of the right rear display may include a co-pilot side view from the vehicle when the second exit assistance conditions are met. The exit assistance may be displayed on a rear left display for a first duration after first exit conditions are no longer met and the exit assistance may be displayed on a rear right display for the first duration after second exit conditions are no longer met.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The drawings described herein are for illustrative purposes only of selected configurations and are not intended to limit the scope of the present disclosure.

[0011] FIG. **1** is a schematic diagram of a vehicle environment including a vehicle management system according to the principles of the present disclosure;

[0012] FIG. **2** is top schematic view of the vehicle of FIG. **1**;

[0013] FIG. **3** is a perspective view of a rear passenger compartment the vehicle of FIG. **1**;

[0014] FIG. **4** is an enlarged schematic diagram showing an example of the vehicle management system of FIG. **1** according to the principles of the present disclosure;

[0015] FIG. **5** is a flow diagram showing operations of the vehicle management system of FIG. **4**;

[0016] FIG. **6** is a detailed view of the flow diagram of FIG. **5**, showing exit assistance inputs; and

[0017] FIG. **7** is a detailed view of the flow diagram of FIG. **5**, showing exit assistance conditions.
[0018] Corresponding reference numerals indicate corresponding parts throughout the drawings.

DETAILED DESCRIPTION

[0019] Example configurations will now be described more fully with reference to the accompanying drawings. Example configurations are provided so that this disclosure will be thorough, and will fully convey the scope of the disclosure to those of ordinary skill in the art. Specific details are set forth such as examples of specific components, devices, and methods, to provide a thorough understanding of configurations of the present disclosure. It will be apparent to those of ordinary skill in the art that specific details need not be employed, that example configurations may be embodied in many different forms, and that the specific details and the example configurations should not be construed to limit the scope of the disclosure.
[0020] The terminology used herein is for the purpose of describing particular exemplary configurations only and is not intended to be limiting. As used herein, the singular articles "a," "an," and "the" may be intended to include the plural forms as well, unless the context clearly indicates otherwise. The terms "comprises," "comprising," "including," and "having," are inclusive and therefore specify the presence of features, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, steps, operations, elements, components, and/or groups thereof. The method steps, processes, and operations described herein are not to be construed as necessarily requiring their performance in the particular order discussed or illustrated, unless specifically identified as an order of performance. Additional or alternative steps may be employed.
[0021] When an element or layer is referred to as being "on," "engaged to," "connected to," "attached to," or "coupled to" another element or layer, it may be directly on, engaged, connected, attached, or coupled to the other element or layer, or intervening elements or layers may be present. In contrast, when an element is referred to as being "directly on," "directly engaged to," "directly connected to," "directly attached to," or "directly coupled to" another element or layer, there may be no intervening elements or layers present. Other words used to describe the relationship between elements should be interpreted in a like fashion (e.g., "between" versus "directly between," "adjacent" versus "directly adjacent," etc.). As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.
[0022] The terms "first," "second," "third," etc. may be used herein to describe various elements, components, regions, layers and/or sections. These elements, components, regions, layers and/or sections should not be limited by these terms. These terms may be only used to distinguish one element, component, region, layer or section from another region, layer or section. Terms such as "first," "second," and other numerical terms do not imply a sequence or order unless clearly indicated by the context. Thus, a first element, component, region, layer or section discussed below could be termed a second element, component, region, layer or section without departing from the teachings of the example configurations.
[0023] In this application, including the definitions below, the term "module" may be replaced with the term "circuit." The term "module" may refer to, be part of, or include an Application Specific Integrated Circuit (ASIC); a digital, analog, or mixed analog/digital discrete circuit; a digital, analog, or mixed analog/digital integrated circuit; a combinational logic circuit; a field programmable gate array (FPGA); a processor (shared, dedicated, or group) that executes code; memory (shared, dedicated, or group) that stores code executed by a processor; other suitable hardware components that provide the described functionality; or a combination of some or all of the above, such as in a system-on-chip.
[0024] The term "code," as used above, may include software, firmware, and/or microcode, and may refer to programs, routines, functions, classes, and/or objects. The term "shared processor" encompasses a single processor that executes some or all code from multiple modules. The term "group processor" encompasses a processor that, in combination with additional processors,

