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MACNEILLE et al.

(54) **BILLBOARD INTERFACES FOR VEHICLE DISPLAYS**

(71) Applicant: **Ford Motor Company**, Dearborn, MI (US)

(72) Inventors: **Perry Robinson MACNEILLE**, Lathrup Village, MI (US); **Bo WU**, Northville, MI (US)

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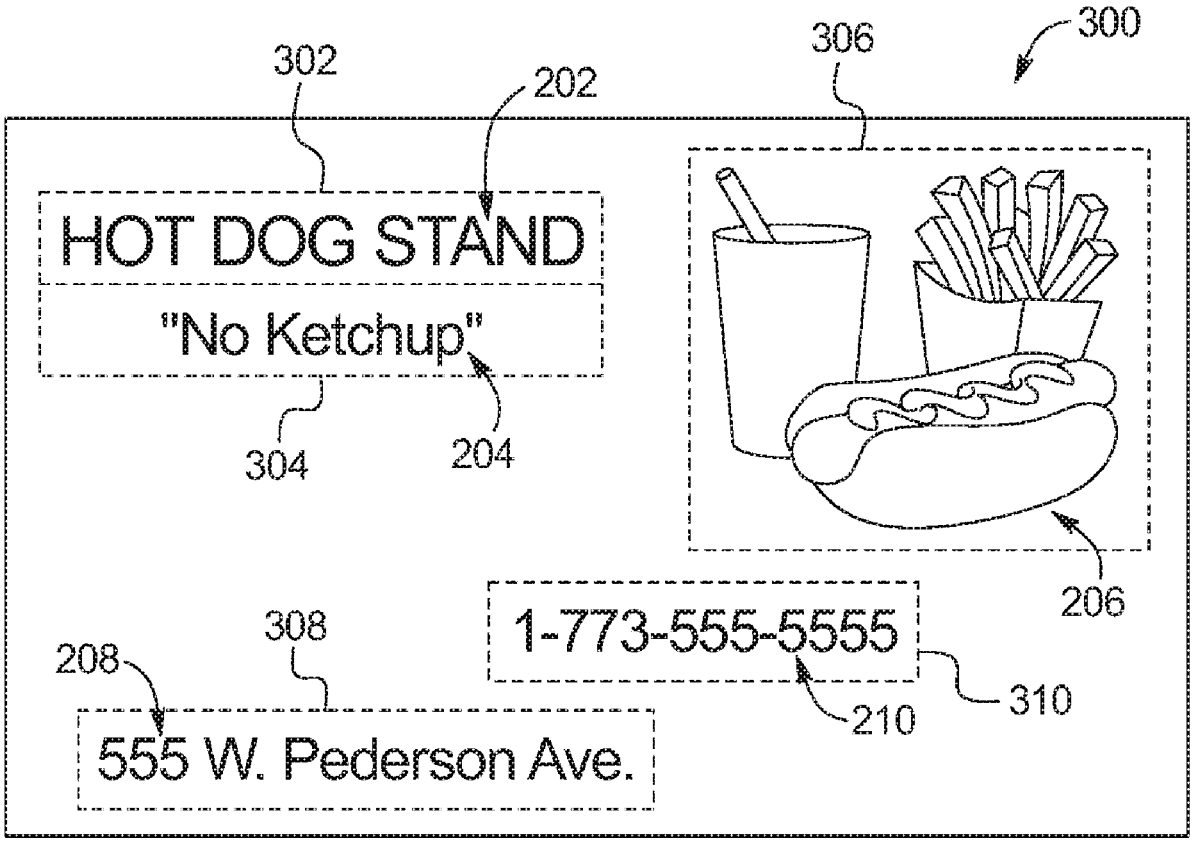
(57) **ABSTRACT**

Method and apparatus are disclosed for billboard interface for display of vehicle. An example method for generating a billboard interface for a vehicle display includes obtaining, via a camera, an image of a billboard and identifying, via a processor, a segment of the image. The example method also includes determining an event associated with the segment and generating a billboard interface to include a hyperlink of the segment that initiates the event. The example method also includes communicating, via a communication module, the billboard interface to a vehicle display for presentation to a user.



