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(54) **ACTIVE PEDESTRIAN WARNING SYSTEM FOR RAIL AND BUS TRANSIT ROUTES**

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G08G 1/09 (2006.01)
G08G 1/005 (2006.01)

(52) **U.S. Cl.**
CPC ***G08G 1/123*** (2013.01); ***G08G 1/093*** (2013.01); *G08G 1/005* (2013.01)

(58) **Field of Classification Search**
CPC G08G 1/123; G08G 1/005; G08G 1/093
USPC 340/989
See application file for complete search history.

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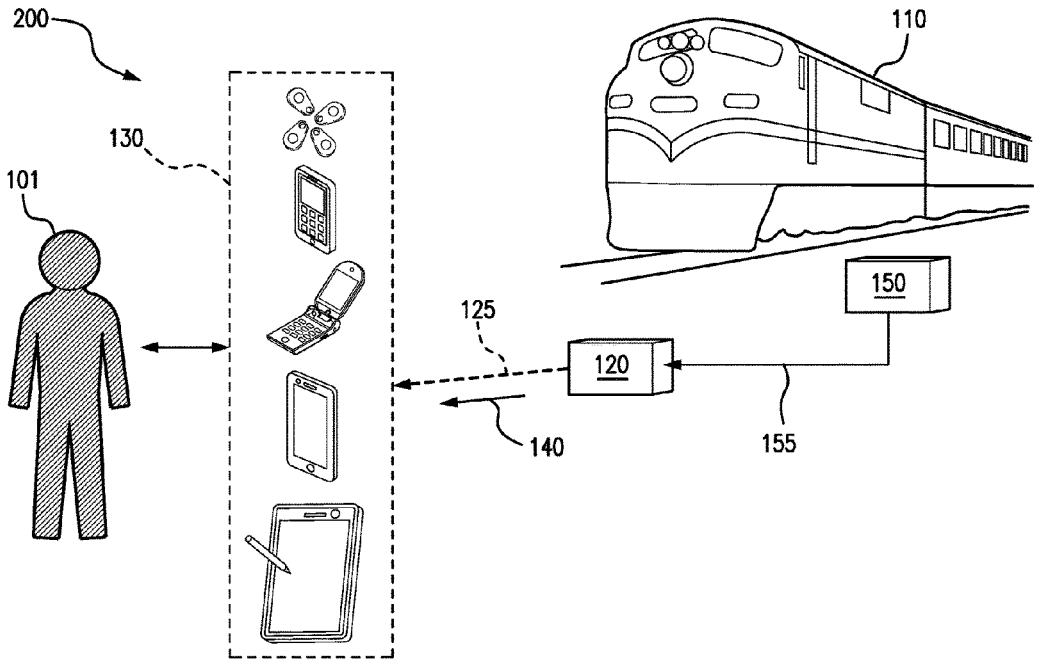
(57) **ABSTRACT**

A system includes a transmitter coupled to a vehicle and a client system. The transmitter broadcasts a wireless signal. The client system includes a receiver that receives the wireless signal from the transmitter. The client system determines an identifier within the wireless signal, compares the identifier within the wireless signal to a list of identifiers, and in response to determining that the identifier within the wireless signal matches a particular identifier within the list of identifiers, generates an alert that the vehicle is approaching.