executes some or all code from one or more modules. The term “shared memory” encompasses a single memory that stores some or all code from multiple modules. The term “group memory” encompasses a memory that, in combination with additional memories, stores some or all code from one or more modules. The term “memory” may be a subset of the term “computer-readable medium.” The term “computer-readable medium” does not encompass transitory electrical and electromagnetic signals propagating through a medium, and may therefore be considered tangible and non-transitory memory. Non-limiting examples of a non-transitory memory include a tangible computer readable medium including a nonvolatile memory, magnetic storage, and optical storage.

[0025] The apparatuses and methods described in this application may be partially or fully implemented by one or more computer programs executed by one or more processors. The computer programs include processor-executable instructions that are stored on at least one non-transitory tangible computer readable medium. The computer programs may also include and/or rely on stored data.

[0026] A software application (i.e., a software resource) may refer to computer software that causes a computing device to perform a task. In some examples, a software application may be referred to as an “application,” an “app,” or a “program.” Example applications include, but are not limited to, system diagnostic applications, system management applications, system maintenance applications, word processing applications, spreadsheet applications, messaging applications, media streaming applications, social networking applications, and gaming applications.

[0027] The non-transitory memory may be physical devices used to store programs (e.g., sequences of instructions) or data (e.g., program state information) on a temporary or permanent basis for use by a computing device. The non-transitory memory may be volatile and/or non-volatile addressable semiconductor memory. Examples of non-volatile memory include, but are not limited to, flash memory and read-only memory (ROM)/programmable read-only memory (PROM)/erasable programmable read-only memory (EPROM)/electronically erasable programmable read-only memory (EEPROM) (e.g., typically used for firmware, such as boot programs). Examples of volatile memory include, but are not limited to, random access memory (RAM), dynamic random access memory (DRAM), static random access memory (SRAM), phase change memory (PCM) as well as disks or tapes.

[0028] These computer programs (also known as programs, software, software applications or code) include machine instructions for a programmable processor, and can be implemented in a high-level procedural and/or object-oriented programming language, and/or in assembly/machine language. As used herein, the terms “machine-readable medium” and “computer-readable medium” refer to any computer program product, non-transitory computer readable medium, apparatus and/or device (e.g., magnetic discs, optical disks, memory, Programmable Logic Devices (PLDs)) used to provide machine instructions and/or data to a programmable processor, including a machine-readable medium that receives machine instructions as a machine-readable signal. The term “machine-readable signal” refers to any signal used to provide machine instructions and/or data to a programmable processor.

[0029] Various implementations of the systems and techniques described herein can be realized in digital electronic and/or optical circuitry, integrated circuitry, specially designed ASICS (application specific integrated circuits), computer hardware, firmware, software, and/or combinations thereof. These various implementations can include implementation in one or more computer programs that are executable and/or interpretable on a programmable system including at least one programmable processor, which may be special or general purpose, coupled to receive data and instructions from, and to transmit data and instructions to, a storage system, at least one input device, and at least one output device.

[0030] The processes and logic flows described in this specification can be performed by one or more programmable processors, also referred to as data processing hardware, executing one or more computer programs to perform functions by operating on input data and generating output.