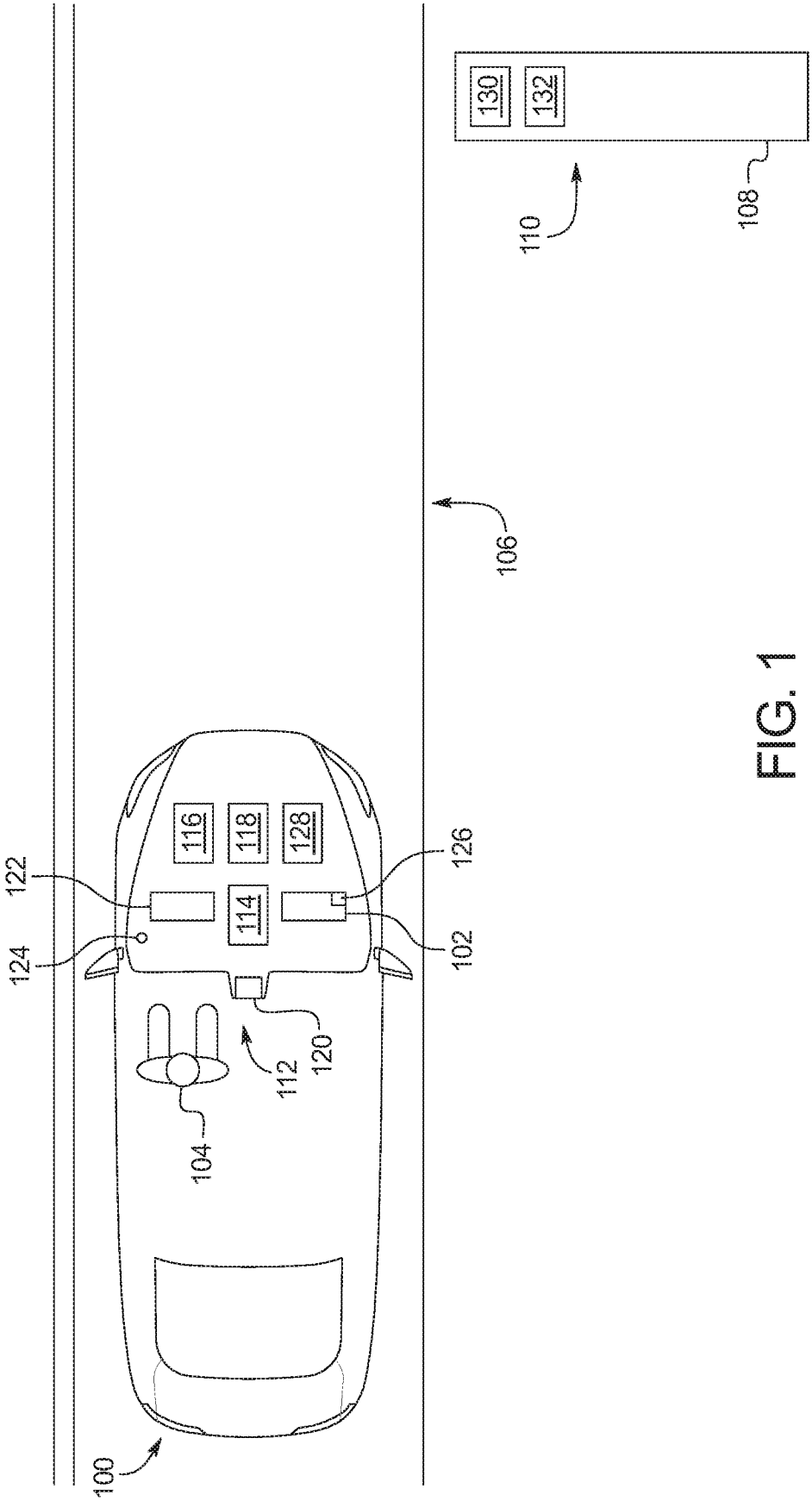

130
132
110
108
106
116
118
128
114
122
126
124
102
120
112
104
100

FIG. 1

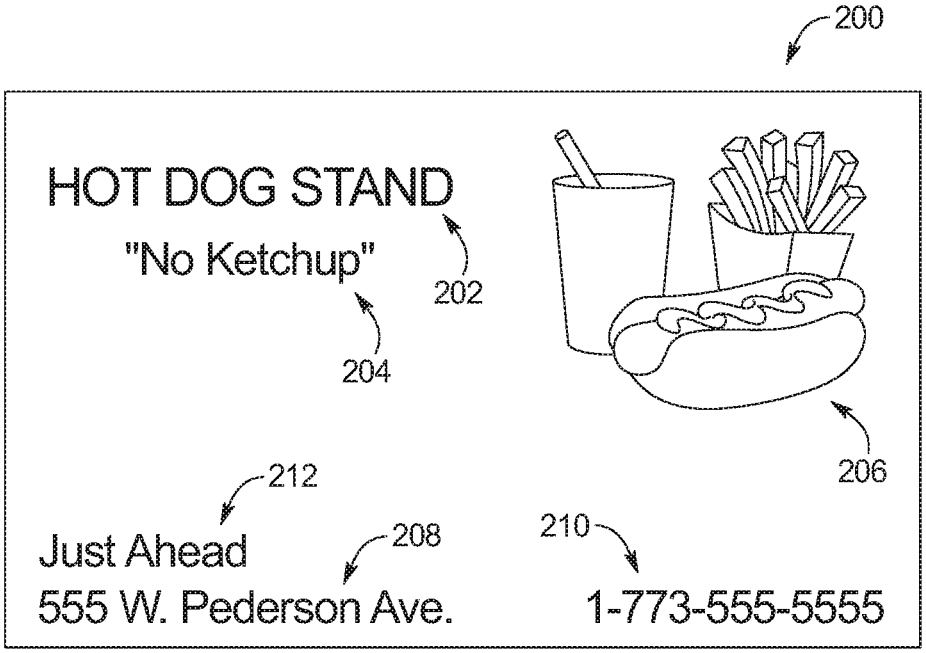

200
HOT DOG STAND
"No Ketchup"
202
204
206
212
Just Ahead
208
555 W. Pederson Ave.
210
1-773-555-5555

FIG. 2

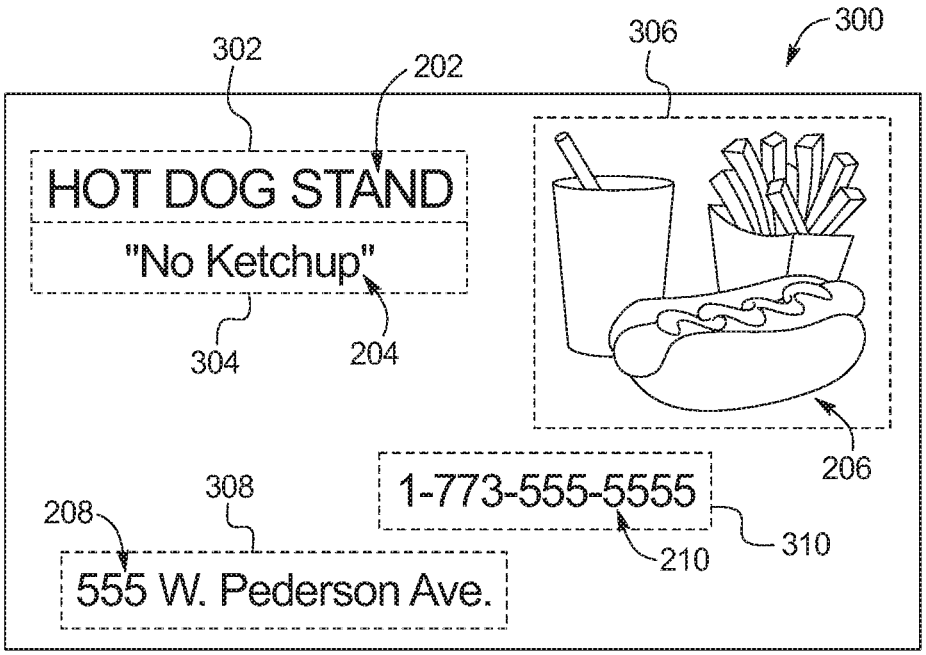

300
302
202
306
HOT DOG STAND
"No Ketchup"
304
204
206
1-773-555-5555
308
208
310
210
555 W. Pederson Ave.

FIG. 3

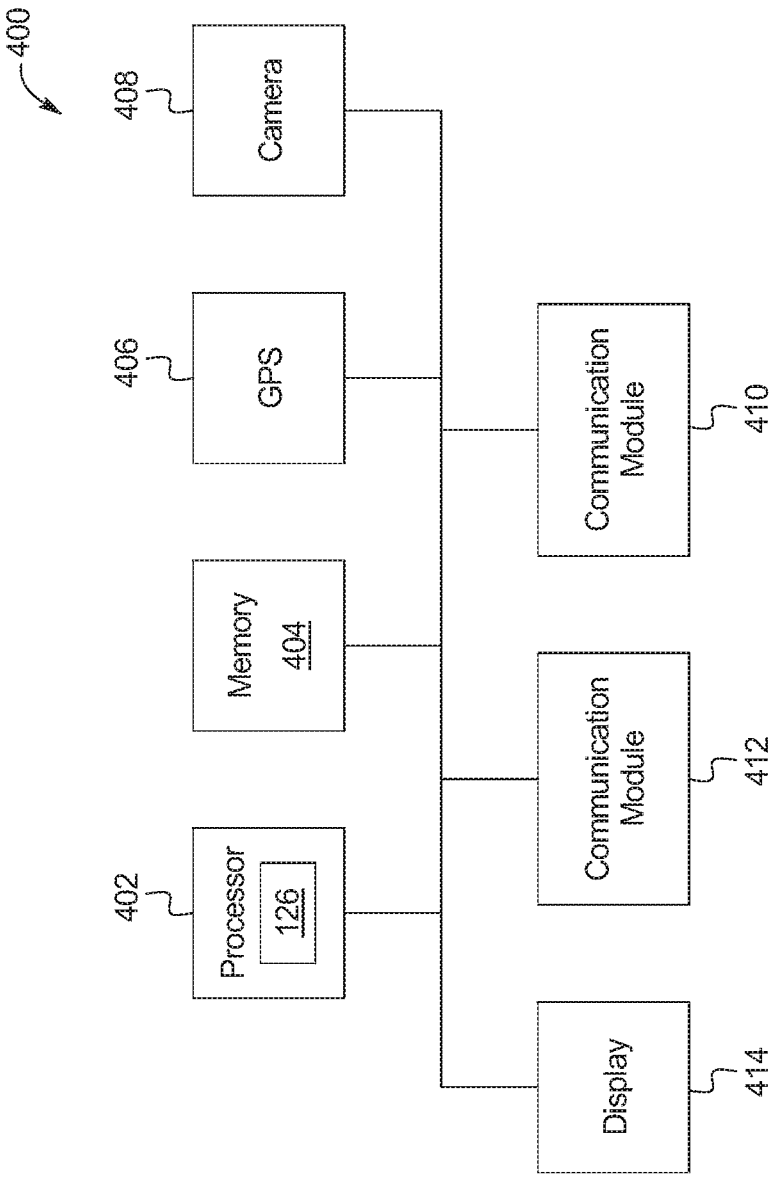

400
408
Camera
406
GPS
Memory
404
402
Processor
126
Communication
Module
410
Communication
Module
412
Display
414

