US 20220396293A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2022/0396293 A1**

(43) **Pub. Date: Dec. 15, 2022**

Harrington et al.

(54) **AUTONOMOUS VEHICLE CARGO RESERVATION**

(71) Applicant: **GM Cruise Holdings LLC**, San Francisco, CA (US)

(72) Inventors: **Curt Harrington**, San Francisco, CA (US); **Wei Lu**, San Bruno, CA (US); **Devina Jain**, San Francisco, CA (US); **Kunal Mehta**, San Francisco, CA (US); **Nikola John Linn Noxon**, San Francisco, CA (US)

(21) Appl. No.: **17/346,555**

(22) Filed: **Jun. 14, 2021**

Publication Classification

(51) **Int. Cl.**

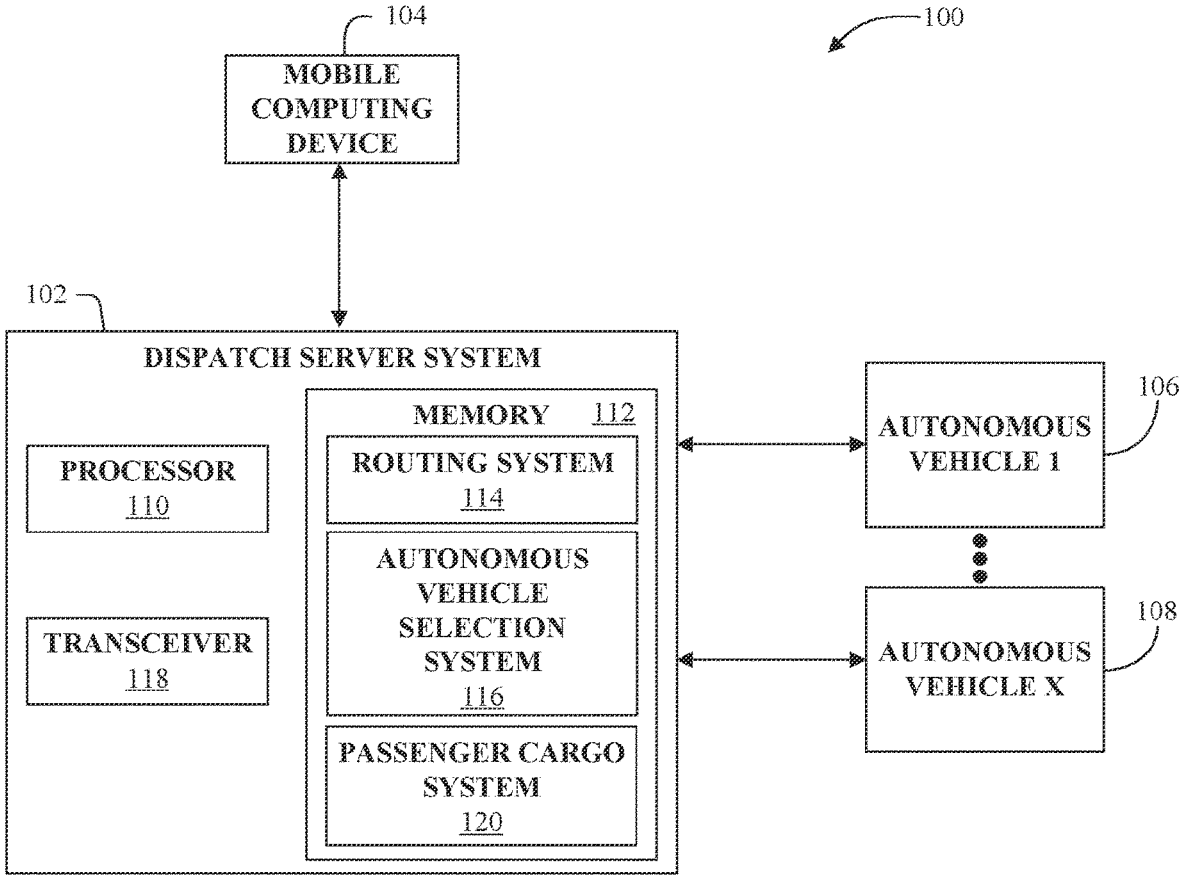
B60W 60/00	(2006.01)
G05D 1/02	(2006.01)
G07C 5/00	(2006.01)
B60W 10/04	(2006.01)
B60W 10/18	(2006.01)
B60W 10/20	(2006.01)
G06Q 10/02	(2006.01)
G06Q 50/30	(2006.01)
G06Q 10/06	(2006.01)
G06T 7/62	(2006.01)
G08B 5/22	(2006.01)
G08B 21/18	(2006.01)
G01G 19/08	(2006.01)

(52) **U.S. Cl.**

CPC ***B60W 60/00253*** (2020.02); ***G05D 1/0276*** (2013.01); ***G07C 5/008*** (2013.01); ***B60W 10/04*** (2013.01); ***B60W 10/18*** (2013.01); ***B60W 10/20*** (2013.01); ***G05D 1/0291*** (2013.01); ***G06Q 10/02*** (2013.01); ***G06Q 50/30*** (2013.01); ***G06Q 10/06315*** (2013.01); ***G06T 7/62*** (2017.01); ***G08B 5/22*** (2013.01); ***G08B 21/182*** (2013.01); ***G01G 19/08*** (2013.01); *B60W 2420/42* (2013.01); *B60R 25/20* (2013.01)

(57) **ABSTRACT**

Described herein are various technologies pertaining to selecting an autonomous vehicle for a trip of a passenger based on a passenger cargo reservation request and real time load data from a fleet of autonomous vehicles. The passenger cargo reservation request specifies a request to store passenger cargo in a cargo storage area of an autonomous vehicle during a ride of a passenger in the autonomous vehicle. Further, an autonomous vehicle from the fleet of autonomous vehicles can be selected for the trip of the passenger based on the passenger cargo reservation request and the real time load data for the autonomous vehicles in the fleet of autonomous vehicles.



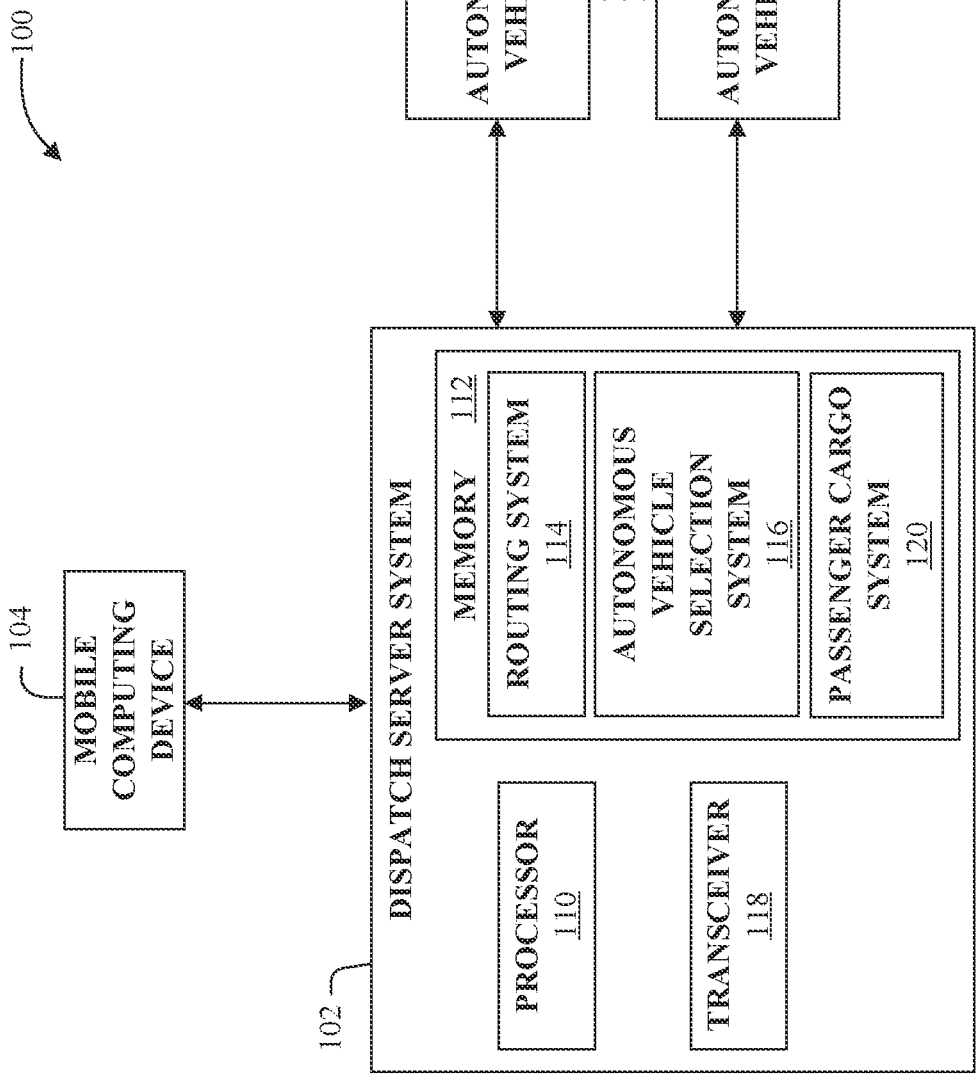

100
104
MOBILE COMPUTING DEVICE
102
DISPATCH SERVER SYSTEM
MEMORY 112
ROUTING SYSTEM 114
AUTONOMOUS VEHICLE SELECTION SYSTEM 116
PASSENGER CARGO SYSTEM 120
PROCESSOR 110
TRANSCEIVER 118
106
AUTONOMOUS VEHICLE 1
108
AUTONOMOUS VEHICLE X