The processes and logic flows can also be performed by special purpose logic circuitry, e.g., an FPGA (field programmable gate array) or an ASIC (application specific integrated circuit). Processors suitable for the execution of a computer program include, by way of example, both general and special purpose microprocessors, and any one or more processors of any kind of digital computer. Generally, a processor will receive instructions and data from a read only memory or a random access memory or both. The essential elements of a computer are a processor for performing instructions and one or more memory devices for storing instructions and data. Generally, a computer will also include, or be operatively coupled to receive data from or transfer data to, or both, one or more mass storage devices for storing data, e.g., magnetic, magneto optical disks, or optical disks. However, a computer need not have such devices. Computer readable media suitable for storing computer program instructions and data include all forms of non-volatile memory, media and memory devices, including by way of example semiconductor memory devices, e.g., EPROM, EEPROM, and flash memory devices; magnetic disks, e.g., internal hard disks or removable disks; magneto optical disks; and CD ROM and DVD-ROM disks. The processor and the memory can be supplemented by, or incorporated in, special purpose logic circuitry.

[0031] To provide for interaction with a user, one or more aspects of the disclosure can be implemented on a computer having a display device, e.g., a CRT (cathode ray tube), LCD (liquid crystal display) monitor, or touch screen for displaying information to the user and optionally a keyboard and a pointing device, e.g., a mouse or a trackball, by which the user can provide input to the computer. Other kinds of devices can be used to provide interaction with a user as well; for example, feedback provided to the user can be any form of sensory feedback, e.g., visual feedback, auditory feedback, or tactile feedback; and input from the user can be received in any form, including acoustic, speech, or tactile input. In addition, a computer can interact with a user by sending documents to and receiving documents from a device that is used by the user; for example, by sending web pages to a web browser on a user's client device in response to requests received from the web browser.

[0032] Referring to FIG. **1**, an example vehicle operating environment **10** is provided for illustration of the principles of the present disclosure. The vehicle operating environment **10** includes a vehicle **100** and a vehicle service center **20**. For the sake of illustration, the vehicle operating environment **10** is shown as including a single vehicle service center **20**. However, in other examples, the vehicle operating environment **10** may include a plurality of vehicle service centers **20** in communication over a network **30** (e.g., the Internet, cellular networks).

[0033] With reference to FIG. **2**, the vehicle **100** can have a vehicle body **102**, which has a first or front end **104** spaced fore-aft from a second or rear end **106** with respect to a longitudinal axis **108**. The vehicle **100** has a first or front passenger compartment **110** near the front end **104** and a second or rear passenger compartment **112** spaced fore-aft of the front passenger compartment **110** toward the rear end **106**. In this example, the front passenger compartment **110** and the rear passenger compartment **112** each has a first or driver side **114** and a second or co-pilot side **116** spaced cross-car from the driver side **114** with respect to a lateral axis **118**. The lateral axis **118** is perpendicular to the longitudinal axis **108**, as shown in FIG. **2**. The driver and co-pilot sides **114**, **116** may be located on different sides of the vehicle **100** (i.e., left or right) depending on the particular region of the world where the vehicle **100** is intended for use. For the purposes of the present disclosure, the driver side **114** is on the left side of the vehicle **100** and the co-pilot side **116** is on the right side of the vehicle **100** with respect to the lateral axis **118**. Note, the present disclosure equally applies to vehicles where the driver side is on the right side of the vehicle and the co-pilot side is on the left side of the vehicle.

[0034] The vehicle **100** may include one or more cameras **119** arranged on the vehicle body **102**. For instance, a first or front camera **119***a* may be arranged on the front end **104** (e.g., on a grille of the vehicle), a second or rear camera **119***b* may be arranged on the rear end **106** (e.g., on a tailgate

of the vehicle), a third or left camera **119***c* may be arranged on the driver side **114** (e.g., on a driver side mirror), and a fourth or right camera **119***d* may be arranged on the co-pilot side **116** (e.g., on a co-pilot side mirror). The one or more cameras **119**, **119***a*-**119***d* may be configured to provide a 360 degree view surrounding the vehicle **100** (e.g., a "bird's eye" view) or another view that may be desirable for one or more passengers of the vehicle **100** when operating the vehicle **100** or exiting the vehicle **100**, for example.