FIG. 4

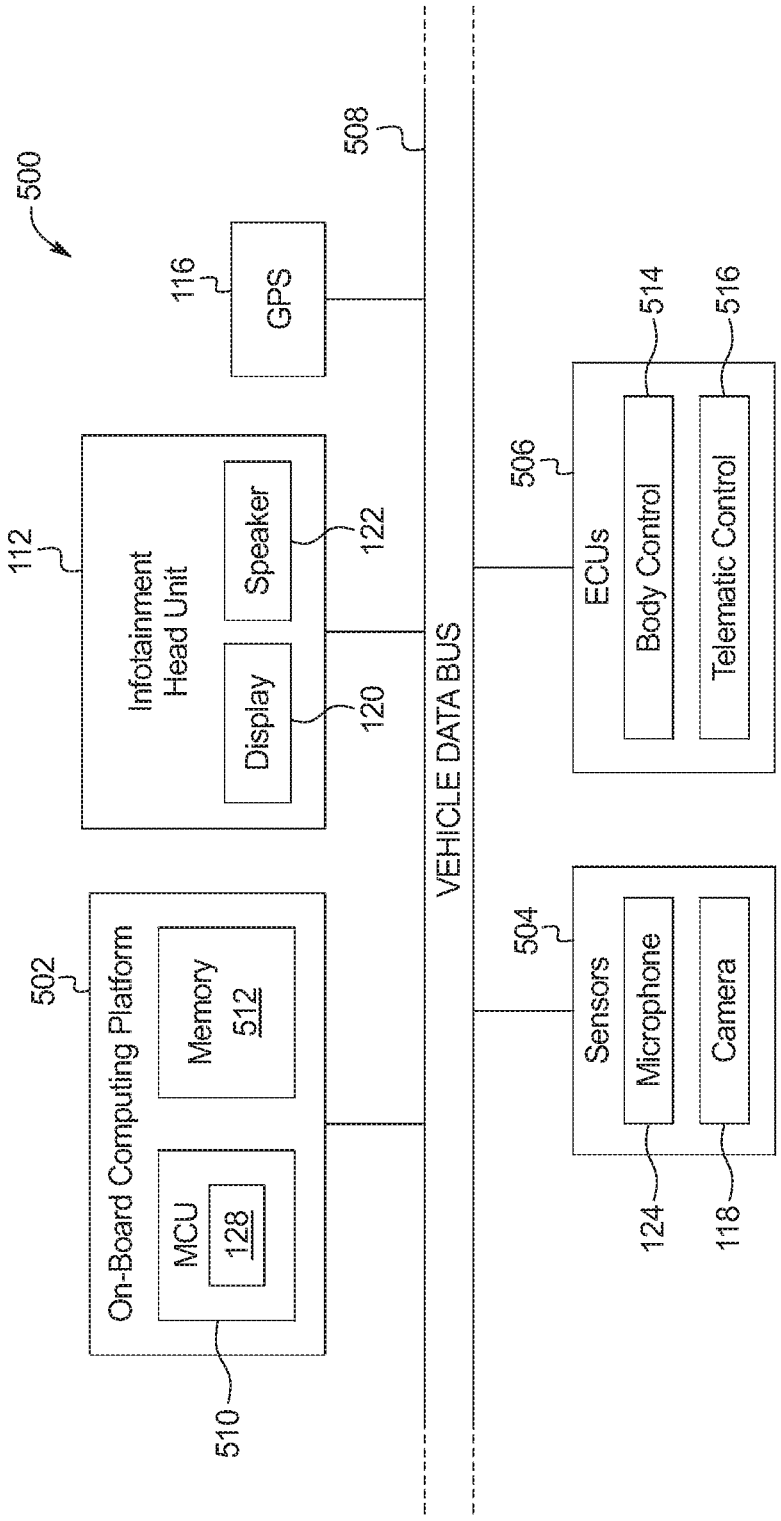

500
508
116
GPS
112
Infotainment Head Unit
Speaker
122
Display
120
506
ECUs
514
Body Control
516
Telematic Control
VEHICLE DATA BUS
502
On-Board Computing Platform
Memory 512
MCU 128
510
504
Sensors
Microphone
Camera
124
118

FIG. 5

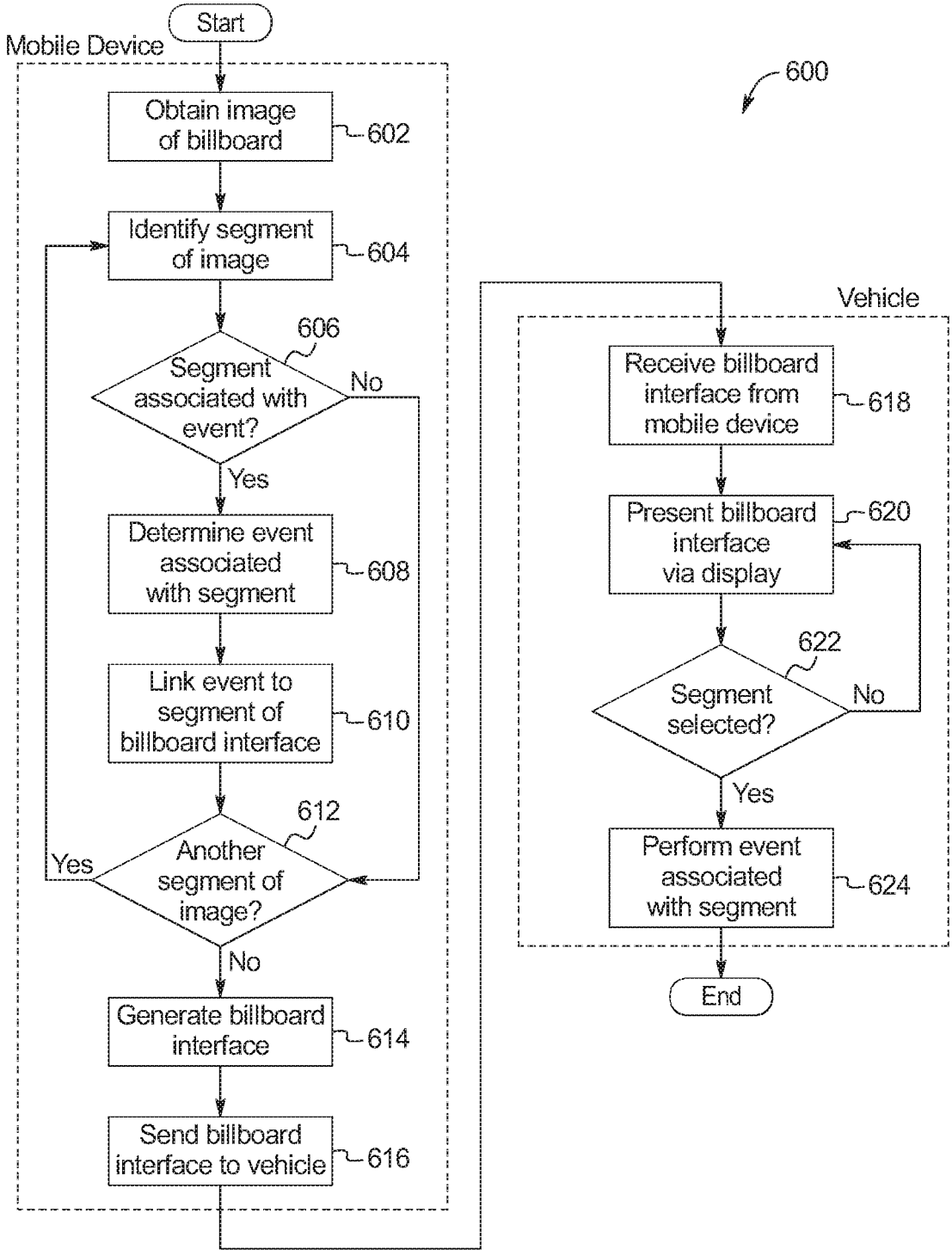

Start
Mobile Device
600
Obtain image of billboard
602
Identify segment of image
604
606
Segment associated with event?
No
Yes
Determine event associated with segment
608
Link event to segment of billboard interface
610
612
Another segment of image?
Yes
No
Generate billboard interface
614
Send billboard interface to vehicle
616
Vehicle
Receive billboard interface from mobile device
618
Present billboard interface via display
620
622
Segment selected?
No
Yes
Perform event associated with segment
624
End

FIG. 6

BILLBOARD INTERFACES FOR VEHICLE DISPLAYS

TECHNICAL FIELD

[0001] The present disclosure generally relates to billboards and, more specifically, billboard interface for display of vehicle.

