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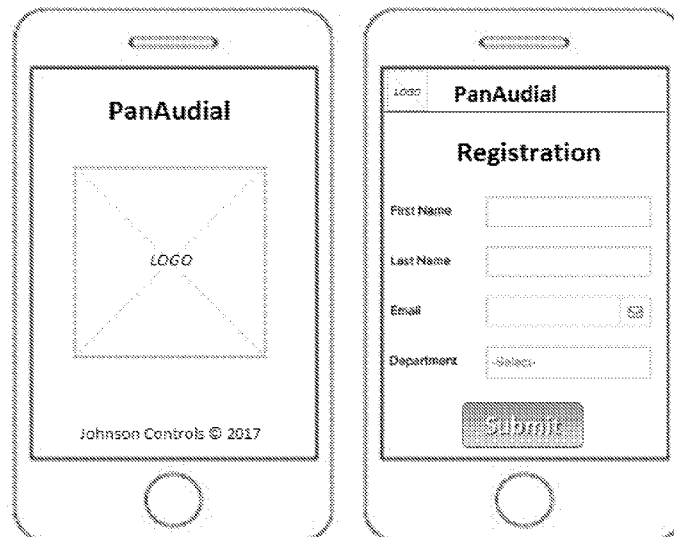


FIG. 1

(57) Abstract: A system and method aimed to assist with the reporting of an emergency (e.g., a fire) and subsequently thereto, if required, to assist with the evacuation process is disclosed. The system and method of the present disclosure uses an internet enabled device (e.g., a smartphone) to run an APP to assist and/or supplement in the reporting or notifying of a fire in a building and subsequently to assist with the evacuation of the occupants. The system and method of the present disclosure may assist occupants in quickly notifying others of an emergency (e.g., fire) by enabling them to use their smartphone to report a dangerous situation. In addition, the system and method may utilize real-time location tracking services to provide additional information on the location of a fire and building occupants.



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SYSTEM AND METHOD FOR AIDING WITH REPORTING AN EMERGENCY AND SUBSEQUENT EVACUATION PROCEDURES

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present disclosure claims the benefit of and priority to U.S. Provisional Application No. 62/492,415, titled “SYSTEM AND METHOD FOR AIDING WITH REPORTING AN EMERGENCY AND SUBSEQUENT EVACUATION PROCEDURES,” filed May 1, 2017, the disclosure of which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] The present disclosure relates generally to the field of alarm systems, and more particularly to a system and method utilizing an internet enabled device (e.g., smartphone) running an APP for alerting occupants to an emergency, allowing occupants to report an emergency, and assisting with subsequent evacuation procedures.

BACKGROUND

[0003] Buildings such as, for example, commercial buildings, residential buildings, high-rise buildings, hotels, etc., may have hundreds of people or occupants including employees, guests, visitors, etc. (used interchangeably herein) each day. One consequence of having so many occupants or visitors in a building is the need to alert all the occupants and visitors of an emergency and, if necessary, to evacuate everyone in a safe and efficient manner.

SUMMARY

[0004] One implementation of the present disclosure is a computer implemented method for providing users with improved emergency notification capabilities. The method includes downloading, by one or more processors of a client device from an application server, a building occupancy application (APP); launching, by the one or more processors, the APP; providing a link, by the one or more processors upon launching the APP, to report an emergency condition; receiving, by the one or more processors via the APP, a user input indicating selection of the link; and transmitting, by the one or more processors using a communications interface of the client device, a notification for receipt by one or more remote devices corresponding to one or more corresponding designated inspectors, upon reporting the emergency condition via the APP based on selection of the link, the

notification including a current location of the client device upon which the APP was downloaded.

[0005] Another implementation of the present disclosure is an article of manufacture including a computer storage device. The computer storage device includes instructions that when executed cause a system to communicate with an APP stored on a client device, track a current location of a user based on a location of the client device, and receive one or more emergency notifications, wherein each notification indicates that a fire is detected, and the current location of the fire.

[0006] Another implementation of the present disclosure is a method of operating an alarm communication system. The method includes maintaining, by one or more processors of the alarm communication system, a database including a plurality of user identifiers associated with a plurality of users of a building, each user identifier associated with at least one location data structure, the at least one location data structure including at least one of (1) a location associated with an access controller of the building or (2) a location associated with a client device associated with the user; receiving, by the one or more processors via a communications interface of the alarm communication system from a first client device of a first user of the plurality of users, a first transmission; extracting, by the one or more processors from the first transmission, location information associated with an emergency condition; generating, by the one or more processors based on the location information associated with the emergency condition, a second transmission identifying a location of the emergency condition; identifying, by the one or more processors using the user database, one or more second client devices, the one or more second client devices each associated with a user identifier indicating a designated inspector user type; and transmitting, by the one or more processors via the communications interface, the second transmission to the one or more second client devices.