[0035] With continued reference to FIG. **2**, one or more closures (e.g., doors, tailgate, etc.) may be coupled to the vehicle body **102** of the vehicle **100**. For instance, a front left passenger compartment door **120***a* and a front right passenger compartment door **120***b* may be coupled to the vehicle body **102** to enclose the front passenger compartment **110**. Likewise, a rear left passenger compartment door **122***a* and a rear right passenger compartment door **122***b* may be coupled to the vehicle body **102** to enclose the rear passenger compartment **112**. The front passenger compartment doors **120***a*, **120***b* and the rear passenger compartment doors **122***a*, **122***b* may each have a door handle **124** and/or lock/un-lock buttons **126** to facilitate passenger entry and exit of the vehicle **100**.

[0036] The front passenger compartment **110** may have a first or front left seat **128** and a second or front right seat **130**. The front left seat **128** and the front right seat **130** each has a front side **132** pointing in the direction of the front end **104** and a rear side **134** pointing in the direction of the rear end **106**. The front left seat **128** may include a first or left rear display **136** coupled to the rear side **134** and the front right seat **130** may include a second or right rear display **138** coupled to the rear side **134**. The left and right rear displays **136**, **138** may be arranged so that one or more rear passengers can view and interact with the rear displays **136**, **138**. The left and right rear displays **136**, **138** may each include an on/off button **140** and/or an array of LEDs **142**.

[0037] With reference to FIGS. **2** and **3**, the rear passenger compartment **112** may have one or more rear seats **144** spaced fore-aft from the front left and front right seats **128**, **130**. For example, while not readily shown in the figures, the one or more rear seats **144** may be a bench seat extending cross-car with respect to the lateral axis **118** and configured to accommodate up to three rear passengers. Alternatively, as shown in FIGS. **2** and **3**, the one or more rear seats **144** may be separate rear passenger seats (e.g., captain's chairs) that are spaced cross-car from one another with respect to the lateral axis **118** so that the seats generally align with the front left seat **128** and the front right **130** seat, respectively. In other words, a third or rear left seat **146** may be arranged fore-aft of the front left seat **128** and a fourth or rear right seat **148** may be arranged fore-aft of the front right seat **130**. The one or more rear seats **144**, such as the rear left seat **146** and the rear right seat **148**, each has a seat belt **150** that may be engaged (i.e., fastened) and disengaged (i.e., unfastened) by a passenger. As will be discussed in more detail below, the rear seats **144** may each include a weight sensor **152** and a seat belt sensor **154**. The weight sensor **152** may be desirable for determining whether a passenger is sitting in the rear left seat **146** adjacent the rear left passenger compartment door **122***a* or the rear right seat **148** adjacent the rear right passenger compartment door **122***b*, for example. The seat belt sensor **154** may be desirable for determining whether the seat belt **150** of the rear left seat **146** or the rear right seat **148** is fastened or unfastened.

[0038] With reference to FIGS. **1** and **4**, the vehicle **100** includes a vehicle management system **160** comprising a sensor system **170**, a computing system **180**, a vehicle system module such as a body control module **190**, and a video control unit **200**. While the vehicle **100** maneuvers about the environment **10** or is at rest within the environment **10**, the sensor system **170** includes various sensor subsystems **172**, **172***a*, **172***b*, **172***c* configured to gather sensor data relating to characteristics of the environment **10** and/or a status of the vehicle **100**. For instance, the sensor subsystem **172** may include a vehicle exterior sensor subsystem **172***a* configured to measure or obtain external environmental data **173***a*, such surrounding objects (e.g., vehicles, bikes, pedestrians, etc.), an interior sensor subsystem **172***b* configured to measure or obtain interior environmental data **173***b*, such as vehicle occupancy, and/or a vehicle status sensor subsystem **172***c* configured to measure or obtain vehicle operating data **173***c*, such as vehicle location and operating