BACKGROUND

[0002] Oftentimes, billboards are located along roads to present information to drivers and/or passengers of vehicles traveling along the roads. In some examples, a billboard includes an advertisement for a business located nearby. The advertisement may include information related to the business, such as products and/or services provided by the business, an address and/or directions to a nearby location of the business, a phone number associated with the business, etc.

SUMMARY

[0003] The appended claims define this application. The present disclosure summarizes aspects of the embodiments and should not be used to limit the claims. Other implementations are contemplated in accordance with the techniques described herein, as will be apparent to one having ordinary skill in the art upon examination of the following drawings and detailed description, and these implementations are intended to be within the scope of this application.

[0004] Example embodiments are shown for billboard interface for display of vehicle. An example disclosed method for generating a billboard interface for a vehicle display includes obtaining, via a camera, an image of a billboard and identifying, via a processor, a segment of the image. The example disclosed method also includes determining an event associated with the segment and generating a billboard interface to include a hyperlink of the segment that initiates the event. The example disclosed method also includes communicating, via a communication module, the billboard interface to a vehicle display for presentation to a user.

[0005] An example disclosed system for presenting a billboard interface includes a mobile device to obtain, via a camera, an image of a billboard and identify, via a processor, a segment of the image. The mobile device also is to determine an event associated with the segment and generate a billboard interface to include a hyperlink of the segment that initiates the event. The example disclosed system also includes a vehicle to receive the billboard interface from the mobile device and present, via a display, the billboard interface.

[0006] An example disclosed tangible computer readable medium includes instructions which, when executed, cause a machine to obtain, via a camera, an image of a billboard and identify, via a processor, a segment of the image. The instructions, when executed, also cause the machine to determine an event associated with the segment, generate a billboard interface to include a hyperlink of the segment that initiates the event, and communicate the billboard interface to a vehicle display for presentation to a user.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] For a better understanding of the invention, reference may be made to embodiments shown in the following drawings. The components in the drawings are not necessarily to scale and related elements may be omitted, or in some instances proportions may have been exaggerated, so as to emphasize and clearly illustrate the novel features described herein. In addition, system components can be variously arranged, as known in the art. Further, in the drawings, like reference numerals designate corresponding parts throughout the several views.

[0008] FIG. **1** illustrates an example vehicle and an example mobile device in accordance with the teachings herein.

[0009] FIG. **2** illustrates an image of a billboard obtained via the mobile device of FIG. **1**.

[0010] FIG. **3** illustrates a billboard interface that is generated to be presented via a display of the vehicle of FIG. **1**.

[0011] FIG. **4** is a block diagram of electronic components of the mobile device of FIG. **1**.

[0012] FIG. **5** is a block diagram of electronic components of the vehicle of FIG. **1**.

[0013] FIG. **6** is a flowchart of an example method to generate the billboard interface of FIG. **3** to be presented via a display of the vehicle of FIG. **1**.

DETAILED DESCRIPTION OF EXAMPLE EMBODIMENTS

[0014] While the invention may be embodied in various forms, there are shown in the drawings, and will hereinafter be described, some exemplary and non-limiting embodiments, with the understanding that the present disclosure is to be considered an exemplification of the invention and is not intended to limit the invention to the specific embodiments illustrated.

[0015] Billboards oftentimes are located near (e.g., adjacent to, along a side of, overhanging) a road to provide information to drivers and/or passengers of passing vehicles. For example, a billboard may include an advertisement for a nearby business. In such instances, the advertisement includes information related to the business. For example, the information provided by the advertisement may include information that attracts the drivers and/or passengers to the business (e.g., available products and/or services). Additionally, the information of the billboard may include information that directs the drivers and/or passengers of the vehicles to the business (e.g., an address of a nearby location, directions to the nearby location, a phone number of the business).

[0016] The driver and/or passenger of the vehicle has a limited amount of time to obtain information from the billboard located near the road as the vehicle approaches and passes the billboard. In some instances, the driver and/or passenger of the vehicle may miss information of the advertisement on the billboard that directs the driver and/or passenger to the corresponding business. For example, while the driver may be able to identify an advertised product and/or service and determine whether the advertised product and/or service is of interest, the driver may be unable to identify the address of and/or directions to the location of the corresponding business before the vehicle passes the billboard. In other instances, the driver may able to identify the address and/or the directions of the advertisement but unable to write the address and/or the directions down to facilitate driving to the business location. In such instances, the driver is unable to locate the business that is advertised via the billboard.

[0017] Examples disclosed herein generate a billboard interface that is presented via a vehicle display to facilitate a user (e.g., a driver, a passenger) of a vehicle to obtain information related to a nearby billboard advertisement. The billboard interface includes a hyperlink of a segment of the billboard advertisement that initiates an event corresponding to the segment of the billboard advertisement to enable the user to obtain additional information associated with the billboard advertisement before, during, and/or after the vehicle passes the billboard advertisement. For example, the user may select a segment of the billboard interface that includes a phone number included in the billboard advertisement. Upon selecting the segment with the phone number, the vehicle and/or a mobile device of the user calls the phone number, for example, to enable the user to place an order with a business associated with the billboard advertisement.

[0018] Example systems disclosed herein include a mobile device and a vehicle of a user (e.g., a driver, a passenger). The user and the mobile device of the user are located within an interior of the vehicle as the vehicle travels along a road.

[0019] The mobile device includes a camera that obtains an image of a billboard located near a road along which the vehicle is traveling. The mobile device is positioned within the vehicle so that the camera is able to obtain the image of the billboard as the vehicle approaches the billboard. Further, the mobile device includes a billboard segmenter and a communication module (e.g., a first communication module). The billboard segmenter identifies a segment of the image, determines an event associated with the segments, and generates a billboard interface to include a hyperlink of the segment that initiates the event. The communication module of the mobile device sends the billboard interface to the vehicle to be presented to the user. In some examples, the billboard segmenter includes an image recognition system that identifies the segment of the image of the billboard via a deep neural network. Also, in some examples, the mobile device includes another communication module (e.g., a second communication module) in communication with a database that includes segment entries and corresponding event entries. In such examples, the billboard segmenter determines the event associated with the segment by matching the segment of the image of the billboard to one of the segment entries of the database and identifies the corresponding one of the event entries of the database.

[0020] The vehicle includes a communication module (e.g., a third communication module) that communicatively couples to and receives the billboard interface from the communication module (e.g., the first communication module) of the mobile device. The vehicle also includes a display to present the billboard interface to the user. Further, the vehicle includes a billboard linker that detects when the user selects the segment of the billboard interface and subsequently initiates the corresponding event via the hyperlink. In some examples, the display is a touch screen. In such examples, the billboard linker detects a selection of the segment of the billboard interface when the user presses a portion of the touch screen corresponding to the segment of the billboard interface. Additionally, or alternatively, the vehicle includes a microphone to receive audible instructions from the user to select the segment of the billboard interface presented via the display.

[0021] In the examples disclosed herein, the segment of the billboard interface that is presented via the display of the vehicle include a logo, a product, a phone number, an address, directions and/or any other portion of the advertisement of the billboard. In some examples, the segment of the billboard interface includes an address of a business associated with the advertisement of the billboard. In some such examples, the display presents visual directions to the address upon the user selecting the segment of the billboard interface. Additionally, or alternatively, the vehicle includes speakers that present audible instructions to the address upon the user selecting the segment. In other examples, the event initiated by the selection of the segment of the billboard interface is a phone call to a phone number of the business associated with the advertisement of the billboard.

[0022] In some examples, the billboard segmenter of the mobile device identifies a first segment of the image and a second segment different than the first image. In such examples, the billboard segmenter determines a first event associated with the first segment and a second event that is associated with the second segment and different than the first event. Further, in such examples, the billboard generates the billboard interface to include a first hyperlink of the first segment that initiates the first event and a second hyperlink of the second segment that initiates the second event. For example, the first event is a phone call to a phone number of a business associated with the advertisement of the billboard, and the second event is a presentation of directions to an address of the business.