FIG. 1

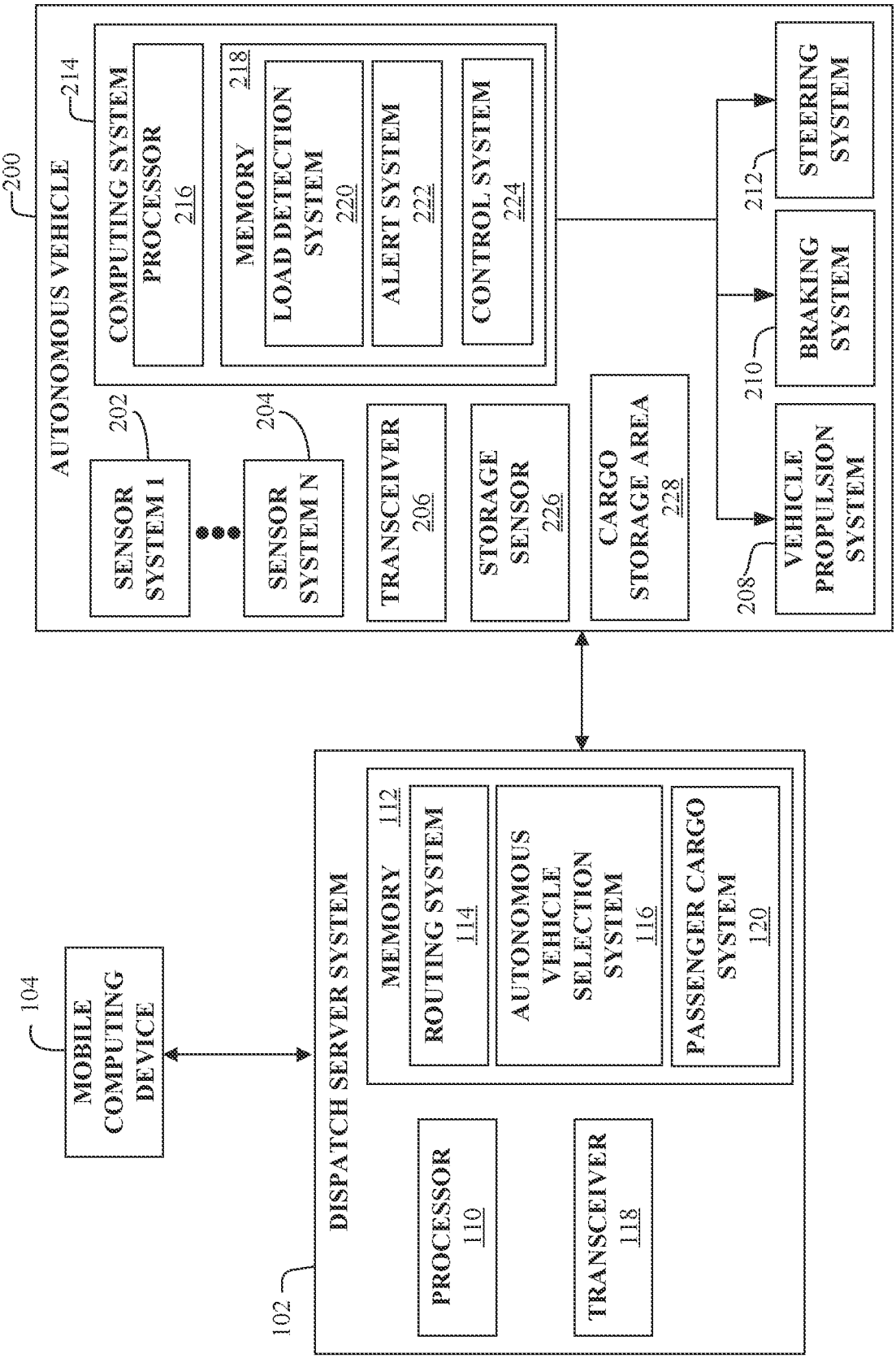

200
AUTONOMOUS VEHICLE
214
COMPUTING SYSTEM
PROCESSOR
216
MEMORY
218
LOAD DETECTION SYSTEM
220
ALERT SYSTEM
222
CONTROL SYSTEM
224
202
SENSOR SYSTEM 1
204
SENSOR SYSTEM N
TRANSCEIVER
206
STORAGE SENSOR
226
CARGO STORAGE AREA
228
210
BRAKING SYSTEM
212
STEERING SYSTEM
208
VEHICLE PROPULSION SYSTEM
104
MOBILE COMPUTING DEVICE
102
DISPATCH SERVER SYSTEM
MEMORY
112
ROUTING SYSTEM
114
AUTONOMOUS VEHICLE SELECTION SYSTEM
116
PASSENGER CARGO SYSTEM
120
PROCESSOR
110
TRANSCEIVER
118

FIG. 2

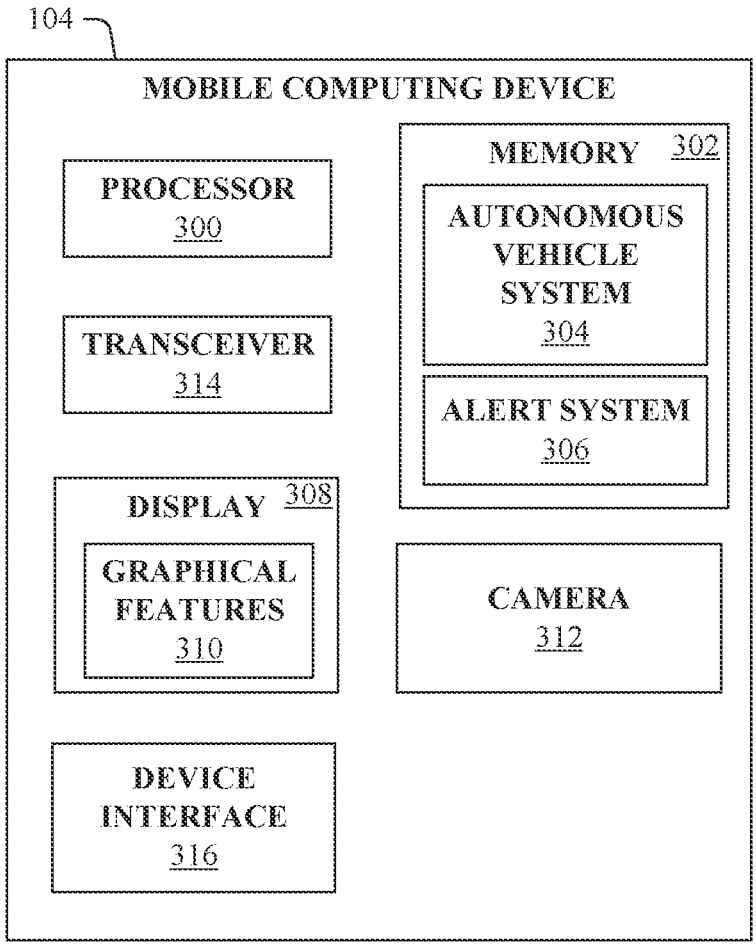
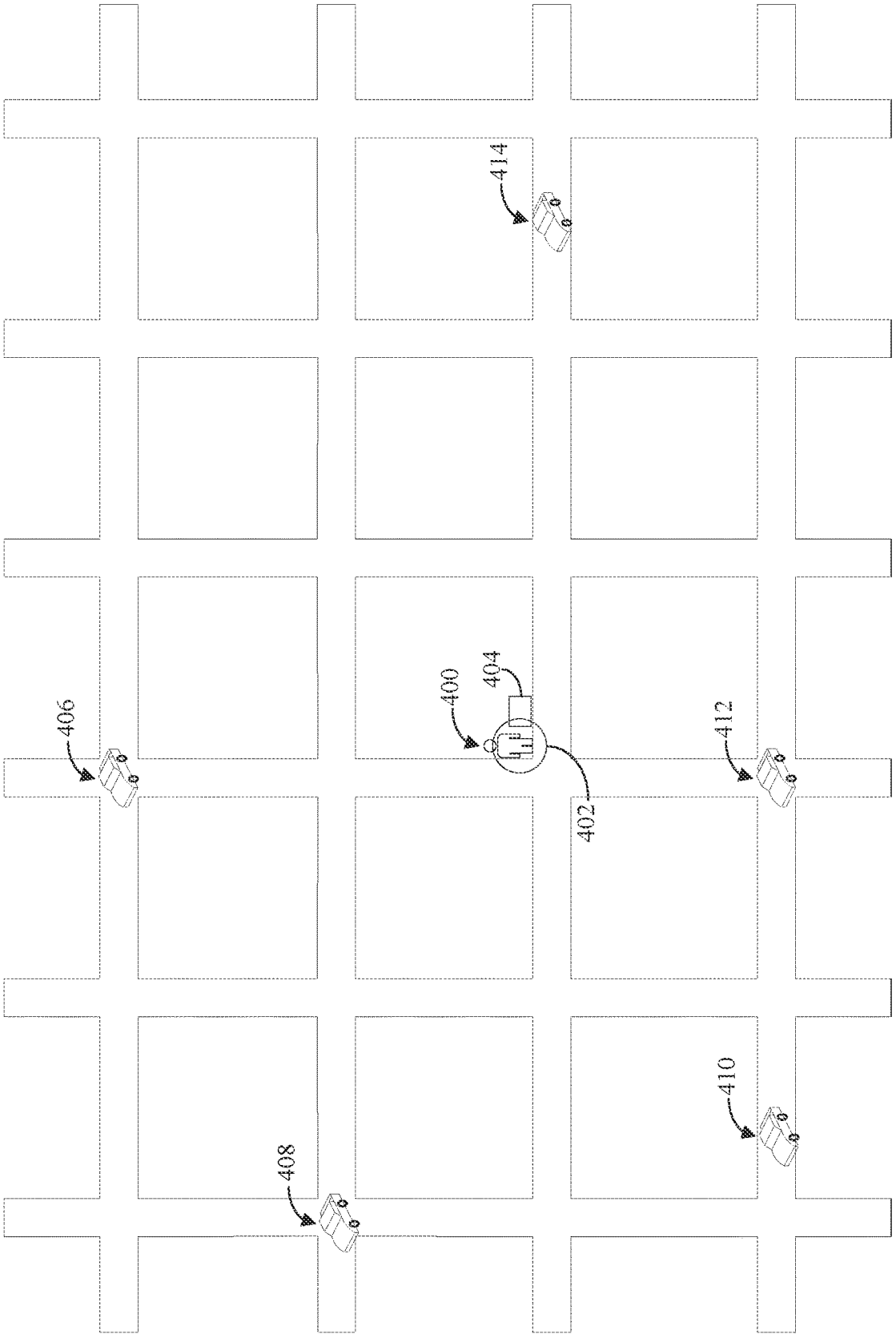

104
MOBILE COMPUTING DEVICE
PROCESSOR
300
TRANSCEIVER
314
DISPLAY
308
GRAPHICAL FEATURES
310
DEVICE INTERFACE
316
MEMORY
302
AUTONOMOUS VEHICLE SYSTEM
304
ALERT SYSTEM
306
CAMERA
312