parameters.
[0039] As the sensor system **170** gathers the sensor data **173**, a computing system **180** is configured to store, process, and/or communicate the sensor data **173** within the vehicle operating environment **10**. In order to perform computing tasks related to the sensor data **173**, the computing system **180** of the vehicle **100** includes data processing hardware **182** and memory hardware **184**. The data processing hardware **182** is configured to execute instructions stored in the memory hardware **184** to perform computing tasks related to operation and management of the vehicle **100**. Generally speaking, the computing system **180** refers to one or more locations of data processing hardware and/or memory hardware.
[0040] In some examples, the computing system **180** is a local system located on the vehicle **100** (e.g., vehicle control unit). When located on the vehicle **100**, the computing system **180** may be centralized (i.e., in a single location/area on the vehicle **100**, for example, a vehicle control unit), decentralized (i.e., located at various locations about the vehicle **100**), or a hybrid combination of both (e.g., with a majority of centralized hardware and a minority of decentralized hardware). To illustrate some differences, a decentralized computing system **180** may allow processing to occur at an activity location while a centralized computing system may allow for a central processing hub that communicates to systems located at various positions on the vehicle **100**.
[0041] Additionally or alternatively, the computing system **180** includes computing resources that are located remotely from the vehicle **100**. For instance, the computing system **180** may communicate via the network **30** with a remote vehicle computing system **80** (e.g., a remote computer/server or a cloud-based environment). Much like the computing system **180**, the remote vehicle computing system **80** includes remote computing resources such as remote data processing hardware **82** and remote memory hardware **84**. Here, the sensor data **173** or other processed data (e.g., data processed locally by the computing system **180**) may be stored in the remote vehicle computing system **80** and may be accessible to the computing system **180**. In some examples, the computing system **180** is configured to utilize the remote resources **82**, **84** as extensions of the computing resources **182**, **184** such that resources of the computing system **180** may reside on resources of the remote vehicle computing system **80**.
[0042] The body control module **190** is capable of monitoring and controlling various electronic aspects of the vehicle **100** (e.g., the sensor system **170**, lock/un-lock button **126**, etc.). In other words, the body control module **190** is capable of receiving sensor data **173** from the sensor system **170** and providing one or more inputs **192** to one or more output devices, such as the video control unit **200**, for example. As will be discussed in more detail below, the sensor data **173** may be received by the body control module **190** as one or more exit assistance inputs **307**, and the inputs **307** may be used for determining whether it is appropriate to display exit assistance **202**, **204** on one or both of the rear displays **136**, **138**.
[0043] The video control unit **200** is capable of controlling various electronic aspects of the vehicle (e.g., infotainment, displaying a front camera view or back-up camera view on a display, etc.). In other words, the video control unit **200** can receive one or more inputs and display one or more outputs on one or more displays of the vehicle **100**. For example, the video control unit **200** can receive the input **192** from the body control module **190** and simultaneously, or immediately thereafter, display relevant sensor data (i.e., exit assistance **202**, **204**), such as exterior sensor data **173***b* received by or more cameras, through a first or left exit assistance **202** for the left rear display **136** and/or a second or right exit assistance **204** for the right display **138**. The relevant sensor data **173** for the left exit assistance **202** may include a view that shows vehicles, pedestrians, or animals, for example, located on or near the driver side **114** of the vehicle **100**. Likewise, the relevant sensor data **173** for the right exit assistance **204** may include a view that shows vehicles, pedestrians, or animals, for example, located on or near the co-pilot side **116** of the vehicle **100**.
[0044] With reference again to FIG. **3**, the video control unit **200** can receive one or more inputs **136***a*, **138***a* from the left rear display **136** or right rear display **138**, respectively, and

simultaneously, or immediately thereafter, display relevant sensor data (e.g., the exit assistance **202**, **204**), such as exterior sensor data **173***a* received by or more cameras. Thus, a passenger can access the exit assistance **202**, **204** on command by engaging with (e.g., pressing) the on/off button **140** of one or both of the left rear display **136** and the right rear display **138**, for example.