[0023] Turning to the figures, FIG. **1** illustrates an example vehicle **100** and an example mobile device **102** (e.g., a smart phone, a dashboard camera, a tablet, a smart watch, a wearable) of a user **104** (e.g., a driver, a passenger) in accordance with the teachings herein. The vehicle **100** may be a standard gasoline powered vehicle, a hybrid vehicle, an electric vehicle, a fuel cell vehicle, and/or any other mobility implementation type of vehicle. The vehicle **100** includes parts related to mobility, such as a powertrain with an engine, a transmission, a suspension, a driveshaft, and/or wheels, etc. The vehicle **100** may be non-autonomous, semi-autonomous (e.g., some routine motive functions controlled by the vehicle **100**), or autonomous (e.g., motive functions are controlled by the vehicle **100** without direct driver input). As illustrated in FIG. **1**, the vehicle **100** is traveling along a road **106** in a direction toward a billboard **108** that is positioned adjacent to the road **106**. The billboard **108** includes an advertisement **110** and/or other information that is intended to be viewed by the user **104** as the vehicle **100** approaches and/or passes the billboard **108**. In the illustrated example, the vehicle **100** includes an infotainment head unit **112**, a communication module **114**, a global positioning sensor (GPS) receiver **116**, and a camera **118**.

[0024] The infotainment head unit **112** provides an interface between the vehicle **100** and the user **104**. The infotainment head unit **112** includes digital and/or analog interfaces (e.g., input devices and output devices) to receive input from and display information for the user(s). The input devices include, for example, a control knob, an instrument panel, a digital camera for image capture and/or visual command recognition, a touch screen, an audio input device (e.g., cabin microphone), buttons, or a touchpad. The output devices may include instrument cluster outputs (e.g., dials, lighting devices), actuators, a heads-up display, a center console display (e.g., a liquid crystal display (LCD), an organic light emitting diode (OLED) display, a flat panel display, a solid state display, etc.), and/or speakers. In the

illustrated example, the infotainment head unit **112** includes hardware (e.g., a processor or controller, memory, storage, etc.) and software (e.g., an operating system, etc.) for an infotainment system (such as SYNC®, MyFord Touch®, SmartDeviceLink®, and AppLink® by Ford®; Entune® by Toyota®; IntelliLink® by GMC®; etc.). Additionally, the infotainment head unit **112** displays the infotainment system on, for example, the center console display.

[0025] As illustrated in FIG. **1**, the infotainment head unit **112** includes a display **120** and a speaker **122**. Additionally, a microphone **124** in and/or near the infotainment head unit **112**. The display **120** presents an interface (e.g., a billboard interface **300** of FIG. **3**) to provide information to the user **104**. In the illustrated example, the display **120** is a touch screen that enables the user **104** to select button(s), hyperlink (s), etc. to provide additional information to the user **104**. Further, the speaker **122** provides audio output information to the user **104**, and the microphone **124** receives audio input information (e.g., instructions for the infotainment head unit **112**) from the user **104**.

[0026] The communication module **114** of the vehicle **100** is to communicatively couple to the mobile device **102**. For example, the communication module **114** communicatively couples to a communication module (e.g., a communication module **412** of FIG. **4**) of the mobile device **102**. In the illustrated example, the communication module **114** is a short-range wireless module that includes a wireless transducer to wirelessly communicate with the mobile device **102** and/or another device when that device is within a broadcast range of the communication module **114**. The short-range wireless module includes hardware and firmware to establish a connection with the mobile device **102**. In some examples, the short-range wireless module implements the Bluetooth and/or Bluetooth Low Energy (BLE) protocols. The Bluetooth and BLE protocols are set forth in Volume 6 of the Bluetooth Specification 4.0 (and subsequent revisions) maintained by the Bluetooth Special Interest Group.

[0027] Additionally, the GPS receiver **116** identifies a location of the vehicle **100**. For example, the GPS receiver **116** is utilized to track the location of the vehicle **100** as the vehicle **100** travels along a set of directions from one location to another location. Further, the camera **118** of the vehicle **100** is utilized to collect, receive and/or otherwise obtain image(s) of object(s) that are adjacent to an exterior of the vehicle **100**. For example, the camera **118** may be utilized to obtain an image (e.g., an image **200** of FIG. **2**) of the advertisement **110** of the billboard **108**.

[0028] As illustrated in FIG. **1**, the mobile device **102** of the user **104** is located within an interior of the vehicle **100** as the user **104** drives the vehicle **100** toward the billboard **108**. The mobile device **102** is communicatively coupled to the communication module **114** of the vehicle **100** and includes a billboard segmenter **126** that enables the display **120** of the vehicle **100** to present a billboard interface to the user **104**.

[0029] In operation, the mobile device **102** collects, receives and/or otherwise obtains an image of the advertisement **110** of the billboard **108**. For example, the mobile device **102** includes a camera (e.g., a camera **408** of FIG. **4**) to obtain the image of the billboard **108**. The billboard segmenter **126** identifies one or more segments of the image. For example, the billboard segmenter **126** includes an image recognition system that identifies the one or more segments utilizing a deep neural network algorithm. The billboard segmenter **126** determines whether the identified segment(s) are associated with events that correspond to the advertisement **110** of the billboard **108**. Further, the billboard segmenter **126** generates a billboard interface to be presented to the user **104** based on the image of the advertisement **110** of the billboard **108**. The billboard interface generated by the billboard segmenter **126** includes hyperlinks that link the events to the corresponding segments. Upon generating the billboard interface, the mobile device **102** sends the billboard interface to the communication module **114** of the vehicle **100**.

[0030] The display **120** of the vehicle **100** presents the billboard interface that is received from the mobile device **102** to the user **104**. Further, the vehicle **100** includes a billboard linker **128** that detects when the user **104** selects a segment of the billboard interface. In examples in which the display **120** is a touch screen, the billboard linker **128** detects selection of a segment of the billboard interface when the user **104** presses a portion of the display **120** that corresponds to the segment. Additionally, or alternatively, the billboard linker **128** detects selection of a segment via audible instructions of the user **104** that are received via the microphone **124** of the vehicle **100**. Upon detecting selection of a segment of the billboard interface, the billboard linker **128** initiates the corresponding event via the corresponding hyperlink. For example, in response to the user **104** selecting a segment associated with an address to a store location, the display **120** presents visual directions and/or the speaker **122** of the vehicle provides audible directions to the address.

[0031] Further, in the illustrated example, the billboard **108** is an electronic billboard that presents advertisements via an electronic display. As illustrated in FIG. **1**, the billboard **108** includes a billboard processor **130** that controls which image is presented on the billboard **108**. The billboard **108** also includes a communication module **132** that is communicatively coupled to the billboard processor **130**. In operation, the billboard processor **130** may facilitate the billboard **108** in selecting and/or personalizing advertisements to be presented based on preferences and/or characteristics of users approaching the billboard **108**. As the vehicle **100** approaches the billboard **108**, the communication module **114** of the vehicle **100** and/or a communication module (e.g., the communication module **410**) of the mobile device **102** communicatively couples to the billboard processor **130** via the communication module **132** of the billboard **108**. For example, the communication module **132** receives information from the mobile device **102** and/or the vehicle **100** that are associated user preferences and/or characteristics of the user **104**. The communication module **132** sends the user information to the billboard processor **130**, and the billboard processor **130** selects and/or personalizes an advertisement (e.g., the advertisement **110**) to display as the vehicle **100** approaches the vehicle based on the user information associated with the user **104**.

[0032] In other examples, the camera **118** of the vehicle **100** may obtain or collect the image of the advertisement **110** as the vehicle **100** approaches the billboard **108**. In some such examples, the vehicle **100** includes the billboard segmenter **126** that generates the billboard interface for the display **120** of the infotainment head unit **112**. In other such examples, the billboard linker **128** identifies segment(s) of the advertisement **110**, determines event(s) associated with the identified segment(s), and generates the billboard inter-

face for the display **120**. In other such examples, the camera **118** of the vehicle **100** sends, via the communication module **114**, the image of the advertisement **110** to the mobile device **102** to enable the billboard segmenter **126** of the mobile device **102** to generate the billboard interface for the display **120** of the vehicle **100**.