20 Claims, 5 Drawing Sheets



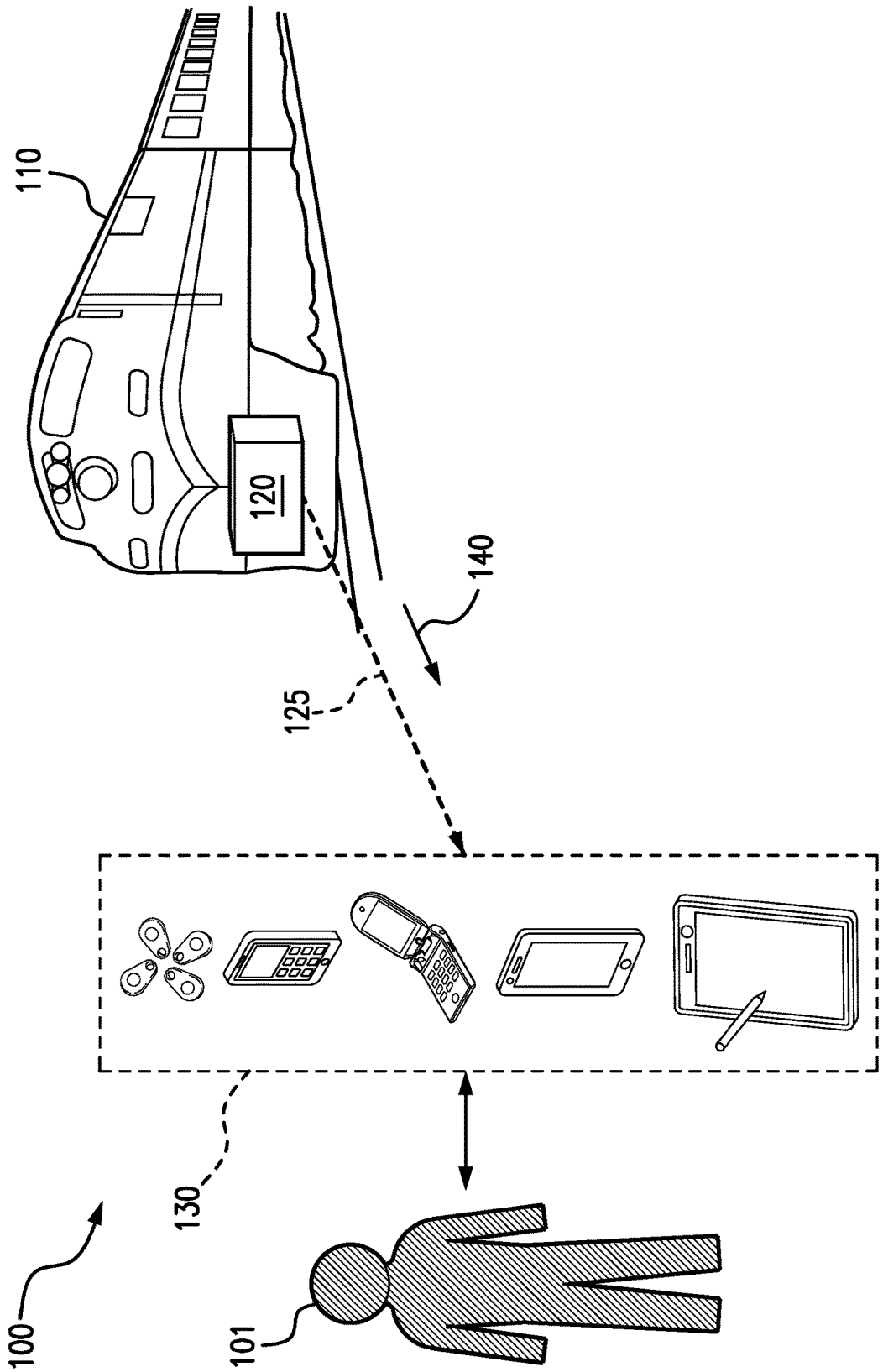


FIG. 1

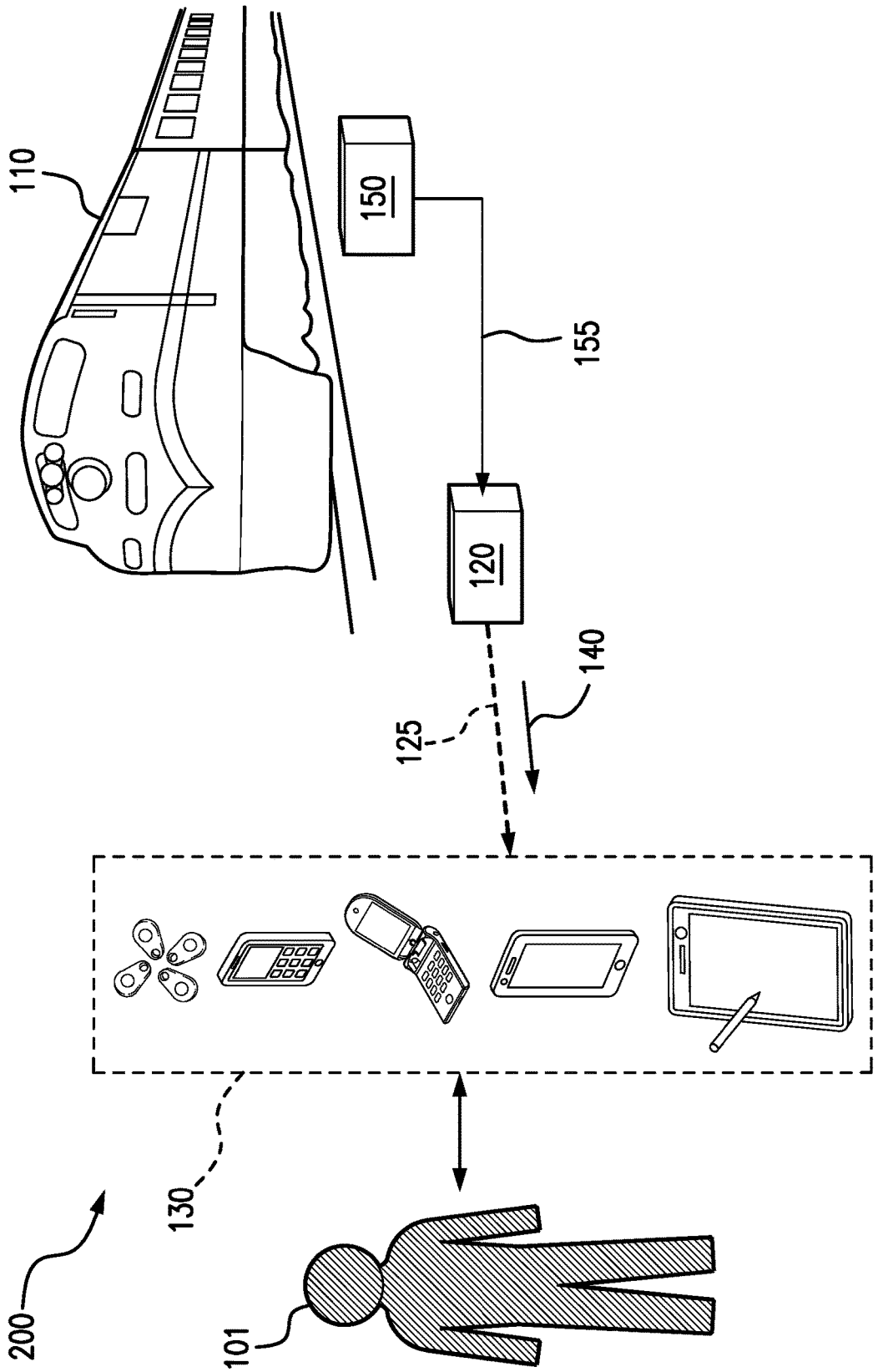


FIG. 2

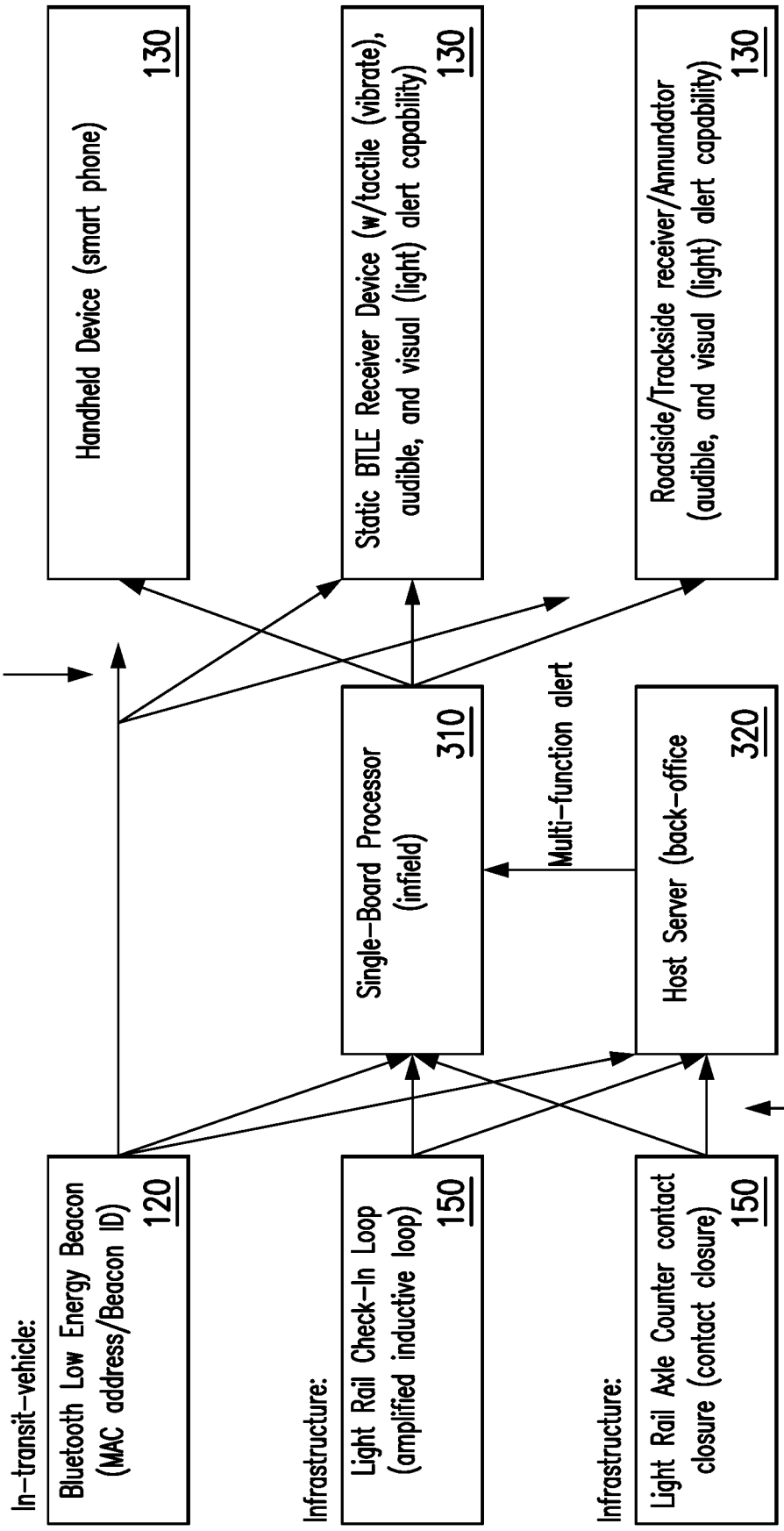

In-transit-vehicle:
Bluetooth Low Energy Beacon (MAC address/Beacon ID) 120
Infrastructure:
Light Rail Check-In Loop (amplified inductive loop) 150
Infrastructure:
Light Rail Axle Counter contact closure (contact closure) 150
Transmit using Bluetooth Low Energy protocol
Handheld Device (smart phone) 130
Static BTLE Receiver Device (w/tactile (vibrate), audible, and visual (light) alert capability) 130
Roadside/Trackside receiver/Annundator (audible, and visual (light) alert capability) 130
Single-Board Processor (infield) 310
Multi-function alert
Host Server (back-office 320
Transmit using Beacon ID, Bluetooth MAC and IP