FIG. 3

FIG. 4



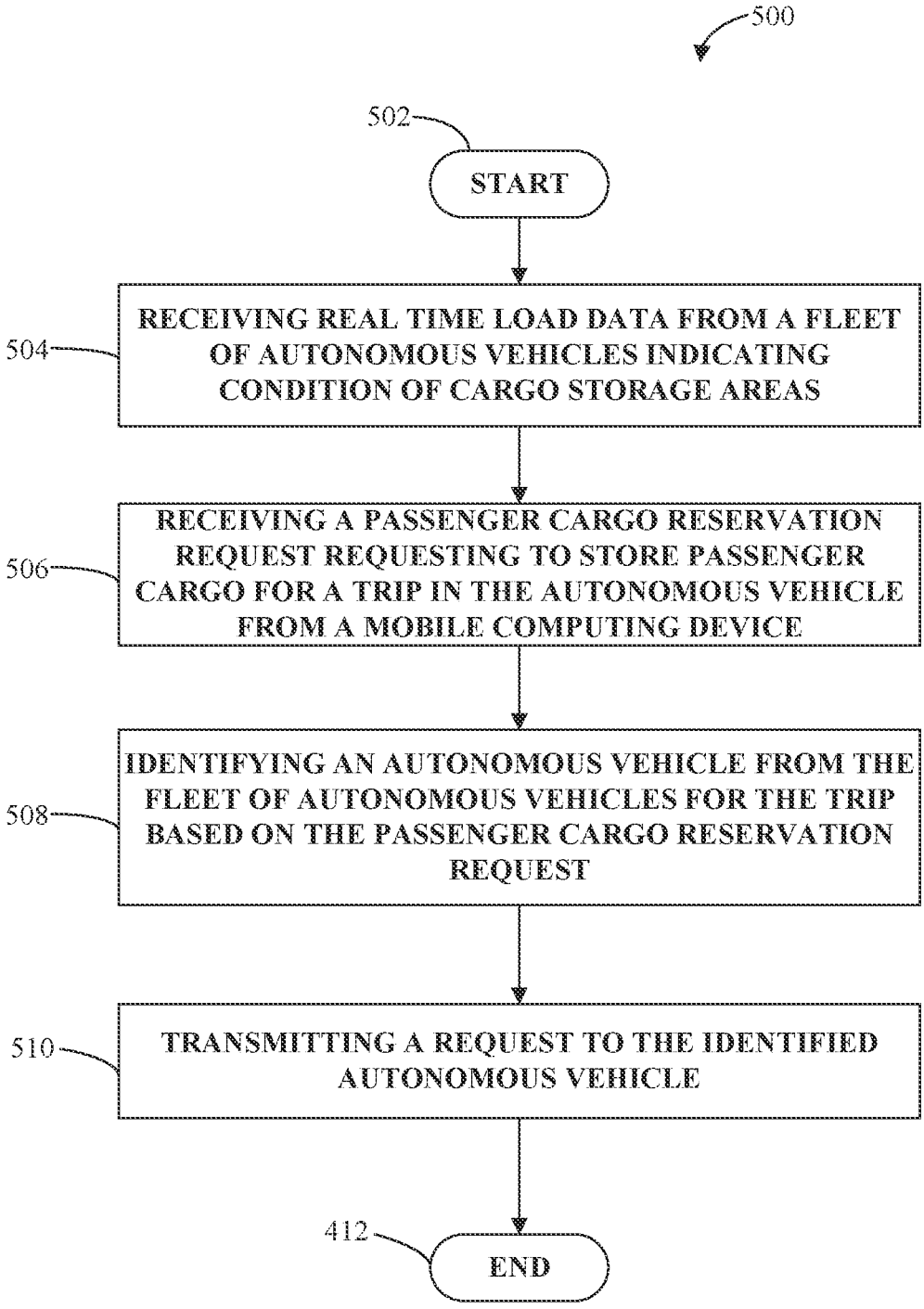

500
502
START
RECEIVING REAL TIME LOAD DATA FROM A FLEET OF AUTONOMOUS VEHICLES INDICATING CONDITION OF CARGO STORAGE AREAS
504
RECEIVING A PASSENGER CARGO RESERVATION REQUEST REQUESTING TO STORE PASSENGER CARGO FOR A TRIP IN THE AUTONOMOUS VEHICLE FROM A MOBILE COMPUTING DEVICE
506
IDENTIFYING AN AUTONOMOUS VEHICLE FROM THE FLEET OF AUTONOMOUS VEHICLES FOR THE TRIP BASED ON THE PASSENGER CARGO RESERVATION REQUEST
508
TRANSMITTING A REQUEST TO THE IDENTIFIED AUTONOMOUS VEHICLE
510
412
END

FIG. 5

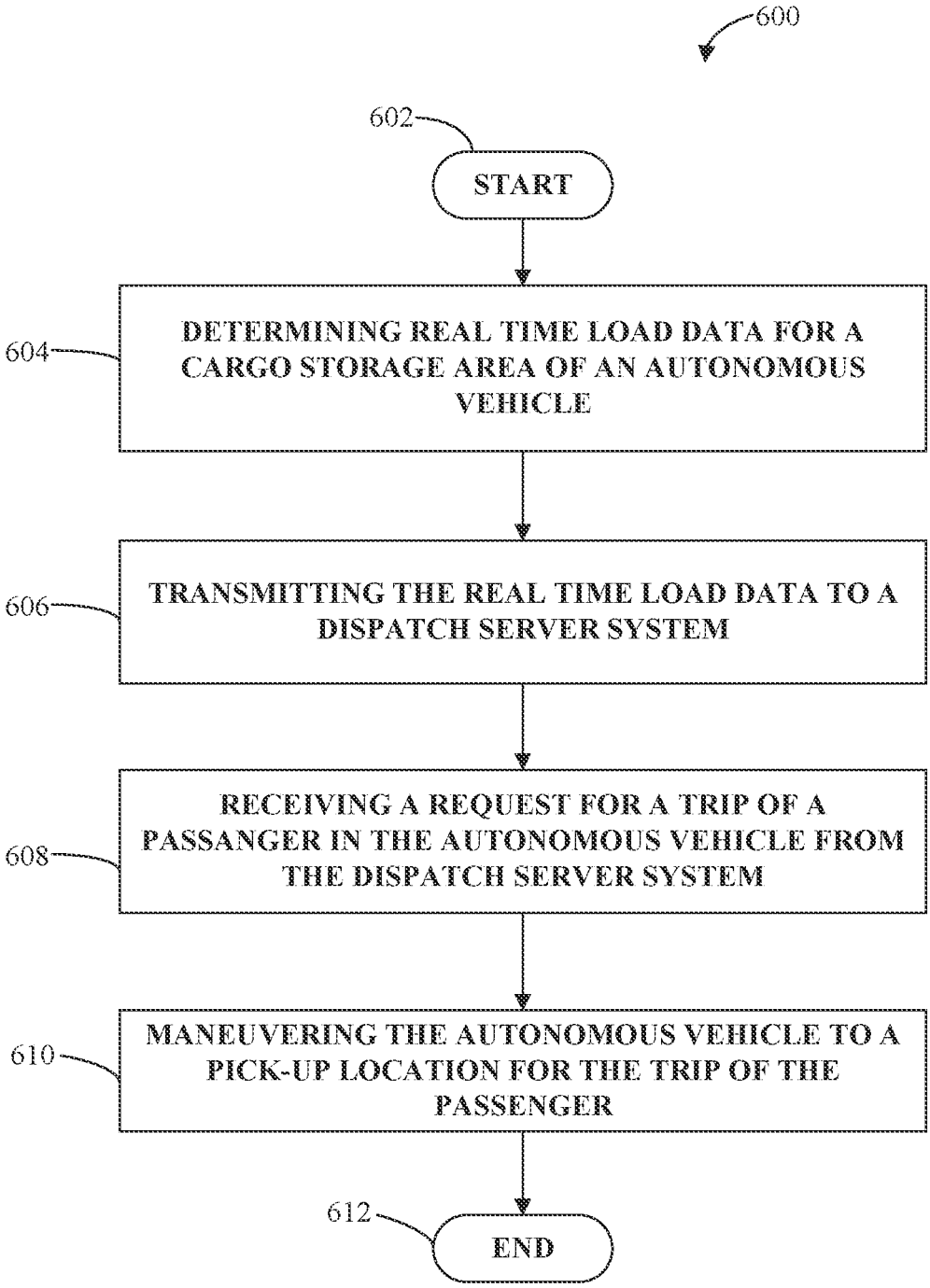

600
602
START
604
DETERMINING REAL TIME LOAD DATA FOR A CARGO STORAGE AREA OF AN AUTONOMOUS VEHICLE
606
TRANSMITTING THE REAL TIME LOAD DATA TO A DISPATCH SERVER SYSTEM
608
RECEIVING A REQUEST FOR A TRIP OF A PASSANGER IN THE AUTONOMOUS VEHICLE FROM THE DISPATCH SERVER SYSTEM
610
MANEUVERING THE AUTONOMOUS VEHICLE TO A PICK-UP LOCATION FOR THE TRIP OF THE PASSENGER
612
END