[0033] Additionally or alternatively, the mobile device **102** of the illustrated example may present the billboard interface to the user **104** via a display (e.g., a display **414** of FIG. **4**) of the mobile device **102**. The billboard interface may be presented to the user **104** via the display of the mobile device **102** when the user **104** remains within the vehicle **100**, after the user **104** exits the vehicle **100**, and/or as the user is walking near the billboard **108**. For example, the camera of the mobile device **102** may obtain the image of the advertisement **110** and the display of the mobile device **102** may present the billboard interface as the user **104** walks along a side of the road **106** near the billboard **108**. Further, when the user **104** is in a public transportation vehicle (e.g., a bus, a train, etc.), the camera of the mobile device **102** may obtain an image of an advertisement (e.g., located in the public transportation vehicle, located on a billboard next to the public transportation vehicle, etc.) and the display of the mobile device **102** may present the billboard interface to the user **104**.

[0034] FIG. **2** illustrates an example image **200** of the advertisement **110** of the billboard **108** that is obtained via a camera (e.g., the camera **408** of FIG. **4**) of the mobile device **102** and/or the camera **118** of the vehicle **100**. In the illustrated example, the image **200** includes a first segment **202** (the "HOT DOG STAND" logo), a second segment **204** (the "No Ketchup" slogan), a third segment **206** (a product image of a hot dog, a drink, and fries), a fourth segment **208** (an address of "555 W. Pederson Ave"), a fifth segment **210** (a phone number of "1-773-555-5555"), and a sixth segment **212** ("Just Ahead" directions).

[0035] The billboard segmenter **126** of the mobile device **102** includes an image recognition system that identifies one or more of the segments **202**, **204**, **206**, **208**, **210**, **212** of the image **200**. For example, the image recognition system identifies one or more of the segments **202**, **204**, **206**, **208**, **210**, **212** of the image **200** via a deep neural network algorithm. In some examples, the image recognition system identifies one or more of the segments **202**, **204**, **206**, **208**, **210**, **212** by identifying corresponding boundaries and features within the corresponding boundaries. The billboard segmenter **126** compares the features within the identified boundaries to segment entries of a database. Further, the database also includes event entries that correspond to the segment entries. When the billboard segmenter **126** matches a feature within a boundary of the image **200** with a segment entry of the database, the billboard segmenter **126** associates the segment of the image **200** with the corresponding event entry of the database. For example, the image recognition system identifies a boundary around the first segment **202**, identifies a feature within the boundary (the "HOT DOG STAND" logo), compares the feature to the segment entries of the database, matches the boundary to one of the segment entries (a "HOT DOG STAND" entry), and associates the first segment **202** to a corresponding event entry (e.g., access a "HOT DOG STAND" website) of the database. Based on one or more of the segments **202**, **204**, **206**, **208**, **210**, **212** of the image **200** of the advertisement **110** of the billboard **108**, the billboard segmenter **126** generates a billboard interface.

[0036] FIG. **3** illustrates an example billboard interface **300** that is generated by the billboard segmenter **126**. The billboard interface **300** is presented via the display **120** of the vehicle **100** to enable the user **104** of the vehicle **100** to obtain, utilize, navigate and/or interact with information associated with advertisement **110**.

[0037] The billboard interface **300** of the illustrated example is based on the image **200** of the billboard **108**. For example, the billboard interface **300** includes the first segment **202** (the "HOT DOG STAND" logo) defined by a boundary **302**, the second segment **204** (the "No Ketchup" slogan) defined by a boundary **304**, the third segment **206** (a product image of a hot dog, a drink, and fries) defined by a boundary **306**, the fourth segment **208** (an address of "555 W. Pederson Ave") defined by a boundary **308** , and the fifth segment **210** (a phone number of "1-773-555-5555") defined by a boundary **310**. Each of the boundaries **302**, **304**, **306**, **308**, **310** of the billboard interface **300** defines a corresponding hyperlink that initiates a corresponding event. For example, the hyperlink defined by the boundary **302** opens a website of "HOT DOG STAND," the hyperlink defined by the boundary **304** opens a social media page of "HOT DOG STAND," the hyperlink defined by the boundary **306** opens a food-ordering app to place an order with "HOT DOG STAND," the hyperlink defined by the boundary **308** prompts directions to be provided for a location of "HOT DOG STAND," and the hyperlink defined by the boundary **310** initiates a phone call to a phone number of the location of "HOT DOG STAND."

[0038] In the illustrated example, the billboard interface **300** has a different aspect ratio than that of the image **200** of the advertisement **110** of the billboard **108**. For example, the aspect ratio of the billboard interface **300** may be defined to accommodate the dimensions of the display **120** of the vehicle **100**. As illustrated in FIGS. **2** and **3**, one or more of the segments **202**, **204**, **206**, **208**, **210** may be shifted and/or rearranged in the billboard interface **300** relative to their position in the image **200** to enable the segments **202**, **204**, **206**, **208**, **210** to fit within the aspect ratio of the billboard interface **300**.

[0039] Further, in the illustrated example, each of the segments **202**, **204**, **206**, **208**, **210** of the billboard interface **300** are identical or substantially similar to the segments **202**, **204**, **206**, **208**, **210** of image **200** of the advertisement **110** of the billboard **108**. In other examples, the billboard interface may include segments that are visually different, but correspond to, segments of the image **200**.

[0040] Additionally, as illustrated in FIG. **3**, the billboard interface **300** of the illustrated example does not include a segment that corresponds to the sixth segment **212** of the image **200**. For example, the database may not include a segment entry that matches the sixth segment **212** and, thus, the billboard interface **300** generated by the billboard segmenter **126** does not include a corresponding segment.

[0041] FIG. **4** is a block diagram of electronic components **400** of the mobile device **102**. As illustrated in FIG. **4**, the electronic components **400** include a microcontroller unit, controller, or processor **402**. Further, the electronic components include memory **404**, a GPS receiver **406**, a camera **408**, a communication module **410**, another communication module **412**, and a display **414**.

[0042] In the illustrated example, the processor **402** of the mobile device **102** is structured to include the billboard segmenter **126**. The processor **402** may be any suitable processing device or set of processing devices such as, but not limited to, a microprocessor, a microcontroller-based platform, an integrated circuit, one or more field programmable gate arrays (FPGAs), and/or one or more application-specific integrated circuits (ASICs).

[0043] The memory **404** may be volatile memory (e.g., RAM including non-volatile RAM, magnetic RAM, ferroelectric RAM, etc.), non-volatile memory (e.g., disk memory, FLASH memory, EPROMs, EEPROMs, memristor-based non-volatile solid-state memory, etc.), unalterable memory (e.g., EPROMs), read-only memory, and/or high-capacity storage devices (e.g., hard drives, solid state drives, etc.). In some examples, the memory **404** includes multiple kinds of memory, particularly volatile memory and non-volatile memory.

[0044] The memory **404** is computer readable media on which one or more sets of instructions, such as the software for operating the methods of the present disclosure, can be embedded. The instructions may embody one or more of the methods or logic as described herein. For example, the memory **404** includes computer readable memory on which instructions for the application for accessing digital keys are embedded. The instructions may reside completely, or at least partially, within any one or more of the memory **404**, the computer readable medium, and/or within the processor **402** during execution of the instructions.

[0045] The terms "non-transitory computer-readable medium" and "computer-readable medium" include a single medium or multiple media, such as a centralized or distributed database, and/or associated caches and servers that store one or more sets of instructions. Further, the terms "non-transitory computer-readable medium" and "computer-readable medium" include any tangible medium that is capable of storing, encoding or carrying a set of instructions for execution by a processor or that cause a system to perform any one or more of the methods or operations disclosed herein. As used herein, the term "computer readable medium" is expressly defined to include any type of computer readable storage device and/or storage disk and to exclude propagating signals.