FIG. 3

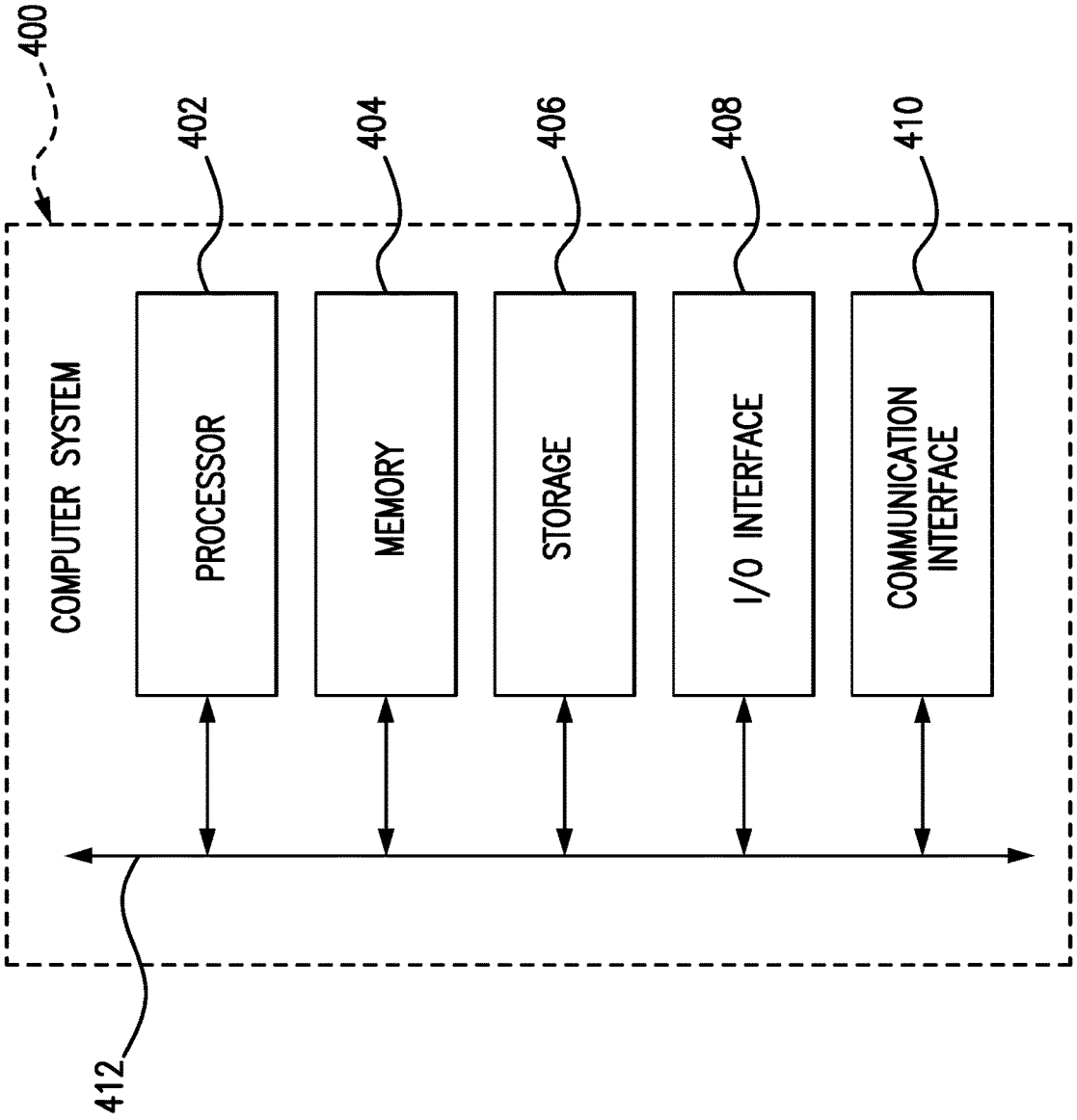

400
402
404
406
408
410
COMPUTER SYSTEM
PROCESSOR
MEMORY
STORAGE
I/O INTERFACE
COMMUNICATION INTERFACE
412

FIG. 4

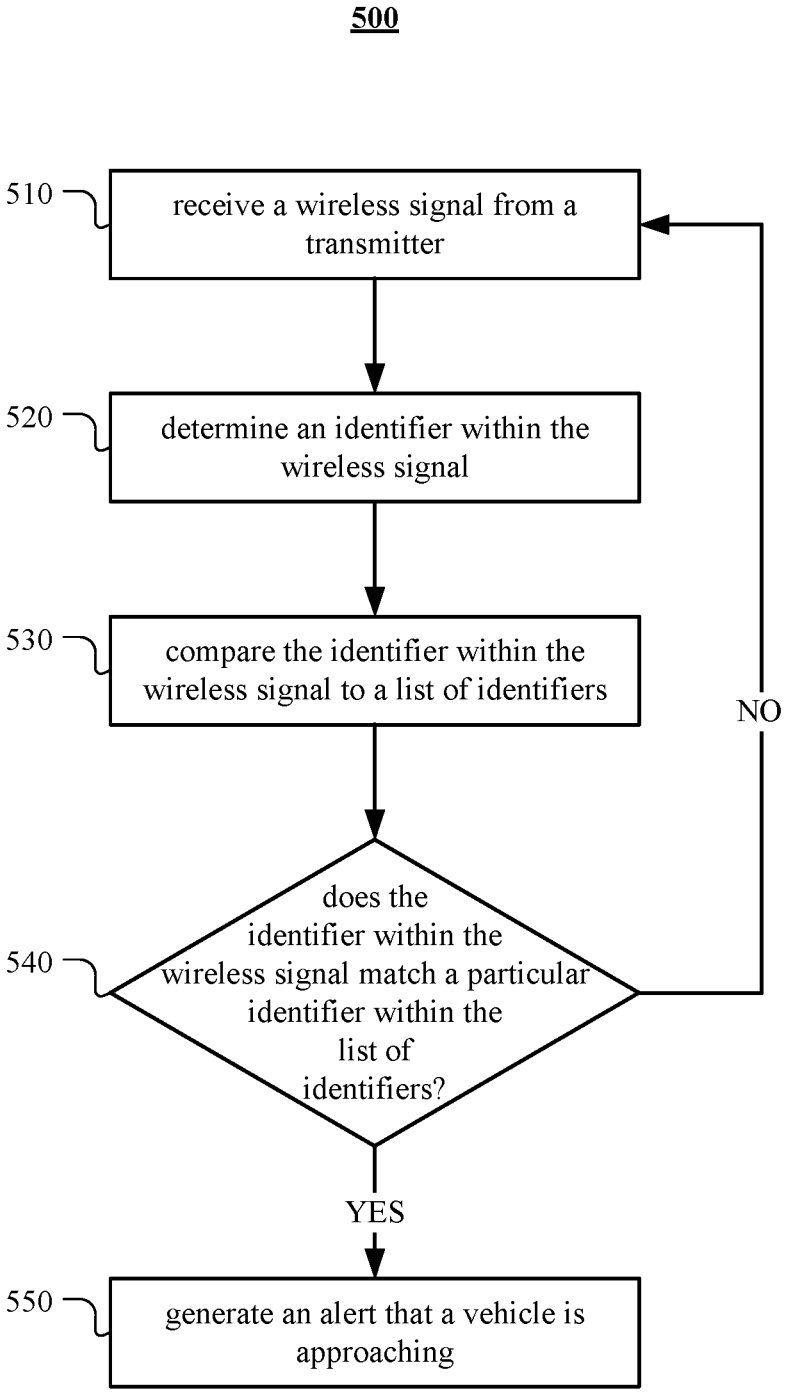

500
510
receive a wireless signal from a transmitter
520
determine an identifier within the wireless signal
530
compare the identifier within the wireless signal to a list of identifiers
540
does the identifier within the wireless signal match a particular identifier within the list of identifiers?
NO
YES
550
generate an alert that a vehicle is approaching

FIG. 5

ACTIVE PEDESTRIAN WARNING SYSTEM FOR RAIL AND BUS TRANSIT ROUTES

PRIORITY

This application claims the benefit, under 35 U.S.C. § 119(e), of U.S. Provisional Patent Application No. 62/487,933, filed 20 Apr. 2017, which is incorporated herein by reference.

TECHNICAL FIELD

This disclosure relates in general to warning systems and more particularly to an active pedestrian warning system for rail and bus transit routes.

BACKGROUND

In general, people such as pedestrians frequently come in close contact with dangerous vehicles such as trains and buses. For example, public transportation systems such as light rail trains frequently traverse crowded streets where pedestrians are present. If pedestrians are distracted or are not paying attention to their surroundings, they may be struck and injured by a passing train.

SUMMARY OF THE DISCLOSURE

Embodiments of the disclosure enable a transit vehicle to emit a beacon signal via wireless technology (for example, using the Bluetooth Low Energy protocol) which is then received and used by a two-way personal mobile communicating device (e.g., smartphone), a one-way communicating device (e.g., a beacon signal receiver with visual, tactile or audible alert capability), or a visual or audible messaging system (e.g., a speaker system, visual "strobe" light or other sensory input device) to alert pedestrians, bicyclists, motorists, or other travelers or systems that a transit vehicle is approaching a known location.

Technical advantages of certain embodiments will be readily apparent to one skilled in the art from the following figures, descriptions, and claims. For example, certain embodiments may provide increased safety by providing a warning that a vehicle is approaching. Moreover, while specific advantages have been enumerated above, various embodiments may include all, some, or none of the enumerated advantages.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present disclosure and its advantages, reference is made to the following description, taken in conjunction with the accompanying drawings, in which:

FIGS. **1-2** illustrate warning systems for an approaching vehicle, according to certain embodiments;

FIG. **3** illustrates a flowchart for various embodiments of warning systems for an approaching vehicle, according to certain embodiments;

FIG. **4** illustrates a computer system that may be used by the systems of FIGS. **1-3**, according to certain embodiments; and

FIG. **5** illustrates an example method for providing an alert that a vehicle is approaching, according to certain embodiments.

DETAILED DESCRIPTION OF THE DISCLOSURE

Increasingly, pedestrians and bicyclists are distracted by the use of electronic devices as they walk and ride. This distraction may cause conflicts near transit routes, stops, and platforms as the pedestrians become less aware of standard warning devices. This distraction on the part of the pedestrian and bicyclist increases the potential for collisions with transit vehicles such as trains and buses. In addition, light-rail and other transit routes have been built into environments where conflicts are inherent (e.g., within streets), but are manageable without a distracted person. For example, a transit vehicle (e.g., rail, light-rail, bus, van, passenger car, etc.) moving along a city street right-of-way or other roadway may pose a risk to pedestrians and bicyclists also using that street or roadway, or to pedestrians or bicyclists crossing the street and crossing the path of the transit vehicle if the pedestrian is not paying attention to existing signs, markings and other warning devices typically found along transit routes.

To address these and other problems, embodiments of the disclosure enable a vehicle (e.g., a transit vehicle such as light-rail, heavy-rail, bus, van, passenger vehicle, etc.) to emit a beacon signal via wireless technology (for example, using the Bluetooth Low Energy (BTLE) protocol) which may be received and used by a two-way personal mobile communicating device (e.g., smartphone), a one-way communicating device (e.g., a beacon signal receiver with visual, tactile or audible alert capability), or a visual or audible messaging system (e.g., a speaker system, visual "strobe" light or other sensory input device) to alert pedestrians, bicyclists, motorists, or other travelers or systems that a vehicle is approaching a known location. The wireless beacon signal may be used to provide an active warning to a user caused by their proximity to a moving transit vehicle, in the absence or presence of other alerting systems, and can do so by preempting that user's real-time use of that device. In some embodiments, a single board computer that produces a continual Bluetooth low energy based beacon signal in an omni-directional pattern is placed on the transit vehicle (e.g., in the front, rear, or both). Carried by pedestrians, bicyclists, or other transportation system users, the receiving device detects the wireless beacon signals and translates them into warnings that may be audible, tactile, visual, or any combination of the above.