[0045] Referring now to FIG. **5**, a method **300** for providing passenger exit assistance is provided. At a first step **302**, the method **300** is initiated. In practical terms, the method **300** may be initiated upon powering up of the vehicle **100** by the vehicle operator.

[0046] At step **304**, the sensor system **170** begins collecting sensor data **173**, **173***a*-**173***c* from one or more of the interior sensor subsystem **172***b*, the exterior sensor subsystem **172***b*, and/or the vehicle status sensor subsystem **172***c*. As introduced above, the sensor data **173** may be utilized at least by the body control module **190** to determine whether one or more exit conditions are met.

[0047] At step **306**, first and second exit assistance conditions **306***a*, **306***b* are monitored by the body control module **190** for determining whether it would be desirable for the left exit assistance **202** or the right exit assistance **204** to be displayed as an exit assistance on the left and/or right rear displays **136**, **138**. For instance, displaying the left exit assistance **202** as exit assistance on the left rear display **136** may be desirable if a passenger is detected in the rear left seat **146**, the seat belt of the rear left seat **146** is unfastened, and the left rear passenger compartment door **122***a* is unlocked. Likewise, displaying the right exit assistance **204** as exit assistance on the right rear display **138** may be desirable if a passenger is detected in the rear right seat **148**, the seat belt **150** of the rear right seat **148** is unfastened, and the right rear passenger compartment door **122***b* is unlocked.

[0048] At step **307**, one or more exit assistance inputs **307** based on the sensor data **173** may be provided to the body control module **190** for monitoring the one or more exit assistance conditions **306**. For example, a first or rear passenger status **307***a*, a second or seat belt status **307***b*, and a third or door lock status **307***c* may be provided to the body control module **190**. The rear passenger status **307***a* may indicate whether a passenger is detected in the rear left seat **146** or the rear right seat **148**. The rear passenger status **307***a* may be determined based on the interior sensor data **173***b* from the interior sensor subsystem **172***b* and, more specifically, based on data received from the weight sensors **152** arranged in the rear left seat **146** and the rear right seat **148**, for example. The seat belt status **307***b* may indicate whether the seat belts **150** of the rear left seat **146** and/or the rear right seat **148** are fastened or unfastened. The seat belt status **307***b* mat be determined based on the interior sensor data **173***b* from the interior sensor subsystem **172***b* and, more specifically, based on data received from the seat belt sensor **154** coupled to or adjacent the rear left seat **146** and the rear right seat **148**, for example. The door lock status **307***c* is monitored by the body control module **190**. The door lock status **307***c* may change as a result of the rear left passenger compartment door **122***a* and/or the rear right passenger compartment door **122***b* being unlocked. For example, the door lock status **307***c* may change if the unlock button of lock/un-lock button **126** coupled to the rear left passenger compartment door **122***a* or rear right passenger compartment door **122***b* is engaged by a passenger. Also, the door lock status **307***c* for the rear left passenger compartment door **122***a* or the rear right passenger compartment door **122***b* can change if a passenger engages with the door handle **124** by actuating the door handle **124** (i.e., pulling on the handle **124** in a manner that would ordinarily open the door if the door was unlocked) and causing the door **122***a*, **122***b* to unlock. Additionally, if an operator of the vehicle **100** places the vehicle in a “park” mode (e.g., shifts a transmission into park) and the doors **122***a*, **122***b* unlock as a result, then the door lock status **307***c* can change.

[0049] At step **308**, the body control module **190** determines whether the exit conditions are met. If the exit assistance conditions are met, then the input **192** is provided to the video control unit **200** and the method continues to step **310**. If the exit assistance conditions are not met, then the input **192** is not provided to the video control unit **200** and the method **300** returns to step **304** where data **173** continues to be gathered.