[0007] Another implementation of the present disclosure is an alarm communication system including a processing circuit including one or more processors and a memory, and a communications interface. The memory includes a database including a plurality of user identifiers associated with a plurality of users of a building, each user identifier associated with at least one location data structure, the at least one location data structure including at least one of (1) a location associated with an access controller of the building or (2) a location associated with a client device associated with the user. The one or more

processors are configured to receive, via a communications interface of the alarm communication system from a first client device of a first user of the plurality of users, a first transmission. The processing circuit is configured to extract, from the first transmission, location information associated with an emergency condition. The processing circuit is configured to generate, based on the location information associated with the emergency condition, a second transmission identifying a location of the emergency condition. The processing circuit is configured to identify, using the user database, one or more second client devices, the one or more second client devices each associated with a user identifier indicating a designated inspector user type. The processing circuit is configured to transmit, via the communications interface, the second transmission to the one or more second client devices.

[0008] Those skilled in the art will appreciate that the summary is illustrative only and is not intended to be in any way limiting. Other aspects, inventive features, and advantages of the devices and/or processes described herein, as defined solely by the claims, will become apparent in the detailed description set forth herein and taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is an exemplary screenshot of an APP according to an embodiment of the present disclosure, the screenshot requesting users to register;

[0010] FIG. 2 is an exemplary screenshot of an APP according to an embodiment of the present disclosure, the screenshot requesting a user if they want to report a fire;

[0011] FIG. 3 is an exemplary screenshot of an APP according to an embodiment of the present disclosure, the screenshot notifying a fire inspector that a user has reported a fire;

[0012] FIG. 4 is an exemplary screenshot of an APP according to an embodiment of the present disclosure, the screenshot requesting the fire inspector to indicate if the reported fire was genuine or not;

[0013] FIG. 5 is an exemplary screenshot of an APP according to an embodiment of the present disclosure, the screenshot illustrating designated area and staff user evacuation route;

[0014] FIG. 6 is a block diagram of a system for aiding with reporting an emergency and subsequent evacuation procedure according to an embodiment of the present disclosure;

[0015] FIG. 7 is a flow diagram of a method for providing users with improved emergency notification capabilities according to an embodiment of the present disclosure; and

[0016] FIG. 8 is a flow diagram of a method for aiding with reporting an emergency and subsequent evacuation procedure according to an embodiment of the present disclosure.

DETAILED DESCRIPTION

[0017] Embodiments of an internet enabled device (e.g., smartphone, etc.) running a computer application program or "APP" for providing enhanced capabilities to assist with the reporting of an emergency situation and, subsequently thereto, to assist with the evacuation procedures for getting occupants out of the building during an emergency situation in accordance with the present disclosure will now be described more fully hereinafter with reference to the accompanying drawings, in which illustrative embodiments of the present disclosure are presented. The internet enabled device and APP of the present disclosure may, however, be embodied in many different forms and should not be construed as being limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will convey certain example aspects of the internet enabled device and/or APP to those skilled in the art.

[0018] The present disclosure concerns an internet enabled device such as, for example, a smartphone, for running a computer program or APP, which can be used by building managers and designated fire inspectors, supervisors, etc. (collectively referred to herein as a fire inspector without the intent to limit) to assist with the reporting of an emergency and, subsequently thereto, to assist with the evacuation procedures for getting occupants out of the building during the emergency.

[0019] Use of smartphones has exploded in recent years. It is estimated that over 250 million users will have a smartphone in the United States in 2020. With such nearly universal usage, today's smartphones have nearly endless possibilities. Today, smartphones can be used as mini-computers, electronic phonebooks, calculators, alarm clock, calendar, photo album, radio, etc. In addition, smartphones incorporate wireless technologies

including, but not limited to, Bluetooth, GPS, Wi-Fi, etc. The incorporation of such wireless technologies enable the smartphone to wirelessly communicate and for the location of the smartphone to be accurately tracked.