FIG. 6

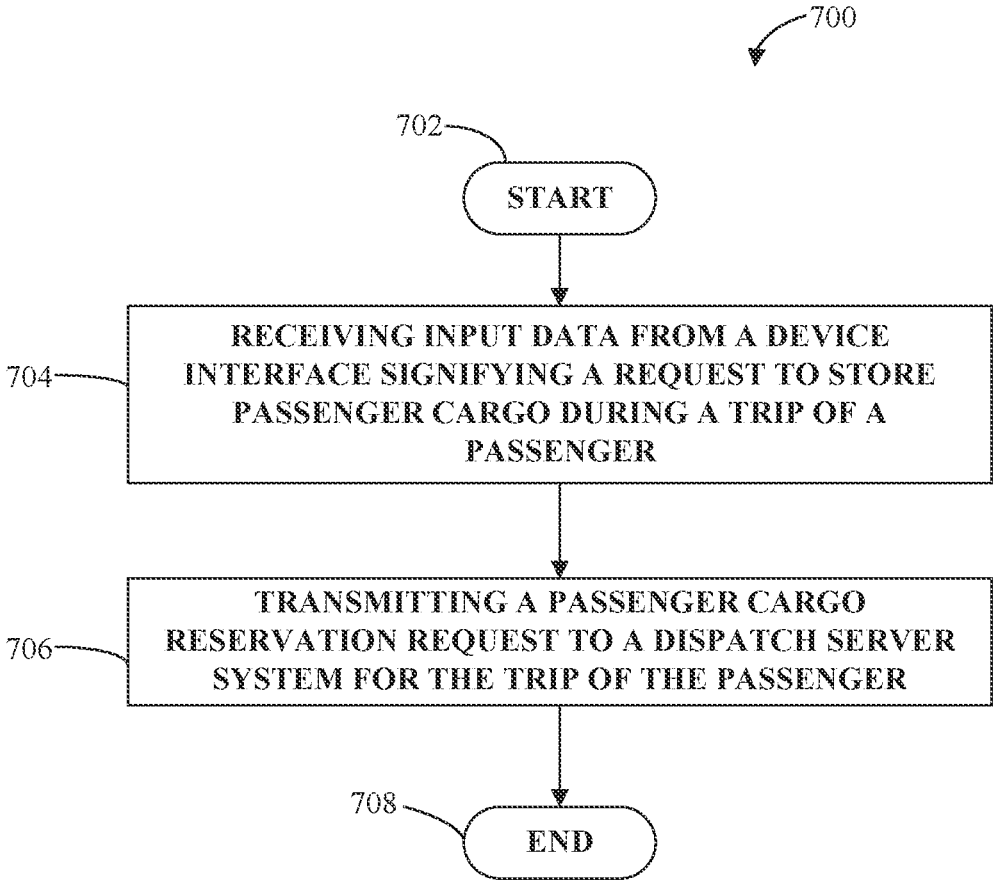
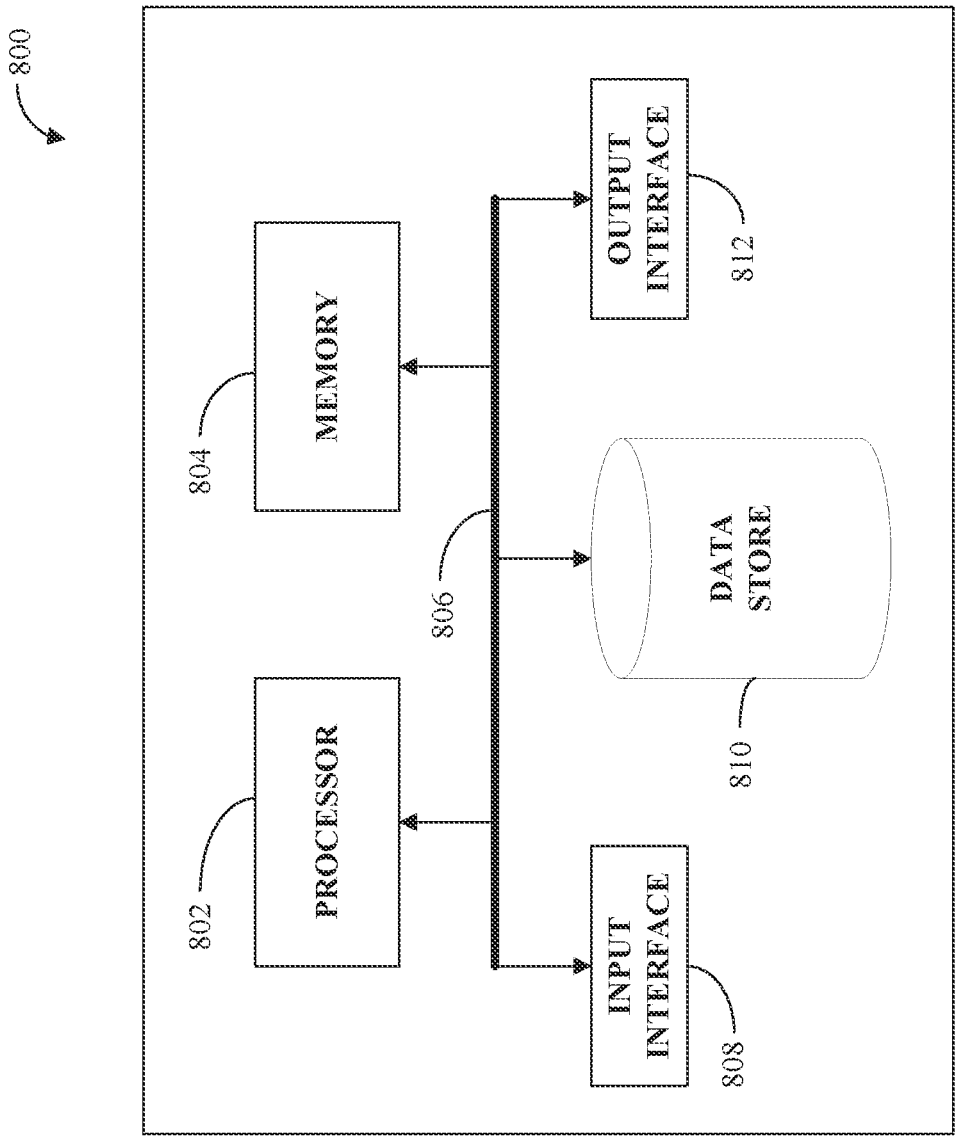

700
702
START
704
RECEIVING INPUT DATA FROM A DEVICE INTERFACE SIGNIFYING A REQUEST TO STORE PASSENGER CARGO DURING A TRIP OF A PASSENGER
706
TRANSMITTING A PASSENGER CARGO RESERVATION REQUEST TO A DISPATCH SERVER SYSTEM FOR THE TRIP OF THE PASSENGER
708
END

FIG. 7

FIG. 8


800
802
PROCESSOR
804
MEMORY
806
808
INPUT INTERFACE
810
DATA STORE
812
OUTPUT INTERFACE

AUTONOMOUS VEHICLE CARGO RESERVATION

BACKGROUND

[0001] An autonomous vehicle is a motorized vehicle that can operate without a human driver. A user can submit a ride request for a trip in an autonomous vehicle to a computing system, where the computing system selects an autonomous vehicle for the trip. The autonomous vehicle can be selected by the computing system for the trip based on proximity of the autonomous vehicle to the user, current occupancy of the autonomous vehicle, scheduled occupancy of the autonomous vehicle, and locations to which the autonomous vehicle is scheduled to travel, for instance. However, if the user is attempting to travel with cargo (e.g., groceries, suitcases, etc.) during the trip, space in a trunk of the autonomous vehicle selected for the trip of the user may be unavailable, resulting in the user either declining to ride in the selected autonomous vehicle (and requesting another autonomous vehicle) or trying to sit with the cargo in his or her lap in the passenger cabin.

SUMMARY

[0002] The following is a brief summary of subject matter that is described in greater detail herein. This summary is not intended to be limiting as to scope of the claims.

[0003] Described herein are various technologies pertaining to selecting an autonomous vehicle based on a passenger cargo reservation for a trip of the passenger in the autonomous vehicle. With more specificity, a user can submit a passenger cargo reservation request to a dispatch server system. The passenger cargo reservation request can specify a size, shape, and/or number of items included in the passenger cargo, for example. According to another example, the passenger cargo reservation request can indicate an amount of a cargo storage area of an autonomous vehicle desirably reserved for the user (e.g., the passenger cargo reservation request can specify that the user desirably reserve 25%, 50%, 75%, or 100% of the cargo storage area of an autonomous vehicle in which the user is to ride). The passenger cargo reservation request can be included as part of a ride request submitted by the user to the dispatch server system, where the ride request indicates that the user requests a trip in an autonomous vehicle (e.g., specifying a pick-up location, a drop-off location, a pick-up time, a desired arrival time, etc. for the trip). Responsive to receiving the passenger cargo reservation request (and the ride request), the dispatch server system can identify an amount of space in a cargo storage area (e.g., a trunk) of an autonomous vehicle to accommodate the passenger cargo during the trip based on the passenger cargo reservation request. The dispatch server system can be further configured to collect real time load data from autonomous vehicles in a fleet of autonomous vehicles. The real time load data can indicate utilized space in respective cargo storage areas of autonomous vehicles in the fleet of autonomous vehicles. The utilized space of an autonomous vehicle can include space in the cargo storage area of the autonomous vehicle that is currently occupied by passenger cargo of other passenger(s) as well as space in the cargo storage area that is reserved for other passenger(s) to be picked up. Moreover, the real time load data can specify time period(s) during which the space in the cargo storage area is to be utilized (e.g., based on time period(s) during which the other passenger(s) are scheduled to ride in the autonomous vehicle). When scheduling an autonomous vehicle to provide the ride for the user responsive to the ride request, the dispatch server system can select the autonomous vehicle from the fleet of autonomous vehicles based at least in part on the autonomous vehicle being able to accommodate the passenger cargo reservation request to store the passenger cargo during the trip.

[0004] According to various embodiments, the dispatch server system can identify potential autonomous vehicles from the fleet that can potentially provide the requested ride for the user (responsive to receiving the ride request from the user). The dispatch server system can transmit information specifying the potential autonomous vehicles and respective availability of space within cargo storage areas of the potential autonomous vehicles to a computing device of the user (as well as estimated pick-up and/or drop-off times). The computing device of the user can present the information specifying the potential autonomous vehicles and the corresponding availability of space within the cargo storage areas. For instance, for each of the potential autonomous vehicles, the computing device can indicate an amount of available space within the cargo storage area as well as an estimated pick-up time and/or estimated drop-off time for the requested ride in the potential autonomous vehicle if the user rides in the potential autonomous vehicle. Accordingly, a particular autonomous vehicle from the potential autonomous vehicles can be selected by the user (e.g., responsive to user input received by the computing device of the user).

[0005] In various embodiments, the dispatch server system may be configured to reserve the cargo storage area (or a portion thereof) for the user. For instance, the dispatch server system can be configured to cause the autonomous vehicle to prevent other users from accessing the cargo storage area (e.g., causing the autonomous vehicle to lock the cargo storage area for other passenger(s) for whom a portion of the cargo storage area is not reserved). According to another illustration, the dispatch server system can be configured to allot a certain amount of space in a cargo storage area of an autonomous vehicle for the user and the autonomous vehicle can be configured to inform the user if the passenger cargo placed in the cargo storage area of the autonomous vehicle by the user exceeds the allotted space.

[0006] The above-described technologies present various advantages over conventional ride request approaches. Unlike the conventional approach of requesting a ride in an autonomous vehicle and assuming there will be adequate space to store passenger cargo, the herein-described technologies allow a user to request an autonomous vehicle with adequate space to store the passenger cargo and reserve such space within the cargo storage area of the autonomous vehicle. Moreover, the herein-described technologies permit a user to reserve specific space in the cargo storage area to prevent the space from being filled prior to the autonomous vehicle reaching the pick-up location for the trip of the passenger.

[0007] The above summary presents a simplified summary in order to provide a basic understanding of some aspects of the systems and/or methods discussed herein. This summary is not an extensive overview of the systems and/or methods discussed herein. It is not intended to identify key/critical elements or to delineate the scope of such systems and/or

methods. Its sole purpose is to present some concepts in a simplified form as a prelude to the more detailed description that is presented later.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. **1** illustrates an exemplary system configured to reserve a cargo storage area (or a portion thereof) of an autonomous vehicle from a fleet of autonomous vehicles for storing passenger cargo during a trip of a passenger in the autonomous vehicle.

[0009] FIG. **2** illustrates an exemplary dispatch server system in communication with an exemplary autonomous vehicle.

[0010] FIG. **3** illustrates an exemplary mobile computing device.

[0011] FIG. **4** illustrates an exemplary driving environment of a plurality of autonomous vehicles.

[0012] FIG. **5** is a flow diagram that illustrates an exemplary methodology executed by a dispatch server system for identifying an autonomous vehicle from a fleet of autonomous vehicles to store passenger cargo during a trip of a passenger.

[0013] FIG. **6** is a flow diagram that illustrates an exemplary methodology executed by an autonomous vehicle for a trip of a user.

[0014] FIG. **7** is a flow diagram that illustrates an exemplary methodology executed by a mobile computing device for submitting a request to store passenger cargo during a trip of the passenger in an autonomous vehicle.

[0015] FIG. **8** illustrates an exemplary computing device.

DETAILED DESCRIPTION

[0016] Various technologies pertaining to selecting an autonomous vehicle for a trip of a passenger based on the passenger requesting to store passenger cargo in the autonomous vehicle during the trip are now described with reference to the drawings, wherein like reference numerals are used to refer to like elements throughout. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of one or more aspects. It may be evident, however, that such aspect(s) may be practiced without these specific details. In other instances, well-known structures and devices are shown in block diagram form in order to facilitate describing one or more aspects. Further, it is to be understood that functionality that is described as being carried out by certain system components may be performed by multiple components. Similarly, for instance, a component may be configured to perform functionality that is described as being carried out by multiple components.