FIG. **1** illustrates a warning system **100** for an approaching vehicle, according to certain embodiments. System **100** includes a vehicle **110**, a transmitter **120**, and a client system **130**. Transmitter **120** emits a wireless signal **125** that includes an identifier **140**. Client system **130** receives wireless signal **125** and alerts a user **101** to approaching vehicle **110**.

User **101** is any person that may be in danger of being struck by vehicle **110**. For example, user **101** may be any pedestrian, bicyclist, motorist, traveler, or transportation system worker. In some embodiments, user **101** may be a railroad construction worker.

Vehicle **110** is any vehicle that may pose a threat to user **101**. For example, vehicle **110** may be any transit vehicle such as a train, light-rail train, bus, van, passenger car, and the like. Vehicle **110** may also be any non-transit vehicle such as a freight train.

Transmitter **120** is any appropriate device capable of emitting wireless signal **125**. In some embodiments, transmitter **120** is a Bluetooth low energy (BTLE) transmitter. In other embodiments, transmitter **120** is a Wi-Fi, classic

Bluetooth, or RFID transmitter. In some embodiments, more than one transmitter **120** may be placed on vehicle **110**. Transmitter **120** may be placed on a front portion, rear portion, or any other appropriate location on vehicle **110**.

Wireless signal **125** is any appropriate wireless signal that is transmitted by transmitter **120**. For example, wireless signal **125** may be a BTLE signal, a classic Bluetooth signal, a Wi-Fi signal, or an RFID signal. In some embodiments, wireless signal **125** is a beacon signal that includes identifier **140**. Identifier **140** is any appropriate identifier for vehicle **110**. In some embodiments, identifier **140** is unique for each particular vehicle **110** or fleet of vehicles **110**. In some embodiments, identifier **140** is a beacon ID or media access control (MAC) address of a network device.

Client system **130** is any appropriate system or device that is capable of receiving wireless signal **125**. In particular embodiments, client system **130** may be an electronic device including hardware, software, or embedded logic components or a combination of two or more such components and capable of carrying out the appropriate functionalities implemented or supported by client system **130**. As an example and not by way of limitation, a client system **130** may include a computer system such as a desktop computer, notebook or laptop computer, netbook, a tablet computer, e-book reader, GPS device, camera, personal digital assistant (PDA), handheld electronic device, cellular telephone, smartphone, augmented/virtual reality device, other suitable electronic device, or any suitable combination thereof. Client system **130** may be a two-way personal mobile communicating device (e.g., smartphone), a one-way communicating device (e.g., a beacon signal receiver with visual, tactile or audible alert capability), or a visual or audible messaging system (e.g., a speaker system, a visual "strobe" light or other sensory input device, a message board, and the like) to alert pedestrians, bicyclists, motorists, or other travelers or systems that vehicle **110** is approaching a known location (e.g., a station).

In operation, transmitter **120** is placed on any vehicle **110** that may pose a threat to users **101** such as pedestrians. In some embodiments, for example, transmitter **120** is placed on the front of vehicle **110** so that it may give the most advanced notice that vehicle **110** is approaching. Transmitter **120** emits wireless signal **125** to be received by client system **130**. In some embodiments, wireless signal **125** is a beacon signal. In some embodiments, wireless signal **125** is transmitted continuously while vehicle **110** is in motion or has power. In other embodiments, wireless signal **125** is transmitted only under certain conditions (e.g., if vehicle **110** is moving faster than a certain speed or if vehicle **110** is a certain distance away from a certain location such as a train station as determined by GPS). In some embodiments, wireless signal **125** is transmitted at certain intervals (e.g., every half second, etc.).

Once client system **130** receives wireless signal **125**, it may alert user **101** that vehicle **110** is approaching using any appropriate manner. For example, client system **130** may emit any visual, tactile (e.g., vibration) or audible alert, alarm, or message to indicate that vehicle **110** is approaching.

In some embodiments, client system **130** may analyze identifier **140** within wireless signal **125** before alerting user **101** of an approaching vehicle **110**. For example, client system **130** may compare identifier **140** to a list of identifiers of known transit vehicles **110**. If the received identifier **140** matches an identifier in the list, client system **130** may proceed to alert user **101** of an approaching vehicle **110**. In some embodiments, the list of identifiers of known transit vehicles **110** may be in any accessible storage or network location. In some embodiments, the list of identifiers of known transit vehicles **110** may hard-coded within software of client system **130** (e.g., hard-coded within an app running on a smartphone **130**). In such embodiments, the list of identifiers of known transit vehicles **110** may be updated by updating the software of client system **130** (e.g., by providing an updated app to smartphone **130**). In other embodiments, client system **130** may access the list of identifiers of known transit vehicles **110** that is stored in any accessible network location. For example, an app running on smartphone **130** may access the list of identifiers of known transit vehicles **110** via a network such as the Internet. In such an embodiment, the list of identifiers of known transit vehicles **110** may be stored in any network-accessible or cloud-based server (e.g., host server **320** described below).

As a specific use example, light rail trains of a city's transit system may be outfitted with BTLE transmitters **120**. A mobile application may be available for users **101** to install on their smartphones **130**. The mobile app on smartphone **130** may detect BTLE signal **125** and alert user **101** that train **110** is approaching. For example, the smartphone **130** may vibrate, emit a noise, and/or display a notification or message of the approaching train **110**. As a result, user **101** may be protected from being struck by train **110**.

FIG. **2** illustrates a warning system **200** for an approaching vehicle, according to certain embodiments. System **200** is similar to system **100** of FIG. **1**, except that transmitter **120** is not placed on vehicle **110**. Instead, transmitter **120** is coupled to a fixed location such as a location within a train or bus station. In operation, transmitter **120** receives a trigger signal **155** from a trigger device **150**. Trigger device **150** is any appropriate device that detects when vehicle **110** passes by. For example, trigger device **150** may be an amplified inductive loop or contact closure placed on a train track or in a road. Once trigger device **150** detects vehicle **110**, it sends trigger signal **155** to transmitter **120**. Transmitter **120** then transmits wireless signal **125** to client system **130** as described above with respect to FIG. **1**.

FIG. **3** illustrates a flowchart for various embodiments of warning systems for an approaching vehicle, according to certain embodiments. As illustrated in this figure, transmitter **120** may be within vehicle **110** and may transmit wireless signal **125** to one or more client systems **130** or other devices such as an in-field single-board processor **310** or a host server **320**. In embodiments that utilize in-field single-board processor **310**, the single-board processor **310** may transmit wireless signal **125** to client systems **130** in response to receiving a signal from transmitter **120** or from trigger device **150**. In embodiments that utilize host server **320**, the host server **320** may transmit a multi-function alert signal to single-board processor **310** in response to receiving a signal from transmitter **120** or from trigger device **150**.