[0020] Generally speaking, the present disclosure is directed to a system and method aimed to assist with the reporting of an emergency such as, for example, a fire and subsequently thereto, if required, to assist with the evacuation process. That is, the system and method of the present disclosure attempts to assist and/or supplement in the reporting or notifying of a fire in a building and subsequently to assist with the evacuation of the occupants. In one embodiment, the system and method of the present disclosure may assist the building's designated fire inspector to perform their duties more efficiently. The system and method may utilize real-time location tracking services to provide additional information on the location of a fire and building occupants. The system and method may also assist with those occupants suffering hearing impairments, who may not be able to hear the standard fire alarm and evacuation notices. The system and method may assist by providing an alternative method of reporting events (via, for example, sound, light and vibration) without the need for specialized equipment. By supplementing current notification and evacuation procedures with the system and method of the present disclosure, several advantages are achieved.

[0021] In one embodiment, the system and method of the present disclosure may provide the occupant with the ability to report a fire or another emergency using their smartphone. For example, occupants in a building may not be aware of the location of notification units, such as, for example, break glass units. In one embodiment, the system and method of the present disclosure assists occupants in quickly notifying others of an emergency (e.g., fire) by enabling them to use their smartphone to report a dangerous situation.

[0022] In one embodiment, the system and method of the present disclosure may assist fire inspectors by initially alerting them to a potentially dangerous situation (e.g., fire). That is, notification by a user of a fire via their smartphone may transmit a notification to the fire inspector, thus providing the fire inspector with a "first knock" alert prompting the fire inspectors to investigate the reported site of the fire or wait for further instruction from chief fire inspector.

[0023] During an emergency (e.g., fire), it is often difficult for fire inspectors to locate each occupant within the building. In one embodiment, by providing real-time situational and location awareness to fire inspectors and occupants, notification of the emergency and evacuation of the building may be made safer and more reliable. In addition, the method and system of the present disclosure facilitates acknowledgement from the occupants that they are aware of the emergency.

[0024] For example, using real-time location tracking services built-in to the smartphones, fire inspectors can be made aware of the precise location of the fire (e.g., location where the fire was initially reported and subsequently any confirmed locations of fire). In addition, fire inspectors can track, in real-time, the location of other fire inspectors, firemen, etc. Moreover, essential equipment may also be located and tracked in real-time. That is, smartphones may also be equipped to track the location of necessary equipment during an emergency. During an emergency, the location of equipment and fire related units may also be reported to fire inspectors (e.g. the storage location of helmets, axes, fire distinguishers, fire panels, break glass units, specialized equipment such as, for example, wheelchairs, respirators etc.). Moreover, using the location tracking feature built-in to smartphones, a fire chief or building manager may be able to confirm the presence of other fire inspectors within the building.

[0025] Moreover, in one embodiment, by utilizing real-time location tracking services built-in to smartphones, evacuation of a building may be made safer and more reliable. For example, in one embodiment, using the location tracking feature built-in to smartphones, fire inspectors can track, in real-time, the location of occupants in a building. In addition, evacuation information, alerts and prompts may be directly transmitted to occupants in the building. For example, in a stressful emergency it may be difficult for people to remember the proper evacuation procedures. In one embodiment, the method and system of the present disclosure may, by providing detailed instructions and evacuation routes, assist with evacuating occupants in a safe and efficient manner. That is, evacuation information such as, for example, identifying the occupant's current location, the location of the fire, the quickest route to safety, mustering points, real time location awareness of the fire inspectors, etc. may be transmitted directly to the user's smartphone.

[0026] In one embodiment, the method and system of the present disclosure may assist with notifying occupants by directly transmitting emergency notifications to a user's

smartphone via sound, light and vibration. As such, smartphones may be particularly useful in notifying occupants who may not hear a standard alarm, for example, people who may suffer from a hearing impairment or people who are in an area of the building where the fire alarm may be difficult to hear. By using a smartphone and APP to alert users, the user may be alerted via a combination of visual, audial and haptic cues. People with disabilities often require specialized equipment to alert them of a fire alarm or emergency, by using the person's own smartphone, the need for specialized equipment may be eliminated. In addition, it may assist fire inspectors to contact or check-in on users with special needs to alert fire inspectors that special attention may be needed in an evacuation (e.g., a respirator, wheelchair, etc.).