[0017] Moreover, the term "or" is intended to mean an inclusive "or" rather than an exclusive "or." That is, unless specified otherwise, or clear from the context, the phrase "X employs A or B" is intended to mean any of the natural inclusive permutations. That is, the phrase "X employs A or B" is satisfied by any of the following instances: X employs A; X employs B; or X employs both A and B. In addition, the articles "a" and "an" as used in this application and the appended claims should generally be construed to mean "one or more" unless specified otherwise or clear from the context to be directed to a singular form.

[0018] Further, as used herein, the terms "component" and "system" are intended to encompass computer-readable data storage that is configured with computer-executable instructions that cause certain functionality to be performed when executed by a processor. The computer-executable instructions may include a routine, a function, or the like. It is also to be understood that a component or system may be localized on a single device or distributed across several devices. Further, as used herein, the term "exemplary" is intended to mean serving as an illustration or example of something and is not intended to indicate a preference.

[0019] Disclosed are various technologies that generally relate to reserving passenger cargo space (e.g., space in a trunk) for a trip in an autonomous vehicle. A dispatch server system receives a ride request from a user (e.g., from a device of the user). The ride request can indicate that the user requests a trip in an autonomous vehicle (e.g., specifying a pick-up location, a drop-off location, a pick-up time, a desired arrival time, etc. for the trip). The ride request can further include a passenger cargo reservation request indicating a request to store passenger cargo during the trip in the autonomous vehicle. The passenger cargo reservation request can be included as part of the ride request and/or can be a separate request. The dispatch server system can select an autonomous vehicle with space to store the passenger cargo based at least in part on the passenger cargo reservation request. The passenger cargo reservation request can indicate a size, shape, and/or number of items included in the passenger cargo of the user. Such information can be used to determine how much space is needed to store the passenger cargo. According to another example, the passenger cargo reservation request can indicate an amount of a cargo storage area of an autonomous vehicle desirably reserved for the user (e.g., the passenger cargo reservation request can specify that the user desirably reserve 25%, 50%, 75%, or 100% of the cargo storage area of an autonomous vehicle in which the user is to ride). The autonomous vehicle can be selected from the autonomous vehicle(s) determined to be able to accommodate the passenger cargo.

[0020] With reference now to FIG. **1**, illustrated is a system **100** configured to reserve a cargo storage area (or a portion thereof) of an autonomous vehicle from a fleet of autonomous vehicles for storing passenger cargo during a trip of a passenger in the autonomous vehicle. The system **100** can be configured to select an autonomous vehicle from a fleet of autonomous vehicles, where the autonomous vehicle that is selected has sufficient space to store the passenger cargo. More specifically, in the system **100**, a user can transmit a ride request requesting a trip in an autonomous vehicle and a passenger cargo reservation request requesting space to store passenger cargo during the trip in the autonomous vehicle to a dispatch server system **102**. The ride request and the passenger cargo reservation request can be sent as part of a same request or separate requests. The dispatch server system **102** can further receive real time load data from a fleet of autonomous vehicles that indicates available storage capacity in the autonomous vehicles of the fleet. The dispatch server system **102** selects the autonomous vehicle from the fleet of autonomous vehicles for the trip of the passenger at least in part based on the real time load data and the passenger cargo reservation request.

[0021] As illustrated in FIG. **1**, the system **100** can include the dispatch server system **102**, which is in communication with a mobile computing device **104** of a user. While described herein as being a mobile computing device, it is contemplated that substantially any type of user device can

be utilized by the user. Moreover, it is to be appreciated that substantially any number of user devices can be in communication with the dispatch server system **102**. The mobile computing device **104**, for instance, can be a smartphone, a tablet computing device, a wearable computing device, etc. By way of another example, the device can comprise a personal computer.

[0022] In the illustrated embodiment, the dispatch server system **102** is in communication with a plurality of autonomous vehicles, namely, autonomous vehicle 1 **106**, . . . , and autonomous vehicle X **108** (collectively referred to herein as autonomous vehicles **106-108**), where X can be substantially any integer greater than 1. The autonomous vehicles **106-108** may be in the same fleet of autonomous vehicles and/or may be part of different fleets of autonomous vehicles. In another embodiment, the dispatch server system **102** can be in communication with a single autonomous vehicle.

[0023] In order to transmit data to the device **104** and/or the autonomous vehicles **106-108** and/or receive data therefrom, the dispatch server system **102** may include a transceiver **118**. The transceiver **118** is configured to transmit data from the dispatch server system **102** and/or receive data at the dispatch server system **102**. Thus, the dispatch server system **102** can be in communication with the mobile computing device **104** and/or the autonomous vehicles **106-108** via the transceiver **118**.

[0024] The dispatch server system **102** is configured to receive a ride request for a trip of a passenger from the mobile computing device **104** and, in response to receiving the ride request, to select an autonomous vehicle from the autonomous vehicles **106-108** for trip of the passenger. The ride request can specify a pick-up location, a drop-off location, a pick-up time, a desired arrival time, etc. for the trip. The ride request can further include a passenger cargo reservation request requesting space in a cargo storage area of the autonomous vehicle to store passenger cargo during the trip of the passenger. The passenger cargo reservation request can be part of the ride request and/or can be a separate request sent from the mobile computing device **104** to the dispatch server system **102**. The dispatch server system **102** can select the autonomous vehicle based at least in part on the passenger cargo reservation request (as well as available room to store the passenger cargo during the trip).

[0025] The dispatch server system **102** can collect real time load data from one or more of the autonomous vehicles **106-108**. The real time load data can indicate utilized space in respective cargo storage areas (e.g., trunks) of the autonomous vehicles **106-108**. The utilized space of an autonomous vehicle can include space in the cargo storage area of the autonomous vehicle that is currently occupied by passenger cargo of other passenger(s) as well as space in the cargo storage area that is reserved for other passenger(s) to be picked up. Moreover, the real time load data can specify time period(s) during which the space in the cargo storage area is to be utilized (e.g., based on time period(s) during which the other passenger(s) are scheduled to ride in the autonomous vehicle). The dispatch server system **102** can compare the requested space specified in the passenger cargo reservation request to available space in the cargo storage areas of the autonomous vehicles **106-108** (indicated by the real time load data) to determine which autonomous vehicle(s) (if any) from the autonomous vehicles **106-108** have room to store the passenger cargo. Accordingly, the dispatch server system **102** can select an autonomous vehicle from the autonomous vehicles **106-108** based at least in part on the foregoing. Further, the dispatch server system **102** can select the autonomous vehicle from the autonomous vehicles **106-108** based on proximity of the autonomous vehicles **106-108** to the user, current occupancies of the autonomous vehicles **106-108**, scheduled occupancies of the autonomous vehicles **106-108**, locations to which the autonomous vehicles **106-108** are scheduled to travel, a combination thereof, and so forth.

[0026] According to various embodiments, the dispatch server system **102** can select the autonomous vehicle for the trip of the passenger. Pursuant to other embodiments, the dispatch server system **102** can identify potential autonomous vehicles from the autonomous vehicles **106-108** that can potentially provide the requested ride for the user (e.g., a subset of autonomous vehicle from the autonomous vehicles **106-108** that can accommodate the passenger cargo reservation request); accordingly, the autonomous vehicle can be selected from the potential autonomous vehicles based on user input (e.g., a selection) made by the user of the mobile computing device **104** to select the autonomous vehicle for the trip. For example, the dispatch server system **102** can transmit information about one or more of the autonomous vehicles **106-108** to the mobile computing device **104**. The information can include location, available room, estimated travel time to the pick-up location (e.g., estimated pick-up time), estimated time of drop off at a drop-off location, and/or the like. The mobile computing device **104** can present such information to the user, and the user can select an autonomous vehicle for the trip of the passenger based upon the presented information.

[0027] The foregoing can allow a user to select an autonomous vehicle that has available storage space that is smaller than a requested amount of cargo storage area but is desirable for another reason. For instance, the user can select an autonomous vehicle that is closer to the pick-up location but with available storage space that is smaller than the passenger cargo. Accordingly, the user can elect to store a portion of the passenger cargo in the storage space and travel with the remaining portion of the passenger cargo in their lap. Thus, a user is not limited to only autonomous vehicles that meet the minimum storage space necessary to hold the passenger cargo.

[0028] The dispatch server system **102** can include a processor **110** and memory **112**, where the memory **112** includes computer-executable instructions that are executed by the processor **110**. In an example, the processor **110** can be or include a graphics processing unit (GPU), a plurality of GPUs, a central processing unit (CPU), a plurality of CPUs, an application-specific integrated circuit (ASIC), a microcontroller, a programmable logic controller (PLC), a field programmable gate array (FGPA), a combination thereof, or the like. The memory **112** may include a routing system **114**, an autonomous vehicle selection system **116**, and/or a passenger cargo system **120**, which are described in detail below.

[0029] The routing system **114** is configured to identify at least one route from an initial location (e.g., pick-up location) to a destination (e.g., drop-off location) of the trip of the passenger. The dispatch server system **102** may identify the at least one route by accessing roadway information (e.g., maintained by the dispatch server system **102**). The initial location and/or the destination can be set based on the

ride request received from the mobile computing device **104**, where the ride request can specify the pick-up location and the drop-off location.

[0030] The autonomous vehicle selection system **116** is configured to select an autonomous vehicle from the autonomous vehicles **106-108** for the trip of the passenger based on the ride request from the mobile computing device **104**. The autonomous vehicle selection system **116** can further be configured to select the autonomous vehicle from the autonomous vehicles **106-108** for the trip of the passenger based on the passenger cargo reservation request. In order to identify which autonomous vehicle from the autonomous vehicles **106-108** is suitable, the dispatch server system **102** is configured to collect real time load data from the autonomous vehicles **106-108**. The autonomous vehicles **106-108** can transmit their respective real time load data to the dispatch server system **102**.

[0031] The real time load data can comprise any suitable information to inform the autonomous vehicle selection system **116** about available storage space in an autonomous vehicle (e.g., autonomous vehicle 1 **106**). The passenger cargo can be stored in any suitable storage location within the autonomous vehicle. For instance, in one embodiment, the passenger cargo is stored in a cargo storage area (e.g., a trunk) of the autonomous vehicle. In another embodiment, the passenger cargo is stored multiple parts of the autonomous vehicle, such as the cargo storage area and a passenger compartment. In the following embodiments, real time load data is discussed with reference to storing the passenger cargo in the cargo storage area, however similar methods can be used for other storage locations.

[0032] In one embodiment, the real time load data can comprise information indicating that a portion of the cargo storage area is occupied, such as with other passenger's cargo. The autonomous vehicle selection system **116** can determine available space in the cargo storage area based on the real time load data. In another embodiment, the autonomous vehicle can determine the available portion in the cargo storage area and the real time load data can comprise information indicating this available portion.

[0033] The autonomous vehicle selection system **116** can filter out autonomous vehicle(s) from the autonomous vehicles **106-108** that do not meet a minimum available space specified by the passenger cargo reservation request. For instance, where the passenger cargo would occupy 80% of the cargo storage area, the autonomous vehicle selection system **116** can filter out autonomous vehicles with less than 80% available space. In another example, the autonomous vehicle selection system **116** can set a minimum available space requirement that is higher than the amount of space that would be occupied by the passenger cargo.