In some embodiments, it may be desirable to prevent client system **130** from alerting user **101** that vehicle **110** is approaching. For example, if user **101** is on or within vehicle **110**, it would not be desirable for client system **130** to constantly alert user **101** to the presence of vehicle **110**. To avoid such scenarios, some embodiments may utilize any appropriate method to determine that user **101** is on or within a specific vehicle **110** and therefore mute or otherwise avoid alerting user **101** to the presence of the specific vehicle **110**. As one example, client system **130** may communicate with a server such as host server **320** to determine that user **101** is on board vehicle **110**. For example, an app running on smartphone **130** may include a ticketing function that communicates with host server **320** and indicates when user **101**

has boarded vehicle **110** (e.g., the app of smartphone **130** may be scanned by a scanner when user **101** boards vehicle **110**). As another example, client system **130** may utilize sensors within client system **130** (e.g., accelerometers, GPS transceivers, etc.) to determine a motion (e.g., speed and direction of movement) of client system **130**. The determined motion of client system **130** may then be compared to that of vehicle **110** (e.g., by accessing movement data of vehicle **110** stored in a server such host server **320** or movement/speed data of vehicle **110** embedded within wireless signal **125**). If the determined motion of client system **130** matches that of vehicle **110** (or is within a certain predetermined percentage of vehicle **110**), client system **130** may determine that user **101** is on board vehicle **110** and therefore mute or otherwise avoid alerting user **101** to the presence of vehicle **110**.

FIG. **4** illustrates an example computer system **400**. In particular embodiments, one or more computer systems **400** perform one or more steps of one or more methods described or illustrated herein. In particular embodiments, one or more computer systems **400** provide functionality described or illustrated herein. In particular embodiments, software running on one or more computer systems **400** performs one or more steps of one or more methods described or illustrated herein or provides functionality described or illustrated herein. Particular embodiments include one or more portions of one or more computer systems **400**. Herein, reference to a computer system may encompass a computing device, and vice versa, where appropriate. Moreover, reference to a computer system may encompass one or more computer systems, where appropriate.

This disclosure contemplates any suitable number of computer systems **400**. This disclosure contemplates computer system **400** taking any suitable physical form. As example and not by way of limitation, computer system **400** may be an embedded computer system, a system-on-chip (SOC), a single-board computer system (SBC) (such as, for example, a computer-on-module (COM) or system-on-module (SOM)), a desktop computer system, a laptop or notebook computer system, an interactive kiosk, a mainframe, a mesh of computer systems, a mobile telephone, a personal digital assistant (PDA), a server, a tablet computer system, an augmented/virtual reality device, or a combination of two or more of these. Where appropriate, computer system **400** may include one or more computer systems **400**; be unitary or distributed; span multiple locations; span multiple machines; span multiple data centers; or reside in a cloud, which may include one or more cloud components in one or more networks. Where appropriate, one or more computer systems **400** may perform without substantial spatial or temporal limitation one or more steps of one or more methods described or illustrated herein. As an example and not by way of limitation, one or more computer systems **400** may perform in real time or in batch mode one or more steps of one or more methods described or illustrated herein. One or more computer systems **400** may perform at different times or at different locations one or more steps of one or more methods described or illustrated herein, where appropriate.

In particular embodiments, computer system **400** includes a processor **402**, memory **404**, storage **406**, an input/output (I/O) interface **408**, a communication interface **410**, and a bus **412**. Although this disclosure describes and illustrates a particular computer system having a particular number of particular components in a particular arrangement, this disclosure contemplates any suitable computer system having any suitable number of any suitable components in any suitable arrangement.

In particular embodiments, processor **402** includes hardware for executing instructions, such as those making up a computer program. As an example and not by way of limitation, to execute instructions, processor **402** may retrieve (or fetch) the instructions from an internal register, an internal cache, memory **404**, or storage **406**; decode and execute them; and then write one or more results to an internal register, an internal cache, memory **404**, or storage **406**. In particular embodiments, processor **402** may include one or more internal caches for data, instructions, or addresses. This disclosure contemplates processor **402** including any suitable number of any suitable internal caches, where appropriate. As an example and not by way of limitation, processor **402** may include one or more instruction caches, one or more data caches, and one or more translation lookaside buffers (TLBs). Instructions in the instruction caches may be copies of instructions in memory **404** or storage **406**, and the instruction caches may speed up retrieval of those instructions by processor **402**. Data in the data caches may be copies of data in memory **404** or storage **406** for instructions executing at processor **402** to operate on; the results of previous instructions executed at processor **402** for access by subsequent instructions executing at processor **402** or for writing to memory **404** or storage **406**; or other suitable data. The data caches may speed up read or write operations by processor **402**. The TLBs may speed up virtual-address translation for processor **402**. In particular embodiments, processor **402** may include one or more internal registers for data, instructions, or addresses. This disclosure contemplates processor **402** including any suitable number of any suitable internal registers, where appropriate. Where appropriate, processor **402** may include one or more arithmetic logic units (ALUs); be a multi-core processor; or include one or more processors **402**. Although this disclosure describes and illustrates a particular processor, this disclosure contemplates any suitable processor.

In particular embodiments, memory **404** includes main memory for storing instructions for processor **402** to execute or data for processor **402** to operate on. As an example and not by way of limitation, computer system **400** may load instructions from storage **406** or another source (such as, for example, another computer system **400**) to memory **404**. Processor **402** may then load the instructions from memory **404** to an internal register or internal cache. To execute the instructions, processor **402** may retrieve the instructions from the internal register or internal cache and decode them. During or after execution of the instructions, processor **402** may write one or more results (which may be intermediate or final results) to the internal register or internal cache. Processor **402** may then write one or more of those results to memory **404**. In particular embodiments, processor **402** executes only instructions in one or more internal registers or internal caches or in memory **404** (as opposed to storage **406** or elsewhere) and operates only on data in one or more internal registers or internal caches or in memory **404** (as opposed to storage **406** or elsewhere). One or more memory buses (which may each include an address bus and a data bus) may couple processor **402** to memory **404**. Bus **412** may include one or more memory buses, as described below. In particular embodiments, one or more memory management units (MMUs) reside between processor **402** and memory **404** and facilitate accesses to memory **404** requested by processor **402**. In particular embodiments, memory **404** includes random access memory (RAM). This

RAM may be volatile memory, where appropriate Where appropriate, this RAM may be dynamic RAM (DRAM) or static RAM (SRAM). Moreover, where appropriate, this RAM may be single-ported or multi-ported RAM. This disclosure contemplates any suitable RAM. Memory **404** may include one or more memories **404**, where appropriate. Although this disclosure describes and illustrates particular memory, this disclosure contemplates any suitable memory.