[0027] Referring to FIG. 1, a user (e.g., an occupant in a building, etc.) may download the APP onto his or her smartphone. Upon initial launching of the APP, the user may be presented with a screen requesting that they register to use the APP. Registration may include creating a username and password and supplying some basic personal information such as, for example, name, email address, department details regarding where they work, user type (e.g., staff, fire inspector), etc.

[0028] Referring to FIG. 2, in one embodiment, anytime a general staff user launches the APP, they may be brought straight to a screen where they can report an emergency, for example, a fire. During an emergency (e.g., a fire), the user may report the fire by pressing a link on the APP. Ideally, the user will also report the fire through other known standard mechanisms, such as, for example, pulling a fire alarm. Upon reporting a fire via the APP, a notification may be sent to the building's designated fire inspectors. The notification transmitted may include the users name and location.

[0029] In return, the notification received by the building's designated fire inspectors may include the location of the user who reported the fire and the fire inspector's quickest route to the user's location based on the fire inspector's current location. In addition, the user's smartphone may be shown a second screen specifying that their notification has been sent and to await further instructions.

[0030] In one embodiment, when a user attempts to report a fire, if a report has already been sent from the same area by another user, another notification may not be sent to prevent the designated fire inspector's smartphone from becoming overloaded with reports

of a fire. In any event, the user's smartphone may still show a screen specifying that their report has been sent and to await further instructions.

[0031] Referring to FIG. 3, once a fire has been reported, either via the APP or by a fire alarm panel, a notification may be sent to the building's designated fire inspectors' smartphones. This notification may display a flashing main image. The notification may also cause the smartphone to vibrate and/or sound a siren in sync with the flashing main image. In response, the APP may require the fire inspector to acknowledge that they have received the alert by pressing a button (e.g., "Investigate" button) on their smartphone. This acknowledgement may also allow other fire inspectors to know who is active.

[0032] Once the fire inspector has acknowledged the alert, they may be brought to the next screen indicating who reported the fire (in the case of the application being used) and the location of the fire alarm trigger. In addition to this textual information, a map displaying the reporting user's current location along with the quickest route to the user's location from the inspector's current location may be displayed. The APP may also display the location and active status of other fire inspectors. In one embodiment, chief fire inspectors may be denoted differently from other personnel. For example, a chief fire inspector may be denoted by a fire helmet avatar (active , inactive ) , a fire inspector may be denoted by a person avatar (active , inactive ) and a current fire ward (i.e. reporting user) may be denoted by a green person avatar () along with the fastest route denoted by, for example, a blue line.

[0033] In this manner, all fire inspectors may be able to see each other's location and movement in real time, thus assisting each fire inspector in their decision-making process as to investigate the issue or to stay at their current location waiting for clarification on whether the report is genuine or a false alarm. This clarification of the outcome from the reported alert can be actioned by using the 'Evacuate' () and 'False Alarm' () buttons by the inspector at the location of the alert.

[0034] Referring to FIG. 4, following the clarification from the fire inspector that the reported fire was a false alarm, all fire inspectors along with the user who initially reported the fire, may be notified with information from the fire inspector who has investigated the report, that everything is ok and there is no evacuation required.

[0035] Alternatively, following clarification from the fire inspector that the reported fire was genuine, all fire inspectors may be notified that they need to attend to their designated areas and all staff users may be notified that they need to evacuate the building by, for example, a flashing image, vibration and/or sound alert on their smartphones. In one embodiment, any user that receives a genuine fire message must acknowledge that they've received the message by clicking, for example, a "Show Route" button, which may display their closest and safest emergency evacuation route.

[0036] Referring to FIG. 5, once a fire inspector has indicated that an evacuation is required, all fire inspectors may be notified and asked to proceed to their designated zones to enable the evacuation process for all occupants. They may be presented with a screen indicating their quickest route to their designated area, which may be highlighted on their map. Once the users have acknowledged the evacuation alert, they may be presented with their quickest and safest route to their nearest emergency exit.

[0037] Referring now to FIG. 6, a system 100 for aiding with reporting an emergency and subsequent evacuation procedure is shown according to an embodiment of the present disclosure. The system 100 can be used to implement the functionality described with reference to FIGS. 1-5. It will be appreciated that the present solution can improve upon existing systems, which may require manual communications during alarm conditions, and may lack a coordinated manner of evacuating people from buildings with multiple alarm systems in place (as well as where there is no accurate count of people in the building).

[0038] The system 100 can include an alarm communication system (ACS) 110. The ACS 110 can communicate with various other entities, such as client devices 120, communication devices 124, and access controllers 128.