[0034] The autonomous vehicle selection system **116** can be further configured to filter the autonomous vehicles based on the type and/or size of the passenger cargo. For instance, where the passenger cargo comprises a bicycle, the autonomous vehicle selection system **116** can filter out vehicles that do not include a bicycle rack. In another example, where the passenger cargo comprises a long object (e.g., a cello), the autonomous vehicle selection system **116** can filter out vehicles that have a cargo storage area below a threshold square area and/or a non-expandable cargo storage area (e.g., a seat can't be put down to expand the cargo storage area).

[0035] The autonomous vehicle selection system **116** can identify an appropriate autonomous vehicle from the filtered autonomous vehicles. For instance, the autonomous vehicle selection system **116** can identify which autonomous vehicle is nearest a pick-up location and has a seat available for trip of the passenger. Subsequent to identifying the appropriate autonomous vehicle, the autonomous vehicle selection system **116** can transmit information specifying the route from the routing system **114** to that autonomous vehicle.

[0036] The passenger cargo system **120** is configured to use information included in the passenger cargo reservation request to determine the amount of space that would be occupied by the passenger cargo. For instance, the information can include a number and/or type of passenger cargo, such as three bags of groceries. In another example, the information can include an image of the passenger cargo, such as a picture of the passenger cargo captured with a camera of the mobile computing device. However, in other embodiments, the passenger cargo reservation request can indicate an amount of a cargo storage area of an autonomous vehicle desirably reserved for the user. For instance, the passenger cargo reservation request can specify that the user desirably reserve 25%, 50%, 75%, or 100% of the cargo storage area of an autonomous vehicle in which the user is to ride; however, substantially any other percentages of the cargo storage area can be specified in the passenger cargo reservation request.

[0037] Turning now to FIG. **2**, illustrated is an exemplary autonomous vehicle **200** (e.g., one of the autonomous vehicles **106-108**) that is in communication with the dispatch server system **102**. The autonomous vehicle **200** can navigate about roadways without human conduction based upon sensor signals output by sensor systems of the autonomous vehicle **200**. The autonomous vehicle **200** includes a plurality of sensor systems, namely, a sensor system 1 **202**, . . . , and a sensor system N **204** (collectively referred to herein as sensor systems **202-204**), where N can be substantially any integer greater than 1. The sensor systems **202-204** are of different types and may be arranged about the autonomous vehicle **200**. For example, the sensor system 1 **202** may be a lidar sensor system and the sensor system N **204** may be a camera (image) system. Other exemplary sensor systems **202-204** included are radar sensor systems, global positioning system (GPS) sensor systems, sonar sensor systems, infrared sensor systems, hybrid sensor systems (e.g., combining two or more sensor modalities), and the like.

[0038] The autonomous vehicle **200** further includes several mechanical systems that are used to effectuate appropriate motion of the autonomous vehicle **200**. For instance, the mechanical systems can include, but are not limited to, a vehicle propulsion system **208**, a braking system **210**, and a steering system **212**. The vehicle propulsion system **208** may be an electric motor, an internal combustion engine, a combination thereof, or the like. The braking system **210** can include an engine brake, brake pads, actuators, and/or any other suitable componentry that is configured to assist in decelerating the autonomous vehicle **200**. The steering system **212** includes suitable componentry that is configured to control the direction of the movement of the autonomous vehicle **200**.

[0039] The autonomous vehicle **200** further includes a cargo storage area **228**. The cargo storage area **228** can be a trunk of the autonomous vehicle. According to another

illustration, the cargo storage area **228** can include a plurality of storage compartments in the autonomous vehicle (e.g., each of which can be individually lockable and unlockable by the autonomous vehicle **200**). Yet, other types of cargo storage areas are intended to fall within the scope of the hereto appended claims.

[0040] Similar to the computing system **102**, in order to transmit data and/or receive data, the autonomous vehicle **200** may further include a transceiver **206**. The transceiver **206** is configured to transmit data from the autonomous vehicle **200** and/or receive data at the autonomous vehicle **200**. Thus, the autonomous vehicle **200** can be in communication with the dispatch server system **102**.

[0041] The autonomous vehicle **200** additionally comprises a computing system **214** that is in communication with the sensor systems **202-204**, the transceiver **206**, the vehicle propulsion system **208**, the braking system **210**, and/or the steering system **212**. The computing system **214** includes a processor **216** and memory **218**; the memory **218** includes computer-executable instructions that are executed by the processor **216**. In an example, the processor **216** can be or include a GPU, a plurality of GPUs, a CPU, a plurality of CPUs, an ASIC, a PLC, an FPGA, a microcontroller, a combination thereof, or the like.

[0042] The memory **218** includes a control system **224** configured to control operation of the vehicle propulsion system **208**, the braking system **210**, and/or the steering system **212**. The memory **218** may further include a load detection system **220** configured to monitor the cargo storage area **228** to provide the load data to the dispatch server system **102**. The memory **218** may yet further include an alert system **222** configured to present one or more messages to a passenger(s) of the autonomous vehicle **200**.

[0043] The load detection system **220** is configured to receive data from a storage sensor **226** in the autonomous vehicle **200** and to transmit real time load data to the dispatch server system **102** based on the storage sensor data. The storage sensor **226** is configured to output data indicative of a condition of the cargo storage area **228** in the autonomous vehicle **200**. For instance, the storage sensor **226** can output data indicating space (if any) in the cargo storage area **228** occupied by other cargo, weight of cargo currently occupying the cargo storage area **228**, and so forth.

[0044] In one embodiment, the storage sensor **226** comprises a weight scale configured to determine a weight of passenger cargo in the cargo storage area **228**. In another embodiment, the storage sensor **226** comprises a camera that captures an image of the cargo storage area **228**. The load detection system **220** can use the image to determine the occupied space in the cargo storage area **228** and/or the image can be transmitted by the load detection system **220** to dispatch server system **102** to determine the occupied space in the cargo storage area **228**. For instance, the load detection system **220** can compare the captured image to a stored image of an unoccupied cargo storage area **228** to determine the occupied space in the cargo storage area **228**.

[0045] The load detection system **220** can collect the information from the storage sensor **226** at any suitable rate. For instance, the information can be collected continuously (e.g., a continuous video of the cargo storage area **228** captured by the camera). In another example, the information can be collected at predefined intervals (e.g., every 30 minutes), every time the cargo storage area **228** is accessed, and/or when the autonomous vehicle selection system **116** is attempting to identify one or more suitable autonomous vehicles in the autonomous vehicles **106-108** for the trip of the passenger.

[0046] In an embodiment, the computing system **214** can be further configured to store information relating to the type of cargo already stored within the autonomous vehicle **200**. For instance, when a passenger stores and/or removes passenger cargo from the cargo storage area **228**, the computing system **214** can update a stored cargo inventory. The information in the stored cargo inventory (e.g., the type of passenger cargo) can be based on the ride request received by the dispatch server system **102** and/or detected by the storage sensor **226**. The load data transmitted to the dispatch server system **102** can include this stored cargo inventory for use by the autonomous vehicle selection system **116** in identifying an autonomous vehicle for the trip of the passenger. For instance, where the stored cargo inventory for the autonomous vehicle **200** includes large or bulky cargo (e.g., suitcases), the autonomous vehicle selection system **116** may filter out the autonomous vehicle **200** when the passenger cargo comprises a fragile object (e.g., eggs) to prevent the bulky cargo from breaking the fragile object.

[0047] As mentioned above, the alert system **222** can be configured to present a message(s) to the passenger. The message can be presented by way of a speaker in the autonomous vehicle **200** and/or a display in the autonomous vehicle **200**. Additionally or alternatively, the message can be transmitted to the mobile computing device **104** for presentation thereby. Different messages can be presented for different situations. For instance, a message can be presented reminding the passenger to check the cargo storage area **228** when the autonomous vehicle **200** reaches a destination for the trip, regardless of whether the passenger stored passenger cargo for the trip.

[0048] In another example, a message can be presented when passenger cargo stored in the cargo storage area **228** exceeds an allotted amount of the cargo storage area **228**. For instance, the dispatch server system **102** and/or the computing system **214** can allot a specific amount of the cargo storage area **228** for the passenger based on the passenger cargo reservation request. If the passenger attempts to store passenger cargo that exceeds the allotted amount of space, the alert system **222** can present a message informing the passenger that they have exceeded their allotted amount.

[0049] In addition to controlling operation of the vehicle propulsion system **208**, the braking system **210**, and/or the steering system **212**, the control system **224** may be further configured to control access to the cargo storage area **228**. For instance, the control system **224** may prevent access to the cargo storage area **228** (e.g., by locking the trunk) for a passenger(s) who did not request room to store passenger cargo.

[0050] Turning now to FIG. **3**, illustrated is an exemplary mobile computing device **104**. The mobile computing device **104** can include a device interface **316** configured to receive an input from a user of the mobile computing device **104**. According to another example, input from the user of the mobile computing device **104** can be received via a display **308** (e.g., a touchscreen); for instance, the display **308** can be or include the device interface **316**. The mobile computing device **104** further includes a processor **300** and memory **302**, where the memory **302** includes computer-executable instructions that are executed by the processor

300. In an example, the processor **300** can be or include a GPU, a plurality of GPUs, a CPU, a plurality of CPUs, an ASIC, a microcontroller, an FPGA, a combination thereof, or the like.

[0051] The memory **302** includes an autonomous vehicle system **304** that interfaces with the dispatch server system **102** and/or the autonomous vehicle **200**. The autonomous vehicle system **304** can be configured to receive input from a user and generate a ride request for a ride in an autonomous vehicle based on the input. The autonomous vehicle system **304** can further be configured to transmit the ride request, via a transceiver **314**, to the dispatch server system **102**. The ride request can include a pick-up location and/or a destination for the trip of the passenger. The ride request can further include a passenger cargo reservation request requesting to store passenger cargo in the autonomous vehicle during the trip of the passenger. While described as being part of the ride request, it is contemplated that the passenger cargo reservation request can be transmitted separately from the ride request from the mobile computing device **104** to the dispatch server system **102**.

[0052] The passenger cargo reservation request can include an indication of the size of the passenger cargo that is then used by the dispatch server system **102** to calculate an amount of cargo storage area that would be used up by the passenger cargo. For instance, the autonomous vehicle system **304** can present a plurality of options that are selectable by the user to indicate the size of the passenger cargo, such as "small," "medium," and/or "large." The autonomous vehicle system **304** can provide the user with examples to assist the user with selecting an appropriate size, e.g., an example of "small" cargo comprises a grocery bag. In another example, the user can indicate a desire to reserve the whole cargo storage area, e.g., prevent any other passenger from storing passenger cargo in the cargo storage area. In yet another example, the user can indicate a percentage of the cargo storage area desirably reserved for the ride. By way of illustration, the user can specify a desire to reserve 25%, 50%, 75%, or 100% of the cargo storage area; however, it is contemplated that other percentages are intended to fall within the scope of the hereto appended claims. Additionally, the autonomous vehicle system **304** can allow the user to indicate a number of objects in the passenger cargo. For example, the user can indicate that the passenger cargo comprises 4 grocery bags.