[0046] The GPS receiver **406** of the electronic components **400** identifies a location of the mobile device **102**. For example, the GPS receiver **406** is utilized to track the location of the mobile device **102** as the mobile device **102** travels from one location to another location. In instances in which the mobile device **102** is located within the interior of the vehicle **100**, the GPS receiver **406** may be utilized to track the location of the vehicle **100** as the vehicle **100** travels along a set of directions from one location to another location. Additionally, or alternatively, the GPS receiver **116** of the vehicle **100** may be utilized to track the location of the vehicle **100** as the vehicle **100** travels along the set of directions.

[0047] Further, the camera **408** of the vehicle **100** is utilized to collect, receive and/or otherwise obtain the image **200** of the advertisement **110** of the billboard **108** as the vehicle **100** approaches the billboard **108**. The mobile device **102** is positioned by the user **104** within the interior of the vehicle **100** such that the camera **408** is able to obtain the image **200** of the advertisement **110**. For example, the user **104** may couple the mobile device **102** to an interior surface of a windshield of the vehicle **100** or may lie the mobile device **102** on a dash of the vehicle **100** to enable the camera **408** of the mobile device **102** to obtain the image **200** of the billboard **108**.

[0048] The communication module **410** is communicatively coupled to a network (e.g., the Internet) that includes a database. For example, the database includes the segment entries associated with segments of billboard advertisements and events entries that correspond to the segment entries. The database of segment entries and corresponding event entries may be created and/or curated by an entity such as an advertising entity that operates billboards and/or other entities that utilize the billboards for advertising. The communication module **410** enables the billboard segmenter **126** to access the database to identify events associated with one or more of the segments **202**, **204**, **206**, **208**, **210**, **212** of the image **200** of the advertisement **110** of the billboard **108**. In some examples, the database is indexed by GPS location of billboards to facilitate identification of the segment entries and/or to avoid the inclusion of duplicative segment entries. In some examples, updates to the database may be instantly or automatically sent to the billboard segmenter **126** via the communication module **410** so that the billboard segmenter **126** is able to update the billboard interface **300**. For example, a restaurant may remove a segment entry associated with a coupon for the restaurant when the restaurant is full, and the billboard segmenter **126** may subsequently automatically remove the segment associated with the coupon from the billboard interface **300**. Further, in some examples, the communication module **410** also communicatively couples to the communication module **132** of the billboard **108** to enable the billboard processor **130** to select and/or personalize advertisements for the user **104** as the vehicle **100** approaches the billboard **108**.

[0049] The communication module **412** of the mobile device **102** is to communicatively couple to the communication module **114** of the vehicle **100**. In the illustrated example, the communication module **412** is a short-range wireless module that includes a wireless transducer to wirelessly communicate with the vehicle **100** and/or another device when that device is within a broadcast range of the communication module **412**. The short-range wireless module includes hardware and firmware to establish a connection with the communication module **114** of the vehicle **100**. In some examples, the short-range wireless module implements the Bluetooth and/or Bluetooth Low Energy (BLE) protocols.

[0050] The display **414** presents an interface to provide information to the user **104** via the mobile device **102**. For example, the display **414** may present the billboard interface **300** to the user **104**. In some such examples, the display **414** is a touch screen that enables the user **104** to select one or more of the hyperlinks of the billboard interface **300**.

[0051] FIG. **5** is a block diagram of electronic components **500** of the vehicle **100**. As illustrated in FIG. **5**, the electronic components **500** include an on-board computing platform **502**, the infotainment head unit **112** that includes the display **120** and the speaker **122**, the GPS receiver **116**, sensors **504**, electronic control units (ECUs) **506**, and a vehicle data bus **508**.

[0052] The on-board computing platform **502** includes a microcontroller unit, controller or processor **510** and memory **512**. In some examples, the on-board computing platform **502** is structured to include billboard linker **128**.

Alternatively, in some examples, the billboard linker **128** is incorporated into another electronic control unit (ECU) with its own processor **510** and memory **512**. Further, in some examples, the billboard linker **128** may be incorporated into the processor **402** of the mobile device **102** that communicates with the on-board computing platform **502** via the communication module **412** of the mobile device **102** and the communication module **114** of the vehicle **100**. The processor **510** may be any suitable processing device or set of processing devices such as, but not limited to, a microprocessor, a microcontroller-based platform, an integrated circuit, one or more field programmable gate arrays (FPGAs), and/or one or more application-specific integrated circuits (ASICs). The memory **512** may be volatile memory (e.g., RAM including non-volatile RAM, magnetic RAM, ferroelectric RAM, etc.), non-volatile memory (e.g., disk memory, FLASH memory, EPROMs, EEPROMs, memristor-based non-volatile solid-state memory, etc.), unalterable memory (e.g., EPROMs), read-only memory, and/or high-capacity storage devices (e.g., hard drives, solid state drives, etc). In some examples, the memory **512** includes multiple kinds of memory, particularly volatile memory and non-volatile memory.

[0053] The memory **512** is computer readable media on which one or more sets of instructions, such as the software for operating the methods of the present disclosure, can be embedded. The instructions may embody one or more of the methods or logic as described herein. For example, the instructions reside completely, or at least partially, within any one or more of the memory **512**, the computer readable medium, and/or within the processor **510** during execution of the instructions.

[0054] The sensors **504** are arranged in and around the vehicle **100** to monitor properties of the vehicle **100** and/or an environment in which the vehicle **100** is located. One or more of the sensors **504** may be mounted to measure properties around an exterior of the vehicle **100**. Additionally or alternatively, one or more of the sensors **504** may be mounted inside a cabin of the vehicle **100** or in a body of the vehicle **100** (e.g., an engine compartment, wheel wells, etc.) to measure properties in an interior of the vehicle **100**. For example, the sensors **504** include accelerometers, odometers, tachometers, pitch and yaw sensors, wheel speed sensors, microphones, tire pressure sensors, biometric sensors and/or sensors of any other suitable type. In the illustrated example, the sensors **504** include the microphone **124** and the camera **118**.

[0055] The ECUs **506** monitor and control the subsystems of the vehicle **100**. For example, the ECUs **506** are discrete sets of electronics that include their own circuit(s) (e.g., integrated circuits, microprocessors, memory, storage, etc.) and firmware, sensors, actuators, and/or mounting hardware. The ECUs **506** communicate and exchange information via a vehicle data bus (e.g., the vehicle data bus **508**). Additionally, the ECUs **506** may communicate properties (e.g., status of the ECUs **506**, sensor readings, control state, error and diagnostic codes, etc.) to and/or receive requests from each other. For example, the vehicle **100** may have seventy or more of the ECUs **506** that are positioned in various locations around the vehicle **100** and are communicatively coupled by the vehicle data bus **508**. In the illustrated example, the ECUs **506** include a body control module **514** and a telematic control unit **516**. The body control module **514** controls one or more subsystems throughout the vehicle **100**, such as power windows, power locks, an immobilizer system, power mirrors, etc. For example, the body control module **514** includes circuits that drive one or more of relays (e.g., to control wiper fluid, etc.), brushed direct current (DC) motors (e.g., to control power seats, power locks, power windows, wipers, etc.), stepper motors, LEDs, etc. The telematic control unit **516** controls tracking of the vehicle **100**, for example, utilizing data received by the GPS receiver **116** of the vehicle **100**.

[0056] The vehicle data bus **508** communicatively couples the on-board computing platform **502**, the infotainment head unit **112**, the GPS receiver **116**, the sensors **504**, and the ECUs **506**. In some examples, the vehicle data bus **508** includes one or more data buses. The vehicle data bus **508** may be implemented in accordance with a controller area network (CAN) bus protocol as defined by International Standards Organization (ISO) 11898-1, a Media Oriented Systems Transport (MOST) bus protocol, a CAN flexible data (CAN-FD) bus protocol (ISO 11898-7) and/a K-line bus protocol (ISO 9141 and ISO 14230-1), and/or an Ethernet™ bus protocol IEEE 802.3 (2002 onwards), etc.