[0039] As shown in FIG. 6, the system 100 includes a communications interface 112 and a processing circuit 114. Communications interface 112 may include wired or wireless interfaces (e.g., jacks, antennas, transmitters, receivers, transceivers, wire terminals, etc.) for conducting data communications with various systems, devices, or networks. For example, communications interface 112 may include an Ethernet card and/or port for sending and receiving data via an Ethernet-based communications network (e.g., network 126). In some embodiments, communications interface 112 includes a wireless transceiver (e.g., a WiFi transceiver, a Bluetooth transceiver, a NFC transceiver, ZigBee, etc.) for communicating via

a wireless communications network (e.g., network 126). Communications interface 102 may be configured to communicate via network 126, which may be associated with local area networks (e.g., a building LAN, etc.) and/or wide area networks (e.g., the Internet, a cellular network, a radio communication network, etc.) and may use a variety of communications protocols (e.g., BACnet, TCP/IP, point-to-point, etc.). While FIG. 6 illustrates ACS 110 as communicating with other entities in system 100 via network 126, it will be appreciated that ACS 110 may directly communicate with the other entities.

[0040] Processing circuit 114 includes a processor 116 and memory 118. The processor 106 may be a general purpose or specific purpose processor, an application specific integrated circuit (ASIC), one or more field programmable gate arrays (FPGAs), a group of processing components, or other suitable processing components. The processor 106 may be configured to execute computer code or instructions stored in memory 108 (e.g., fuzzy logic, etc.) or received from other computer readable media (e.g., CDROM, network storage, a remote server, etc.) to perform one or more of the processes described herein. The memory 118 may include one or more data storage devices (e.g., memory units, memory devices, computer-readable storage media, etc.) configured to store data, computer code, executable instructions, or other forms of computer-readable information. The memory 118 may include random access memory (RAM), read-only memory (ROM), hard drive storage, temporary storage, non-volatile memory, flash memory, optical memory, or any other suitable memory for storing software objects and/or computer instructions. The memory 118 may include database components, object code components, script components, or any other type of information structure for supporting the various activities and information structures described in the present disclosure. The memory 118 may be communicably connected to the processor 116 via the processing circuit 114 and may include computer code for executing (e.g., by processor 116) one or more of the processes described herein. The memory 118 can include various modules (e.g., circuits, engines) for completing processes described herein.

[0041] In some embodiments, the client device 120 includes a position sensor, such as a GPS/GNSS sensor configured to detect a position of the client device 120. It will be appreciated that in various use cases, particularly when the client device 120 is located inside of a building and/or in a multi-path signal environment, a position detected by the position sensor may have uncertainty. For example, an expected uncertainty of the position

sensor of the client device 120 may be on the order of meters in typical situations (e.g., position may be detected to +/- 5 meters), and may increase significantly in locations inside of a building, including to the order of tens of meters. It will be appreciated that in order for the ACS 110 to accurately track locations of users by tracking locations of client devices 120, the accuracy provided by the position sensor of the client devices 120 may be insufficient.

[0042] The client device 120 can be various electronic devices, particularly portable electronic devices associated with users, such as smartphones. The client device 120 is configured to communicate with communication devices 124, such as by including a wireless transceiver analogous to the wireless transceiver of the ACS 110. The client device 120 can include a user interface including a display device and a user input device (not shown). The client device 120 can include a processing circuit including a processor and memory (not shown).

[0043] The client device 120 can use the processing circuit to execute an application (APP) 122, such as to execute functions described with respect to the APP of FIGS. 1-5. The APP 122 can be a building occupancy application. In some embodiments, the client device 120 can establish a communication link with an application server 130 via network 126 and receive (e.g., download) the APP 122 via the communication link. In some embodiments, the application server 130 is hosted by the ACS 110. As will be discussed further herein, the APP 122 can store identifiers of the communication devices 124 with which the client device 120 establishes a communications link.

[0044] The communication devices 124 can include various devices such as WiFi devices (e.g., WiFi routers), Bluetooth devices, near field communication (NFC) devices, and other devices configured to establish a communications link with client devices 120 and/or network 126. The communications devices 124 can be configured to operate according to various wireless communications protocols.