[0053] In another example, an image of the passenger cargo can be captured with a camera **312** that is then used to determine a size of the passenger cargo. In one embodiment, the autonomous vehicle system **304** is configured to use the image to determine the size of the passenger cargo which is then transmitted to the dispatch server system **102**. In another embodiment, the image is transmitted by the autonomous vehicle system **304** to the dispatch server system **102** which then uses the passenger cargo system **120** to determine the size of the passenger cargo system.

[0054] The autonomous vehicle system **304** can be further configured receive information indicative of one or more of the autonomous vehicles **106-108** from the dispatch server system **102** and to present this information to the user. The information can include location, available room, estimated travel time to the pick-up location, anticipated drop-off time, and/or the like. The user can select the autonomous vehicle for the trip from the presented autonomous vehicle(s). This selection is then transmitted to the dispatch server system **102**.

[0055] This can allow a user to select an autonomous vehicle that has available storage space that is smaller than passenger cargo. For instance, the user can select an autonomous vehicle that is closer to the pick-up location but with available storage space that is smaller than the passenger cargo. Accordingly, the user can elect to store a portion of the passenger cargo in the storage space and travel with the remaining portion of the passenger cargo in their lap. Thus, a user is not limited to waiting for only autonomous vehicles that meet the minimum storage space necessary to hold the passenger cargo.

[0056] The mobile computing device **104** may include a display **308**, whereupon graphical features **310** may be presented. For instance, a GUI for the autonomous vehicle application **304** may be presented as part of the graphical features **310**. For instance, the information regarding the autonomous vehicle(s) from the dispatch server system **102** can be presented on the display **308**.

[0057] The memory **302** further includes an alert system **306** configured to present the message(s) generated by the alert system **222** in the autonomous vehicle **200**. In one embodiment, the message can be presented textually on the display **308**. In another embodiment, the message is presented audibly by a speaker (not pictured) in the mobile computing device **104**.

[0058] Turning now to FIG. **4**, illustrated is an exemplary embodiment of selecting an autonomous vehicle to store passenger cargo during a trip of the passenger using the techniques described above. In the illustrated embodiment, a passenger **400** submits a ride request to the dispatch server system **102** for a trip in an autonomous vehicle from a pick-up location **402**. The submitted ride request further indicates a desire to store passenger cargo **404** during the trip (e.g., via a passenger cargo reservation request). The passenger **400** can indicate the size, shape, and number of times included as part of the passenger cargo **404** in the passenger cargo reservation request. This size, shape, and/or number of items can be used by dispatch server system **102** to select a suitable autonomous vehicle(s) from a fleet of autonomous vehicles.

[0059] In the illustrated embodiment, dispatch server system **102** is in communication with a fleet of autonomous vehicles, namely, a first autonomous vehicle **406**, a second autonomous vehicle **408**, a third autonomous vehicle **410**, a fourth autonomous vehicle **412**, and a fifth autonomous vehicle **414** (collectively referred to herein as autonomous vehicles **406-414**). The autonomous vehicles **406-414** can transmit real time load data to the dispatch server system **102** indicative of a condition of their respective cargo storage areas (e.g., available space and/or occupied space). For instance, the first autonomous vehicle **406** can indicate that 50% of its cargo storage area is available, the second autonomous vehicle **408** can indicate that 20% of its cargo storage area is available, the third autonomous vehicle **410** can indicate that 0% of its cargo storage area is available, the fourth autonomous vehicle **412** can indicate that 40% of its cargo storage area is available, and the fifth autonomous vehicle **414** can indicate that 80% of its cargo storage area is available. This real time load data can be used to select the suitable autonomous vehicle for the trip of passenger.

[0060] In one example, the dispatch server system **102** uses this real time load data to filter the autonomous vehicles **406-414**. More particularly, the passenger cargo reservation request can indicate that the passenger cargo **404** requests at least 50% of a cargo storage area to be available to hold the passenger cargo **404**. Accordingly, the dispatch server system **102** can filter out the second autonomous vehicle **408**, the third autonomous vehicle **410**, and the fourth autonomous vehicle **412** because each have less than 50% available area in their cargo storage area. After filtering out autonomous vehicles with insufficient room in the cargo storage area, the dispatch server system **102** can select from the remaining autonomous vehicle(s) based on other factors. For instance, dispatch server system **102** can select the autonomous vehicle based on distance from the pick-up location **402**, amongst other factors. In the illustrated case, this results in the dispatch server system **102** selecting the first autonomous vehicle **406** for the trip of the passenger **400**.

[0061] In another example, the dispatch server system **102** transmits data about the autonomous vehicles **406-414** to the mobile computing device **104** of the passenger **400** and the passenger **400** selects the autonomous vehicle for the trip. In one embodiment, the dispatch server system **102** can filter out the autonomous vehicles that have less available cargo storage area than requested in the passenger cargo reservation request. The passenger **400** can then select from the filtered autonomous vehicles (e.g., the first autonomous vehicle **406** and the fifth autonomous vehicle **414**). The passenger **400** can be presented with information regarding estimated time to the pick-up location **402**, the available cargo storage area, anticipated time of drop-off at a destination of the user, and/or any other suitable information for the autonomous vehicles. For instance, the passenger **400** may select the fifth autonomous vehicle **414** for the trip because it has more available cargo storage area as compared to the first autonomous vehicle **406** (80% vs. 50%), even though the travel time to the pick-up location **402** is longer for the fifth autonomous vehicle **414** than the first autonomous vehicle **406**.

[0062] In another embodiment, the passenger **400** can select from the autonomous vehicles **406-414** in communication with the dispatch server system **102**. Instead of filtering the autonomous vehicles **406-414**, the dispatch server system **102** can transmit the information to the mobile computing device **104**. The passenger **400** than selects from all the autonomous vehicles **406-414**. The autonomous vehicle system **304** of the mobile computing device **104** can permit the passenger **400** to filter the autonomous vehicles **406-414** such as by distance from the pick-up location **402**, available cargo storage area, type of autonomous vehicle, and/or the like. By allowing the passenger **400** to select from the available autonomous vehicles **406-414**, the system **100** allows for the passenger **400** to split up the passenger cargo **404** to store a portion in the cargo storage area and to retain a portion with them in the passenger sitting area. For instance, even though the fourth autonomous vehicle **412** has available cargo storage area that is less than is needed to store the passenger cargo **404**, the fourth autonomous vehicle **412** is the closest to the pick-up location **402**. Accordingly, if the passenger **400** is willing to hold a portion of the passenger cargo **404** in their lap during the trip, the passenger **400** can select the fourth autonomous vehicle **412** to wait the least amount of time for an autonomous vehicle for the trip.

[0063] FIG. **5** illustrates an exemplary methodology **500** for selecting an autonomous vehicle for a trip of a passenger in the autonomous vehicle. FIG. **6** illustrates an exemplary methodology **600** for operating an autonomous vehicle for a trip of a passenger. FIG. **7** illustrates an exemplary methodology **700** for employing a mobile computing device to request for a trip of a passenger in an autonomous vehicle. While the methodologies **500**, **600**, and **700** are shown as being a series of acts that are performed in a sequence, it is to be understood and appreciated that the methodologies are not limited by the order of the sequence. For example, some acts can occur in a different order than what is described herein. In addition, an act can occur concurrently with another act. Further, in some instances, not all acts may be required to implement a methodology described herein.

[0064] Moreover, the acts described herein may be computer-executable instructions that can be implemented by one or more processors and/or stored on a computer-readable medium or media. The computer-executable instructions can include a routine, a sub-routine, programs, a thread of execution, and/or the like. Still further, results of acts of the methodologies can be stored in a computer-readable medium displayed on a display device, and/or the like.

[0065] Referring now to FIG. **5**, the methodology **500** begins at **502**, and at **504**, real time load data from a fleet of autonomous vehicles is received at a dispatch server system. At **506**, a passenger cargo reservation request requesting to store passenger cargo for a trip in an autonomous vehicle can be received from a mobile computing device at the dispatch server system. The passenger cargo reservation request can be included as part of a ride request. Alternatively, the passenger cargo reservation request can be separate from the ride request (e.g., separate requests can be sent from the mobile computing device of the user to the dispatch server system). At **508**, an autonomous vehicle from the fleet of autonomous vehicles can be identified for the trip of the passenger. The autonomous vehicle from the fleet of autonomous vehicles can be identified based on the passenger cargo reservation request and the real time load data for the autonomous vehicles in the fleet of autonomous vehicles. At **510**, a request is transmitted to the identified autonomous vehicle. The request can cause the identified autonomous vehicle to move to a pick-up location for the trip of the passenger.

[0066] In an embodiment of the methodology **500**, the passenger cargo reservation request can include information specifying an amount of the passenger cargo. The autonomous vehicle from the fleet of autonomous vehicles can be identified based on the amount of the passenger cargo. Moreover, the request transmitted to the identified autonomous vehicle can cause the autonomous vehicle to allocate an amount of the cargo storage area to store the amount of the passenger cargo specified in the passenger cargo reservation request.

[0067] In another embodiment of the methodology **500**, the request transmitted to the autonomous vehicle can cause the autonomous vehicle to secure a cargo storage area of the identified autonomous vehicle as the identified autonomous moves to the pick-up location for the trip of the passenger. Securing the cargo storage area can prevent a user from accessing the cargo storage area.

[0068] In a further embodiment of the methodology **500**, the passenger cargo reservation request an indicate a type of the passenger cargo. The autonomous vehicle from the fleet

of autonomous vehicles can be further identified based on the type of the passenger cargo.

[0069] In yet another embodiment of the methodology **500**, identifying the autonomous vehicle from the fleet of autonomous vehicles comprises transmitting vehicle suggestion data to the mobile computing device of the passenger. The vehicle suggestion data can include the real time load data from the fleet of autonomous vehicles. Identifying the autonomous vehicle from the fleet of autonomous vehicles further comprises receiving selection data from the mobile computing device of the passenger. The selection data can indicate selection of an autonomous vehicle from the fleet of autonomous vehicles.

[0070] The methodology **600** starts at **602**, and at **604** real time load data for a cargo storage area of an autonomous vehicle can be determined. For instance, the real time load data can be determined at least in part based on sensor data provided by a storage sensor of the autonomous vehicle. At **606**, the real time load data can be transmitted from the autonomous vehicle to a dispatch server system. At **608**, a request for a trip of a passenger in the autonomous vehicle is received from the dispatch server system. The request can be transmitted to the autonomous vehicle based on the real time load data and a passenger cargo reservation request for the passenger. At **610**, the autonomous vehicle is maneuvered to a pick-up location for the trip of the passenger by controlling at least one of a vehicle propulsion system, a braking system, or a steering system. The methodology **600** concludes at **612**.