[0050] At step **310**, the video control unit **200** receives the input **192** and displays the left exit

assistance **202** to the left rear display **136** and/or displays the right exit assistance **204** to the right rear display **138** accordingly. For instance, if a passenger is only detected in the rear left seat **146**, the seat belt **150** of the rear left seat **146** is unfastened, and the rear left passenger compartment door **122***a* is unlocked, then only the left exit assistance **202** may be displayed on the left rear display **136**.

[0051] At step **312**, if the body control module **190** is still providing an input **192** to the video control unit **200** that the exit conditions are met, then the left exit assistance **202** and/or right exit assistance **204** remains displayed on the left and/or right rear displays **136**, **138**, respectively. However, if the body control module **190** is no longer providing the input **192** to the video control unit **200**, then the method **300** may proceed to step **314**.

[0052] At step **314**, once the input **192** is no longer being received at the video control unit **200**, the video control unit **200** may stop providing the first exit assistance **202** and/or second exit assistance to the left and/or right rear displays **136**, **138** after a first duration has passed. In the present example, the first duration is 10 seconds but may be between 5 seconds and 45 seconds or between 10 seconds and 60 seconds, for example.

[0053] After step **314**, the method **300** may return to step **304** and continue to gather data or the method **300** may end at step **316**.

[0054] Providing the left exit assistance **202** and/or the right exit assistance **204** on the left and/or right rear displays **136**, **138**, respectively, provides an occupant exiting the vehicle **100** with a view of external surroundings of the vehicle **100**. Accordingly, the left exit assistance **202** and the right exit assistance **204** can help exiting occupants avoid hazards such as an animal, an approaching biker, or another vehicle by displaying—on the respective displays **136**, **138**—an area around the vehicle **100**. The occupant can view the area around the vehicle **100** on one or more of the displays **136**, **138** and time their exit from the vehicle **100** with a time when an actual or perceived hazard has past (i.e., when a biker or another vehicle has sufficiently passed the vehicle **100** to allow for safe exit from the vehicle **100**).

[0055] A number of implementations have been described. Nevertheless, it will be understood that various modifications may be made without departing from the spirit and scope of the disclosure. Accordingly, other implementations are within the scope of the following claims.

[0056] The foregoing description has been provided for purposes of illustration and description. It is not intended to be exhaustive or to limit the disclosure. Individual elements or features of a particular configuration are generally not limited to that particular configuration, but, where applicable, are interchangeable and can be used in a selected configuration, even if not specifically shown or described. The same may also be varied in many ways. Such variations are not to be regarded as a departure from the disclosure, and all such modifications are intended to be included within the scope of the disclosure.

Claims

1. A computer-implemented method that, when executed by data processing hardware, cause the data processing hardware to perform operations comprising: obtaining a rear passenger status; obtaining a seat belt status; obtaining a door lock status; determining whether exit assistance conditions are met based on the rear passenger status, the seat belt status, and the door lock status; and displaying exit assistance on one or more displays of a vehicle.

2. The method of claim 1, wherein the exit assistance conditions comprises a first exit assistance condition that is met and the exit assistance is displayed on a left rear display of the one or more displays when a passenger is detected in a left rear seat of the vehicle, a left rear seat belt is unfastened, and a left rear passenger compartment door is unlocked.

3. The method of claim 2, wherein the exit assistance conditions comprises a second exit assistance condition that is met and the exit assistance is displayed on a right rear display of the one or more

displays when a passenger is detected in a right rear seat of the vehicle, a right rear seat belt is unfastened, and a right rear passenger compartment door is unlocked.

4. The method of claim 3, wherein the exit assistance is displayed on the left rear display as long as the first conditions are met and is displayed on the right rear display as long as the second conditions are met.