[0045] The access controllers 128 can be located throughout the building. The access controller 128 can be configured to selectively enable access to locations in the building, such as by actuating gates, doors, turnstiles, or other access control devices responsive to an access condition being satisfied, such as security information received at the access controller 128 matching stored security information. The access controller 128 can be

configured to read an access card or other security credential provided by a user. The access controller 128 may include, for example, smartcard readers, magnetic stripe readers, biometric readers, access keypads, and the like, each of which may require a credential (e.g., signal received from an access credential or via a user input device of the access controller 128 indicative of a credential) responsive to which the access controller 128 enables access.

[0046] The access controller 128 can store and/or communicate to the ACS 110 indications of user entry through the associated access control devices. For example, responsive to receive the credential and actuating the access control device, the access controller 128 can modify a location state associated with a user identifier associated with the credential. Modifying the location state can include assigning a location mapped to the access controller 128 to the location state of the user identifier. For example, the credential may indicate a user identifier corresponding to a name or identification number. The access controller 128 can associate, to the user identifier, a location that the user would have entered by accessing the access controller 128. As such, the access controller 128 can facilitate generating a mapping of people in the building to locations in the building. The access controller 128 can also store a time associated with the user entry (e.g., by recording a time responsive to receiving credential information or actuating the access control device). The access controllers 128 can transmit some or all of this information to the ACS 110, such as by transmitting a signal including location information of the form {user identifier; location, time}. It will be appreciated that the access controller 128 can provide a fully precise point location for the user at a specific point in time (e.g., without an associated uncertainty because it is known that the user will have moved immediately adjacent to the access controller 128 and/or the associated access control device), as compared to communication devices 124, which may have uncertainty associated with the location. At the same time, the precision and accuracy of the location of the user as determined by the access controller 128 may decrease significantly over time; for example, if the user only enters the access-controlled area once a day, it may be difficult for the ACS 110 to rely on the information received from the access controller 128 to make a determination with high confidence regarding the location of the user. As described herein, the present solution can improve the operation of systems having access controllers 128 (where typically, during an alarm situation, a manual roll call would be required) by enabling an accurate determination

regarding location of users even if information from the access controller 128 is not accurate.

[0047] In some embodiments, the access controllers 128 are configured to require a credential to enable access in a first mode of operation but not in a second mode of operation. For example, the access controllers 128 may control operation of a door (or other similar device) that is locked in a first direction, and thus can be electronically actuated by the access controllers 128 to be moved in the first direction (such as to enter a secure area, such as an office space within a building); at the same time, the door can be manually opened in a second direction.

[0048] In various such embodiments, the access controller 128 may be required to only require the credential for movement in the first mode of operation. For example, the access controllers 128 may be required (e.g., by regulations) to not prevent access control devices from opening in a direction towards an exit of a building, particularly during an emergency condition, so as to ensure that people inside the building can exit as easily as possible. As such, while the access controller 128 can store and transmit to the ACS 110 information regarding user entry, such as user identifier, location, and time information, the access controller 128 cannot store or transmit information regarding user exit. The access controller 128 may be configured to maintain a count of user exits, such as to compare to a count of user entries, but the ACS 110 may not be able to use the count of user exits to determine, with sufficient confidence, that each user has exited the building.

[0049] Referring further to FIG. 6, in some embodiments, the ACS 110 maintains a user database. The user database can include, for each user, one or more of a user identifier, a location, a time associated with the location, a device identifier (associated with the client device 120 of the user), and a user type. It will be appreciated that a plurality of locations may thus be stored over time for each user, which can enable the ACS 110 to calculate an estimated location. The user type may indicate whether the user is a designated inspector, such that the ACS 110 can transmit information intended to be received by designated inspectors to the corresponding client device 120 associated with the designated inspector user.

[0050] In some embodiments, the ACS 110 assigns an indication of a source of the location to each location stored in the user database. For example, the ACS 110 can

indicate that the received location corresponds to a particular WiFi router of the communications devices 124 or a particular access controller 128 of the access controllers 128.

[0051] It will be appreciated that over time, location information associated with particular users may decrease in accuracy or otherwise become stale. For example, location information more than twenty-four hours old, in most cases, will be redundant and/or insufficiently accurate for the ACS 110 to use to make an estimation of a location of a user with reasonable confidence. At the same time, maintaining numerous location information entries for each user can impose a significant data storage burden on memory 118 of ACS 110. As such, the ACS 110 can improve both accuracy of location estimation and reduce the data storage burden on memory 118 by executing a data expiration policy to information maintained in the user database. The data expiration policy can include a plurality of rules that the ACS 110 can use to determine whether to delete location information from the user database based on at least one of predetermined durations of time or indications of the source of the location. For example, the data expiration policy can include a rule to delete location data for a particular user that is (1) associated with a specific access controller 128 and (2) not the most recent location data for the specific access controller 128. The data expiration policy can include a rule to delete location data for a particular user that is older than a threshold duration of time (e.g., a threshold duration of time on the order of minutes, hours, or days).