[0071] Referring now to FIG. **7**, the methodology **700** starts at **702**, and at **704** input data is received by a device interface signifying input is received by the device interface. The input data can indicate a request to store passenger cargo in a cargo storage area of the autonomous vehicle. The input data can further indicate an amount of passenger cargo. At **706**, a passenger cargo reservation request can be transmitted to a dispatch server system. The passenger cargo reservation request can be included as part of a ride request and/or can be transmitted separately from the ride request The passenger cargo reservation request (and/or the ride request) can be configured for use by the dispatch server system to select an autonomous vehicle from a fleet of autonomous vehicles for the trip of the passenger. The methodology **700** concludes at **708**.

[0072] Referring now to FIG. **8**, a high-level illustration of an exemplary computing device that can be used in accordance with the systems and methodologies disclosed herein is illustrated. For instance, the computing device **800** may be or include the mobile computing device or the dispatch server system. The computing device **800** includes at least one processor **802** that executes instructions that are stored in a memory **804**. The instructions may be, for instance, instructions for implementing functionality described as being carried out by one or more components discussed above or instructions for implementing one or more methods described above. The processor **802** may be a GPU, a plurality of GPUs, a CPU, a plurality of CPUs, a multi-core processor, etc. The processor **802** may access the memory **804** by way of a system bus **806**. In addition to storing executable instructions, the memory **804** may also store images, data specifying characteristics of specific objects, etc.

[0073] The computing device **800** additionally includes a data store **810** that is accessible by the processor **802** by way of the system bus **806**. The data store **810** may include executable instructions, images, data specifying characteristics of specific objects, etc. The computing device **800** also includes an input interface **508** that allows external devices to communicate with the computing device **800**. For instance, the input interface **508** may be used to receive instructions from an external computer device, from a user, etc. The computing device **800** also includes an output interface **812** that interfaces the computing device **800** with one or more external devices. For example, the computing device **800** may display text, images, etc. by way of the output interface **812**.

[0074] Additionally, while illustrated as a single system, it is to be understood that the computing device **800** may be a distributed system. Thus, for instance, several devices may be in communication by way of a network connection and may collectively perform tasks described as being performed by the computing device **800**.

[0075] Various functions described herein can be implemented in hardware, software, or any combination thereof. If implemented in software, the functions can be stored on or transmitted over as one or more instructions or code on a computer-readable medium. Computer-readable media includes computer-readable storage media. A computer-readable storage media can be any available storage media that can be accessed by a computer. By way of example, and not limitation, such computer-readable storage media can comprise RAM, ROM, EEPROM, CD-ROM or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other medium that can be used to store desired program code in the form of instructions or data structures and that can be accessed by a computer. Disk and disc, as used herein, include compact disc (CD), laser disc, optical disc, digital versatile disc (DVD), floppy disk, and blu-ray disc (BD), where disks usually reproduce data magnetically and discs usually reproduce data optically with lasers. Further, a propagated signal is not included within the scope of computer-readable storage media. Computer-readable media also includes communication media including any medium that facilitates transfer of a computer program from one place to another. A connection, for instance, can be a communication medium. For example, if the software is transmitted from a website, server, or other remote source using a coaxial cable, fiber optic cable, twisted pair, digital subscriber line (DSL), or wireless technologies such as infrared, radio, and microwave, then the coaxial cable, fiber optic cable, twisted pair, DSL, or wireless technologies such as infrared, radio, and microwave are included in the definition of communication medium. Combinations of the above should also be included within the scope of computer-readable media.

[0076] Alternatively, or in addition, the functionally described herein can be performed, at least in part, by one or more hardware logic components. For example, and without limitation, illustrative types of hardware logic components that can be used include Field-programmable Gate Arrays (FPGAs), Application-specific Integrated Circuits (ASICs), Application-specific Standard Products (ASSPs), System-on-a-chip systems (SOCs), Complex Programmable Logic Devices (CPLDs), etc.

[0077] As described herein, one aspect of the present technology is the gathering and use of data available from various sources to improve quality and experience. The present disclosure contemplates that in some instances, this

gathered data may include personal information. The present disclosure contemplates that the entities involved with such personal information respect and value privacy policies and practices.

[0078] What has been described above includes examples of one or more embodiments. It is, of course, not possible to describe every conceivable modification and alteration of the above devices or methodologies for purposes of describing the aforementioned aspects, but one of ordinary skill in the art can recognize that many further modifications and permutations of various aspects are possible. Accordingly, the described aspects are intended to embrace all such alterations, modifications, and variations that fall within the spirit and scope of the appended claims. Furthermore, to the extent that the term "includes" is used in either the details description or the claims, such term is intended to be inclusive in a manner similar to the term "comprising" as "comprising" is interpreted when employed as a transitional word in a claim.

What is claimed is:

1. An autonomous vehicle, comprising:

a cargo storage area; and

a computing system comprising:

a processor; and

memory that stores computer-executable instructions that, when executed by the processor, cause the processor to perform acts comprising:

determining, by way of a load detection system, real time load data for the cargo storage area of the autonomous vehicle;

transmitting the real time load data to a dispatch server system;

receiving, from the dispatch server system, a request for a trip of a passenger in the autonomous vehicle, wherein the request is transmitted to the autonomous vehicle based on the real time load data and a passenger cargo reservation request for the passenger; and

responsive to receiving the request from the dispatch server system, controlling at least one of a vehicle propulsion system, a braking system, or a steering system to maneuver the autonomous vehicle to a pick-up location for the trip of the passenger.

2. The autonomous vehicle of claim **1**, wherein the load detection system comprises a weight scale configured to determine a weight of passenger cargo currently in the cargo storage area of the autonomous vehicle.

3. The autonomous vehicle of claim **1**, wherein the load detection system comprises a camera configured to capture an image of the cargo storage area.

4. The autonomous vehicle of claim **1**, the acts further comprising:

securing the cargo storage area as the autonomous vehicle maneuvers to the pick-up location for the trip of the passenger, wherein securing the cargo storage area prevents a differing user from accessing the cargo storage area.

5. The autonomous vehicle of claim **1**, wherein:

the passenger cargo reservation request indicates an amount of the cargo storage area desirably reserved for the passenger;

the acts further comprising:

presenting a message to the passenger when passenger cargo of the passenger in the cargo storage area exceeds the amount of the cargo storage area desirably reserved for the passenger.

6. The autonomous vehicle of claim **1**, the acts further comprising:

presenting a message to the passenger when the autonomous vehicle reaches a destination for the trip of the passenger in the autonomous vehicle, wherein the message indicates to check the cargo storage area.

7. The autonomous vehicle of claim **6**, wherein presenting the message to the passenger comprises transmitting the data from the computing system to a mobile device of the passenger, wherein the data is configured to cause the message to be presented on a display of the mobile device of the passenger.

8. The autonomous vehicle of claim **1**, wherein the real time load data further indicates a type of cargo stored in the cargo storage area.

9. The autonomous vehicle of claim **1**, wherein the autonomous vehicle is in a fleet of autonomous vehicles

10. A method of selecting an autonomous vehicle for a trip of a passenger in the autonomous vehicle, comprising:

receiving, at a dispatch server system, real time load data from a fleet of autonomous vehicles;

receiving, at the dispatch server system, a passenger cargo reservation request for the trip of the passenger in the autonomous vehicle from a mobile computing device, wherein the passenger cargo reservation request indicates a request to store passenger cargo in a cargo storage area of the autonomous vehicle;

responsive to receiving the passenger cargo reservation request, identifying the autonomous vehicle from the fleet of autonomous vehicles for the trip of the passenger, wherein the autonomous vehicle from the fleet of autonomous vehicles is identified based on the passenger cargo reservation request and the real time load data for the autonomous vehicles in the fleet of autonomous vehicles; and

transmitting a request to the autonomous vehicle, wherein the request causes the autonomous vehicle to move to a pick-up location for the trip of the passenger.

11. The method of claim **10**, wherein the passenger cargo reservation request comprises information specifying an amount of the passenger cargo, wherein the autonomous vehicle from the fleet of autonomous vehicles is further identified based on the amount of the passenger cargo.

12. The method of claim **11**, wherein the request transmitted to the autonomous vehicle includes an indication of the amount of the passenger cargo, wherein the request transmitted to the autonomous vehicle further causes the autonomous vehicle to allocate an amount of the cargo storage area to store the amount of the passenger cargo.

13. The method of claim **10**, wherein the request transmitted to the autonomous vehicle further causes the autonomous vehicle to secure a cargo storage area of the autonomous vehicle as the autonomous vehicle moves to the pick-up location for the trip of the passenger.

14. The method of claim **10**, wherein the passenger cargo reservation request indicates a type of the passenger cargo, wherein the autonomous vehicle from the fleet of autonomous vehicles is further identified based on the type of the passenger cargo.

15. The method of claim **10**, wherein identifying the autonomous vehicle from the fleet of autonomous vehicles comprises:

transmitting vehicle suggestion data to the mobile computing device of the passenger specifying potential autonomous vehicles for the trip; and

receiving selection data from the mobile computing device of the passenger, wherein the selection data indicates a selection of the autonomous vehicle from the potential autonomous vehicles.

16. A mobile computing device for requesting a trip of a passenger in an autonomous vehicle, comprising:

a device interface configured to receive an input from a user of the mobile computing device;

a processor; and

memory that stores computer-executable instructions that, when executed by the processor, cause the processor to perform acts comprising:

receiving input data from the device interface, wherein the input data indicates a request to store passenger cargo in a cargo storage area of the autonomous vehicle, wherein the input data further indicates an amount of passenger cargo; and

transmitting a passenger cargo reservation request to a dispatch server system, wherein the passenger cargo reservation request includes the request to store passenger cargo in the cargo storage area, wherein the passenger cargo reservation request further indicates the amount of passenger cargo, wherein the passenger cargo reservation request is configured for use by the dispatch server system to select an autonomous vehicle from a fleet of autonomous vehicles for the trip of the passenger.

17. The mobile computing device of claim **16**, further comprising a camera, wherein the amount of passenger cargo comprises an image of the passenger cargo captured by the camera.

18. The mobile computing device of claim **16**, the acts further comprising:

receiving vehicle suggestion data from the dispatch server system, wherein the vehicle suggestion data includes real time load data from the fleet of autonomous vehicles;

displaying the real time load data on a display of the mobile computing device;

receiving a selection of an autonomous vehicle from the fleet of autonomous vehicles; and

transmitting selection data to the dispatch server system, wherein the selection data indicates the selection of the autonomous vehicle from the fleet of autonomous vehicles.

19. The mobile computing device of claim **16**, the acts further comprising:

receiving message data when the autonomous vehicle reaches a destination for the trip of the passenger in the autonomous vehicle, wherein the message data comprises a message to check the cargo storage area; and

presenting the message.

20. The mobile computing device of claim **16**, wherein the passenger cargo reservation request is used to allocate a portion of the cargo storage area for storing passenger cargo, the acts further comprising:

receiving message data when the passenger cargo in the cargo storage area exceeds the allocated portion, wherein the message data comprises a message indicating the passenger cargo exceeds the allocation portion; and

presenting the message.

* * * * *