[0057] FIG. **6** is a flowchart of an example method **600** to generate a billboard interface to be presented via a display of a vehicle. The flowchart of FIG. **6** is representative of machine readable instructions that are stored in memory (such as the memory **404** of FIG. **4** and/or the memory **512** of FIG. **5**) and include one or more programs which, when executed by a processor (such as the processor **402** of FIG. **4** and/or the processor **510** of FIG. **5**), cause the vehicle **100** and/or the mobile device **102** to implement the example billboard linker **128** of FIGS. **1** and **5** and/or the example billboard segmenter **126** of FIGS. **1** and **4**. While the example program(s) is/are described with reference to the flowchart illustrated in FIG. **6**, many other methods of implementing the example billboard segmenter **126** and/or the example billboard linker **128** may alternatively be used. For example, the order of execution of the blocks may be rearranged, changed, eliminated, and/or combined to perform the method **600**. Further, because the method **600** is disclosed in connection with the components of FIGS. **1-5**, some functions of those components will not be described in detail below.

[0058] Initially, at block **602**, the camera **408** of the mobile device **102** obtains the image **200** of the advertisement **110** of the billboard **108**. At block **604**, the billboard segmenter **126** identifies a segment of the image **200**. For example, the billboard segmenter **126** includes an image recognition system that identifies the first segment **202** of the segments **202**, **204**, **206**, **208**, **210**, **212** utilizing a deep neural network algorithm.

[0059] At block **606**, the billboard segmenter **126** determines whether the segment of the image **200** is associated with an event. For example, the billboard segmenter **126** compares the segment of the image **200** to segment entries of a database that also includes corresponding event entries. If the segment of the image **200** matches one of the segment entries of the database, the billboard segmenter **126** determines that an event is associated with the segment of the image **200** and proceeds to block **608** at which the billboard segmenter **126** determines the event entry of the database that corresponds to the segment of the image **200**. For example, the billboard segmenter **126** determines that the first segment **202** corresponds with accessing a website.

Further, at block **610**, the billboard segmenter **126** links the event (e.g., accessing the website) to the segment.

[0060] Upon determining that the segment is not associated with an event at block **606** or upon linking the event to the segment at block **610**, the billboard segmenter **126** determines whether there is another of the segments **202**, **204**, **206**, **208**, **210**, **212** of the image **200** (block **612**). If the billboard segmenter **126** determines that there is another segment, the method **600** repeats blocks **604**, **606**, **608**, **610**, **612** until no other segment of the image **200** is identified.

[0061] Upon completing block **612**, the billboard segmenter **126** generates the billboard interface **300** (block **614**). For example, the billboard segmenter **126** generates the billboard interface **300** to include the segments **202**, **204**, **206**, **208**, **210** and the corresponding hyperlinks to initiate the corresponding events. At block **616**, the communication module **410** of the mobile device **102** sends the billboard interface **300** to the communication module **114** of the vehicle **100**.

[0062] At block **618**, the communication module **114** of the vehicle **100** receives the billboard interface **300** from the communication module **410** of the mobile device **102**. At block **620**, the display **120** of the vehicle **100** presents the billboard interface **300** for the user **104**. At block **622**, the billboard linker **128** of the vehicle **100** determines whether a segment of the billboard interface **300** has been selected by the user **104**. If the billboard linker **128** determines that a segment has not been selected, the method returns to block **620**. Otherwise, if the billboard linker **128** determines that a segment has been selected, the method **600** proceeds to block **624** at which the billboard linker **128** performs the event associated with the selected segment. For example, if the billboard linker **128** determines that the user **104** has selected the first segment **202** (block **622**), the billboard linker **128** presents the website to the user **104** via the display **120**. After block **624** is completed, the method **600** ends.

[0063] In this application, the use of the disjunctive is intended to include the conjunctive. The use of definite or indefinite articles is not intended to indicate cardinality. In particular, a reference to "the" object or "a" and "an" object is intended to denote also one of a possible plurality of such objects. Further, the conjunction "or" may be used to convey features that are simultaneously present instead of mutually exclusive alternatives. In other words, the conjunction "or" should be understood to include "and/or". The terms "includes," "including," and "include" are inclusive and have the same scope as "comprises," "comprising," and "comprise" respectively.

[0064] The above-described embodiments, and particularly any "preferred" embodiments, are possible examples of implementations and merely set forth for a clear understanding of the principles of the invention. Many variations and modifications may be made to the above-described embodiment(s) without substantially departing from the spirit and principles of the techniques described herein. All modifications are intended to be included herein within the scope of this disclosure and protected by the following claims.

What is claimed is:

1. A method for generating billboard interfaces for vehicle displays, the method comprising:
- obtaining, via a camera, an image of a billboard;
- identifying, via a processor, a segment of the image;
- determining an event associated with the segment;
- generating a billboard interface to include a hyperlink of the segment that initiates the event; and
- communicating, via a communication module, the billboard interface to a vehicle display for presentation to a user.

2. The method of claim **1**, wherein the segment includes an address associated with the image of the billboard.

3. The method of claim **2**, further including presenting visual directions to the address via the vehicle display upon selection of the segment.

4. The method of claim **2**, further including presenting audible directions to the address upon selection of the segment.

5. The method of claim **1**, wherein the vehicle display is a touch screen.

6. The method of claim **5**, further including:
- detecting a selection of the segment of the billboard interface via the touch screen; and
- initiating the event via the hyperlink upon detecting the selection.

7. The method of claim **1**, further including:
- identifying a second segment of the image different than the segment;
- determining a second event associated with the second segment, the second event different than the event; and
- generating the billboard interface to further include a second hyperlink of the second segment that initiates the second event.

8. A system for presenting billboard interfaces, the system comprising:
- a mobile device to:
  - obtain, via a camera, an image of a billboard;
  - identify, via a processor, a segment of the image;
  - determine an event associated with the segment; and
  - generate a billboard interface to include a hyperlink of the segment that initiates the event; and
- a vehicle to:
  - receive the billboard interface from the mobile device; and
  - present, via a display, the billboard interface.

9. The system of claim **8**, wherein the display of the vehicle is a touch screen configured to detect a selection of the segment of the billboard interface presented via the touch screen.

10. The system of claim **8**, wherein the vehicle includes a microphone to receive audible instructions to select the segment of the billboard interface presented via the display.

11. The system of claim **8**, wherein the vehicle initiates the event via the hyperlink upon the segment of the billboard interface being selected.

12. The system of claim **11**, wherein the vehicle includes a billboard linker to detect selection of the segment and initiate the event via the hyperlink upon detecting the selection of the segment.

13. The system of claim **8**, wherein the mobile device:
- identifies a second segment of the image different than the segment;
- determines a second event associated with the second segment, the second event different than the event; and
- generates the billboard interface to further include a second hyperlink of the second segment that initiates the second event.

14. The system of claim **13**, wherein the event is a phone call to a phone number associated with the image of the

billboard and the second event is a presentation of directions to an address associated with the image of the billboard.

15. A tangible computer readable medium including instructions which, when executed, cause a machine to:

obtain, via a camera, an image of a billboard;

identify, via a processor, a segment of the image;

determine an event associated with the segment;

generate a billboard interface to include a hyperlink of the segment that initiates the event; and

communicate the billboard interface to a vehicle display for presentation to a user.

16. The tangible computer readable medium of claim **15**, wherein, to identify the segment of the image, the instructions further cause the machine to utilize an image recognition system that identifies the segment via a deep neural network.

17. The tangible computer readable medium of claim **15**, wherein the event is a phone call to a phone number associated with the image of the billboard.

18. The tangible computer readable medium of claim **15**, wherein the instructions further cause the machine to communicate with a database that includes segment entries and corresponding event entries.

19. The tangible computer readable medium of claim **18**, wherein, to determine the event associated with the segment, the instructions further cause the machine to match the segment to one of the segment entries of the database and identifying the corresponding one of the event entries.

20. The tangible computer readable medium of claim **18**, wherein the instructions further cause the machine to communicate to a billboard processor to facilitate the billboard to display a personalized advertisement for a user.

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