[0052] In some embodiments, the ACS 110 executes the data expiration policy to not store or delete redundant data while also maintain a count associated with locations. For example, the ACS 110 can identify a source of the location information based on an indication of the source, determine that the user database includes at least one entry corresponding to the identified source, and at least one of (1) delete the existing entry and add a new entry or (2) delete the existing entry and increment a count associated with the location corresponding to the identified source. For example, if the ACS 110 determines that a received location information is based on information with a WiFi router that has already been connected to, the ACS 110 can delete older entries and increment a count of entries (the incremented count can be used to increase a confidence that the user is located near the WiFi router). The ACS 110 can reset the count to zero after a period of time, such as a day.

[0053] In some embodiments, the ACS 110 maintains a building map database. The building map database can include a map for each building. The map can be a data structure representative of spatial relationships and distances between specific locations in the building. In some embodiments, the map defines a plurality of locations, each of which may be assigned a map feature.

[0054] The ACS 110 can assign the communication devices 124 (e.g., as map features) to locations of the map of the building maintained in the building map database. Similarly, the ACS 110 can assign the access controllers 128 as map features to locations of the map of the building. As such, the ACS 110 can maintain (and update, over time), locations of each communication device 124 and/or access controller 128. Assigning the communications devices 124 and/or access controllers 128 to locations of the map can include assigning a device identifier of the communications devices 124 and/or access controllers 128 to locations of the map. In some embodiments, the ACS 110 assigns a known or expected uncertainty to the communications devices 124 and/or access controllers 128. The known or expected uncertainty can correspond to an uncertainty in the location determination for the corresponding device. For example, if the communication device 124 is a WiFi router having an expected range of 30 meters, the ACS 110 can assign an expected uncertainty of 30 meters to the location of the user (where the location of the user corresponds to the location of the WiFi router).

[0055] The ACS 110 can receive a location corresponding to a user from the client device 120 (e.g., from the APP 122 of the client device 120). For example, the ACS 110 can receive a location signal including at least one of the user identifier, the location of the client device 120, the time associated with the location, or the device identifier of the client device 120. In some embodiments, the ACS 110 can receive a location signal including one of the user identifier or the device identifier, and retrieve the other of the user identifier or the device identifier by performing a lookup in the user database.

[0056] The ACS 110 can update the user database based on the information of the location signal received from the client device 120. The ACS 110 can use the information of the location signal to assign locations of users to the map stored in the building map database. The ACS 110 may assign an uncertainty to each location based on an indication of the source of the location (e.g., based on a device identifier of the device used to determine the location).

[0057] The client device 124 can execute the APP 122 to generate the location information. For example, the client device 124 can execute the APP 122 can poll the position sensor of the client device 120 to determine a GPS-based position, and generate the location information to include the GPS-based position and a time at which the GPS-based position was detected. The client device 124 can execute the APP 122 to detect a communication link with a particular communication device 124, and generate the location information to include a device identifier of the particular communication device 124. In some embodiments, the client device 124 can execute the APP 122 to detect signal quality parameters associated with the communication link, including but not limited to signal strength or latency.

[0058] In some embodiments, the client device 120 executes the APP 122 in at least two different modes based on a state of the client device 120. The client device 124 can operate in the at least two different modes based on a desired power usage by the client device 120. For example, in a first mode, the client device 120 can execute the APP 122 to poll the position sensor and/or detect communication links with communication devices 124 at a first sample rate, and in a second mode, the client device 120 can execute the APP 122 to poll the position sensor and/or detect communication links with communication devices 124 at a second sample rate greater than the first sample rate. As such, power usage by the client device 120 can be reduced in the first mode, particularly where performing such sampling can require the client device to draw significant power from a power supply (e.g., battery). In some embodiments, the first mode is a normal mode of operation, and the second mode includes at least one of a startup mode of operation or an alarm mode of operation. The client device 120 can execute the APP 122 in the startup mode of operation responsive to receiving instructions to launch the APP 122. The client devices 120 can execute the APP 122 in the alarm mode of operation responsive to receiving a notification from ACS 110 indicating an alarm for the building. It will be appreciated that by reducing the sampling rate, the client device 120 can improve data privacy for users by reducing a rate at which the client device 120 determines and outputs location information; similarly, data storage load for (and data privacy concerns regarding) the ACS 110 are reduced.