In particular embodiments, storage **406** includes mass storage for data or instructions. As an example and not by way of limitation, storage **406** may include a hard disk drive (HDD), a floppy disk drive, flash memory, an optical disc, a magneto-optical disc, magnetic tape, or a Universal Serial Bus (USB) drive or a combination of two or more of these. Storage **406** may include removable or non-removable (or fixed) media, where appropriate. Storage **406** may be internal or external to computer system **400**, where appropriate. In particular embodiments, storage **406** is non-volatile, solid-state memory. In particular embodiments, storage **406** includes read-only memory (ROM). Where appropriate, this ROM may be mask-programmed ROM, programmable ROM (PROM), erasable PROM (EPROM), electrically erasable PROM (EEPROM), electrically alterable ROM (EAROM), or flash memory or a combination of two or more of these. This disclosure contemplates mass storage **406** taking any suitable physical form. Storage **406** may include one or more storage control units facilitating communication between processor **402** and storage **406**, where appropriate. Where appropriate, storage **406** may include one or more storages **406**. Although this disclosure describes and illustrates particular storage, this disclosure contemplates any suitable storage.

In particular embodiments, I/O interface **408** includes hardware, software, or both, providing one or more interfaces for communication between computer system **400** and one or more I/O devices. Computer system **400** may include one or more of these I/O devices, where appropriate. One or more of these I/O devices may enable communication between a person and computer system **400**. As an example and not by way of limitation, an I/O device may include a keyboard, keypad, microphone, monitor, mouse, printer, scanner, speaker, still camera, stylus, tablet, touch screen, trackball, video camera, another suitable I/O device or a combination of two or more of these. An I/O device may include one or more sensors. This disclosure contemplates any suitable I/O devices and any suitable I/O interfaces **408** for them. Where appropriate, I/O interface **408** may include one or more device or software drivers enabling processor **402** to drive one or more of these I/O devices. I/O interface **408** may include one or more I/O interfaces **408**, where appropriate. Although this disclosure describes and illustrates a particular I/O interface, this disclosure contemplates any suitable I/O interface.

In particular embodiments, communication interface **410** includes hardware, software, or both providing one or more interfaces for communication (such as, for example, packet-based communication) between computer system **400** and one or more other computer systems **400** or one or more networks. As an example and not by way of limitation, communication interface **410** may include a network interface controller (NIC) or network adapter for communicating with an Ethernet or other wire-based network or a wireless NIC (WNIC) or wireless adapter for communicating with a wireless network, such as a WI-FI network. This disclosure contemplates any suitable network and any suitable communication interface **410** for it. As an example and not by way of limitation, computer system **400** may communicate with an ad hoc network, a personal area network (PAN), a local area network (LAN), a wide area network (WAN), a metropolitan area network (MAN), or one or more portions of the Internet or a combination of two or more of these. One or more portions of one or more of these networks may be wired or wireless. As an example, computer system **400** may communicate with a wireless PAN (WPAN) (such as, for example, a BLUETOOTH WPAN), a WI-FI network, a WI-MAX network, a cellular telephone network (such as, for example, a Global System for Mobile Communications (GSM) network), or other suitable wireless network or a combination of two or more of these. Computer system **400** may include any suitable communication interface **410** for any of these networks, where appropriate. Communication interface **410** may include one or more communication interfaces **410**, where appropriate. Although this disclosure describes and illustrates a particular communication interface, this disclosure contemplates any suitable communication interface.

In particular embodiments, bus **412** includes hardware, software, or both coupling components of computer system **400** to each other. As an example and not by way of limitation, bus **412** may include an Accelerated Graphics Port (AGP) or other graphics bus, an Enhanced Industry Standard Architecture (EISA) bus, a front-side bus (FSB), a HYPERTRANSPORT (HT) interconnect, an Industry Standard Architecture (ISA) bus, an INFINIBAND interconnect, a low-pin-count (LPC) bus, a memory bus, a Micro Channel Architecture (MCA) bus, a Peripheral Component Interconnect (PCI) bus, a PCI-Express (PCIe) bus, a serial advanced technology attachment (SATA) bus, a Video Electronics Standards Association local (VLB) bus, or another suitable bus or a combination of two or more of these. Bus **412** may include one or more buses **412**, where appropriate. Although this disclosure describes and illustrates a particular bus, this disclosure contemplates any suitable bus or interconnect.

FIG. **5** illustrates an example method **500** for providing an alert that a vehicle is approaching. Method **500** may begin at step **510** where a wireless signal is received from a transmitter. In some embodiments, the wireless signal is wireless signal **125**. In some embodiments, the wireless signal is received by client system **130** or trigger device **150**. In some embodiments, the wireless signal is transmitted by transmitter **120** that may be coupled to a vehicle such as vehicle **110**. In some embodiments, the wireless signal is a BTLE signal, a classic Bluetooth signal, a Wi-Fi signal, an RFID signal, or the like.

At step **520**, method **500** determines an identifier within the wireless signal received in step **510**. In some embodiments, the identifier is identifier **140**. In some embodiments, the identifier is a beacon ID, a MAC address of a network device, or the like.

At step **530**, method **500** compares the identifier within the wireless signal to a list of identifiers. In some embodiments, the list of identifiers is stored locally on client system **130** (e.g., within memory of client system **130** or embedded within software running on client system **130**). In some embodiments, the list of identifiers is retrieved or otherwise accessed from any network or cloud-based server or computer system.

At step **540**, method **500** determines whether the identifier within the wireless signal matches a particular identifier within the list of identifiers. If the identifier within the wireless signal matches a particular identifier within the list of identifiers, method **500** proceeds to step **550**. If the

identifier within the wireless signal does not match any identifier within the list of identifiers, method **500** may proceed back to step **510**.

At step **550**, method **500** generates an alert that a vehicle is approaching. In some embodiments, the alert is any audible, visual, or tactile alert. After step **550**, method **500** may end or proceed back to step **510**.

Particular embodiments may repeat one or more steps of method **500** where appropriate. Although this disclosure describes and illustrates particular steps of method **500** as occurring in a particular order, this disclosure contemplates any suitable steps of method **500** occurring in any suitable order. Moreover, although this disclosure describes and illustrates an example method for providing an alert that a vehicle is approaching including the particular steps of method **500**, this disclosure contemplates any suitable method for providing an alert that a vehicle is approaching including any suitable steps, which may include all, some, or none of the steps of method **500**, where appropriate. Furthermore, although this disclosure describes and illustrates particular components, devices, or systems carrying out particular steps of method **500**, this disclosure contemplates any suitable combination of any suitable components, devices, or systems carrying out any suitable steps of method **500**.