5. The method of claim 3, wherein the exit assistance of the left rear display comprises a driver side view from the vehicle when the first exit assistance conditions are met and the exit assistance of the right rear display comprises a co-pilot side view from the vehicle when the second exit assistance conditions are met.

6. The method of claim 1, wherein the exit assistance is displayed on the one or more displays while the exit conditions are met.

7. The method of claim 6, wherein the exit assistance is displayed for a first duration after the exit assistance conditions are no longer met.

8. A system comprising: data processing hardware; and memory hardware in communication with the data processing hardware, the memory hardware storing instructions that, when executed on the data processing hardware, cause the data processing hardware to perform operations comprising: obtaining a rear passenger status; obtaining a seat belt status; obtaining a door lock status; determining whether exit assistance conditions are met based on the rear passenger status, the seat belt status, and the door lock status; and displaying an exit assistance on one or more displays of a vehicle.

9. The system of claim 8, wherein the exit assistance conditions comprises a first exit assistance condition that is met and the exit assistance is displayed on a left rear display of the one or more displays when a passenger is detected in a left rear seat of the vehicle, a left rear seat belt is unfastened, and a left rear passenger compartment door is unlocked.

10. The system of claim 9, wherein the exit assistance conditions comprises a second exit assistance condition that is met and the exit assistance is displayed on a right rear display of the one or more displays when a passenger is detected in a right rear seat of the vehicle, a right rear seat belt is unfastened, and a right rear passenger compartment door is unlocked.

11. The system of claim 10, wherein the exit assistance is displayed on the left rear display as long as the first conditions are met and is displayed on the right rear display as long as the second conditions are met.

12. The system of claim 10, wherein the exit assistance of the left rear display comprises a driver side view from the vehicle when the first exit assistance conditions are met and the exit assistance of the right rear display comprises a co-pilot side view from the vehicle when the second exit assistance conditions are met.

13. The system of claim 8, wherein the exit assistance is displayed on the one or more displays while the exit conditions are met.

14. The system of claim 13, wherein the exit assistance is displayed for a first duration after the exit assistance conditions are no longer met.

15. A vehicle management system comprising: a body control module; a video control unit in communication with the body control module; data processing hardware; and memory hardware in communication with the data processing hardware, the memory hardware storing instructions that, when executed on the data processing hardware, cause the data processing hardware to perform operations comprising: obtaining a rear passenger status using weight sensors in one or more rear seats; obtaining a seat belt status using seat belt sensors in one or more rear seats; obtaining a door lock status at the body control module; determining whether exit assistance conditions are met based on the rear passenger status, the seat belt status, and the door lock status; and displaying an exit assistance on one or more rear displays of a vehicle.

16. The vehicle management system of claim 15, wherein the exit assistance conditions comprises a first exit assistance condition that is met and the exit assistance is displayed on a left rear display

of the one or more displays when a passenger is detected in a left rear seat of the vehicle, a left rear seat belt is unfastened, and a left rear passenger compartment door is unlocked.

17. The vehicle management system of claim 16, wherein the exit assistance conditions comprises a second exit assistance condition that is met and the exit assistance is displayed on a right rear display of the one or more displays when a passenger is detected in a right rear seat of the vehicle, a right rear seat belt is unfastened, and a right rear passenger compartment door is unlocked.

18. The vehicle management system of claim 17, wherein the exit assistance is displayed on the left rear display as long as the first conditions are met and is displayed on the right rear display as long as the second conditions are met.

19. The vehicle management system of claim 17, wherein the exit assistance of the left rear display comprises a driver side view from the vehicle when the first exit assistance conditions are met and the exit assistance of the right rear display comprises a co-pilot side view from the vehicle when the second exit assistance conditions are met.

20. The vehicle management system of claim 15, wherein the exit assistance is displayed on a rear left display for a first duration after first exit conditions are no longer met and the exit assistance is displayed on a rear right display for the first duration after second exit conditions are no longer met.