Herein, a computer-readable non-transitory storage medium or media may include one or more semiconductor-based or other integrated circuits (ICs) (such, as for example, field-programmable gate arrays (FPGAs) or application-specific ICs (ASICs)), hard disk drives (HDDs), hybrid hard drives (HHDs), optical discs, optical disc drives (ODDs), magneto-optical discs, magneto-optical drives, floppy diskettes, floppy disk drives (FDDs), magnetic tapes, solid-state drives (SSDs), RAM-drives, SECURE DIGITAL cards or drives, any other suitable computer-readable non-transitory storage media, or any suitable combination of two or more of these, where appropriate. A computer-readable non-transitory storage medium may be volatile, non-volatile, or a combination of volatile and non-volatile, where appropriate.

Herein, "or" is inclusive and not exclusive, unless expressly indicated otherwise or indicated otherwise by context. Therefore, herein, "A or B" means "A, B, or both," unless expressly indicated otherwise or indicated otherwise by context. Moreover, "and" is both joint and several, unless expressly indicated otherwise or indicated otherwise by context. Therefore, herein, "A and B" means "A and B, jointly or severally," unless expressly indicated otherwise or indicated otherwise by context.

The scope of this disclosure encompasses all changes, substitutions, variations, alterations, and modifications to the example embodiments described or illustrated herein that a person having ordinary skill in the art would comprehend. The scope of this disclosure is not limited to the example embodiments described or illustrated herein. Moreover, although this disclosure describes and illustrates respective embodiments herein as including particular components, elements, feature, functions, operations, or steps, any of these embodiments may include any combination or permutation of any of the components, elements, features, functions, operations, or steps described or illustrated anywhere herein that a person having ordinary skill in the art would comprehend. Furthermore, reference in the appended claims to an apparatus or system or a component of an apparatus or system being adapted to, arranged to, capable of, configured to, enabled to, operable to, or operative to perform a particular function encompasses that apparatus, system, component, whether or not it or that particular function is activated, turned on, or unlocked, as long as that apparatus, system, or component is so adapted, arranged, capable, configured, enabled, operable, or operative. Additionally, although this disclosure describes or illustrates particular embodiments as providing particular advantages, particular embodiments may provide none, some, or all of these advantages.

What is claimed is:

1. A system, comprising:
- a transmitter coupled to a vehicle, the transmitter operable to broadcast a wireless signal; and
- a client system comprising a receiver operable to receive the wireless signal from the transmitter, the client system operable to;
  - determine an identifier within the wireless signal;
  - compare the identifier within the wireless signal to a list of identifiers; and
  - in response to determining that the identifier within the wireless signal matches a particular identifier within the list of identifiers, generate an alert that the vehicle is approaching.

2. The system of claim **1**, wherein the vehicle comprises:
- a freight train;
- a transit train;
- a bus;
- an automobile:;
- a truck;
- a heavy vehicle;
- a tractor;
- construction equipment; or
- road-worthy equipment.

3. The system of claim **1**, wherein the transmitter comprises:
- a Bluetooth Low Energy transmitter;
- a classic Bluetooth transmitter;
- a Wi-Fi transmitter;
- an RFID transmitter.

4. The system of claim **1**, wherein the identifier within the wireless signal comprises one or more of:
- a beacon ID; and
- media access control (MAC) address of a network device.

5. The system of claim **1**, wherein the alert comprises one or more of:
- an audible alert;
- a visual alert; and
- a tactile alert.

6. The system of claim **1**, wherein client system is further operable to:
- determine a motion of the client system using one or more sensors of the client system;
- determine a motion of the vehicle;
- determine whether the motion of the client system matches the motion of the vehicle within a predetermined amount; and
- prevent any alerts that the vehicle is approaching when the motion of the client system is determined to match the motion of the vehicle within the predetermined amount.

7. The system of claim **1**, wherein the client system is further operable to:
- determine that the client system is in the vehicle; and
- prevent any alerts that the vehicle is approaching when it is determined that the client system is in the vehicle.

8. One or more computer-readable non-transitory storage media embodying software that is operable when executed to:

receive a wireless signal from a transmitter;
determine an identifier within the wireless signal;
compare the identifier within the wireless signal to a list of identifiers; and
in response to determining that the identifier within the wireless signal matches a particular identifier within the list of identifiers, generate an alert that a vehicle is approaching.

9. The media of claim **8**, wherein the vehicle comprises:
a freight train;
a transit train;
a bus;
an automobile;
a truck;
a heavy vehicle;
a tractor;
construction equipment; or
road-worthy equipment.

10. The media of claim **8**, wherein the transmitter comprises:
a Bluetooth Low Energy transmitter;
a classic Bluetooth transmitter;
a Wi-Fi transmitter;
an RFID transmitter.

11. The media of claim **8**, wherein the identifier within the wireless signal comprises one or more of:
a beacon ID; and
media access control (MAC)address of a network device.

12. The media of claim **8**, wherein the alert comprises one or more of:
an audible alert;
a visual alert; and
a tactile alert.

13. The media of claim **8**, wherein the software is further operable when executed to:
determine a motion of a client system using one or more sensors of the client system;
determine a motion of the vehicle;
determine whether the motion of the client system matches the motion of the vehicle within a predetermined amount; and
prevent any alerts that the vehicle is approaching when the motion of the client system is determined to match the motion of the vehicle within the predetermined amount.

14. The media of claim **8**, wherein the software is further operable when executed to:
determine that a client system is in the vehicle; and
prevent any alerts that the vehicle is approaching when it is determined that the client system is in the vehicle.

15. A system comprising:
one or more processors; and
one or more computer-readable non-transitory storage media coupled to one or more of the processors and comprising instructions operable when executed by one or more of the processors to cause the system to:
receive a wireless signal from a transmitter;
determine an identifier within the wireless signal;
compare the identifier within the wireless signal to a list of identifiers; and
in response to determining that the identifier within the wireless signal matches a particular identifier within the list of identifiers, generate an alert that a vehicle is approaching.

16. The system of claim **15**, wherein the transmitter comprises:
a Bluetooth Low Energy transmitter;
a classic Bluetooth transmitter;
a Wi-Fi transmitter;
an RFID transmitter.

17. The system of claim **15**, wherein the identifier within the wireless signal comprises one or more of:
a beacon ID; and
media access control (MAC) address of a network device.

18. The system of claim **15**, wherein the alert comprises one or more of:
an audible alert;
a visual alert; and
a tactile alert.

19. The system of claim **15**, wherein the instructions are further operable when executed by one or more of the processors to cause the system to:
determine a motion of the system using one or more sensors of the system;
determine a motion of the vehicle;
determine whether the motion of the system matches the motion of the vehicle within a predetermined amount; and
prevent any alerts that the vehicle is approaching when the motion of the system is determined to match the motion of the vehicle within the predetermined amount.

20. The system of claim **15**, wherein the instructions are further operable when executed by one or more of the processors to cause the system to:
determine that the system is in the vehicle; and
prevent any alerts that the vehicle is approaching when it is determined that the system is in the vehicle.

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