[0059] In some embodiments, the client device 120 generates and/or stores the location information in a manner that reduces bandwidth required to transmit the location information to the ACS 110 and/or reduces data storage load on the ACS 110 (as well as on

the client device 124). For example, while operating in the first mode, the client device 120 may store location information on local memory for a predetermined period of time (e.g., one hour), and transmit the location information to the ACS 110 in batches and/or in response to a request from the ACS 110, rather than at a more frequent rate. In some embodiments, the client device 120 maintains a count associated with communication links to particular communication devices 124; rather than store and/or transmit location information each time a communication link is detected with each particular communication device 124, the client device 120 can increment (and store/transmit) the corresponding count.

[0060] The client device 120 can execute the APP 122 to provide a user interface. For example, the client device 120 can execute the APP 122 to provide a link, upon launching the APP 122, to report an emergency condition. Responsive to receiving user input to execute the link, the client device 120 can generate a notification transmission indicative of the emergency condition and transmit the notification transmission to the ACS 110. The client device 120 can include location information in the notification transmission, such as location information determined by executing the APP 122 to poll the position sensor and/or detect communication link(s) with communication device(s) 124. The notification transmission can cause the ACS 110 to transmit an indication of the emergency condition to one or more client devices 120, such as client devices 120 associated with designated inspectors. The client device 120 can execute the APP 122 to provide a second screen indicating that the notification transmission has been sent.

[0061] In some embodiments, the client device 120 executes the APP 122 to provide a user interface including a map of the building. The client device 120 can receive user input via the user interface, which may be used to indicate a location of the emergency condition. The client device 120 can generate the notification transmission to include the indicated location of the emergency condition.

[0062] As such, the ACS 110 can determine a current location of the client device 120 based on at least one of (1) the notification transmission from the client device 120, (2) other transmissions from the client device 120 including location information, or (3) information maintained in the user database by the ACS 110 regarding the client device 120. The ACS 110 can determine the current location by using the user database and/or building map database to retrieve data such as each location assigned to each access

controller 128 associated with the user identifier associated with the client device 120, and/or each location assigned to each communication device 124 associated with the client device 120.

[0063] The ACS 110 can execute a location determination function based on the retrieved location(s). Executing the location determination function can include calculating a weighted average of the retrieved location(s). The weights of the weighted average may depend on various factors, such as known or expected uncertainty associated with each communication device 124 and/or access controller 128, as well as the time(s) associated with the retrieved location(s). For example, if the retrieved locations include several entries corresponding to a location associated with a particular Bluetooth communication device 124, then the corresponding weighting for the location can be relatively high. In some embodiments, the ACS 110 uses signal quality parameters (e.g., as detected by client device 122 when executing the APP 122 to detect a communication link with communication devices 124) to execute the location determination function; for example, a relatively higher signal quality can increase a confidence that the client device 120 was in proximity to the corresponding communication device 124 and/or reduce an uncertainty associated with the corresponding communication device 124. The ACS 110 can assign a relatively high weight to GPS-based location data, a relatively lower weight to Bluetooth-based location data, and a still lower weight to WiFi-based location data.

[0064] In some embodiments, the ACS 110 uses the notification transmission to transmit an inspection transmission to a client device 120 associated with a designated inspector. For example, responsive to receiving the notification transmission, the ACS 110 can search the user database to identify one or more client devices 120 associated with designated inspectors based on user type data. The ACS 110 can generate the inspection transmission to include the determined current location of the client device 120 from which the notification transmission was received. The ACS 110 can generate the inspection transmission to include the location of the emergency condition as indicated by user input received by the client device 120. The inspection transmission can be configured to cause the APP 122 executed by the client device(s) 120 associated with the designated inspector(s) to output an alarm notification, such as to user a display device of the client device 120 to display an image (e.g., flashing main image), cause a vibration actuator of the

client device 120 to vibrate the client device 120, and/or cause an audio output device of the client device 120 output an audio alarm (e.g., output a siren noise).

[0065] The inspection transmission can cause the client device 120 to request a response input. For example, in response to receiving the inspection transmission, the client device 120 can execute the APP 122 to generate a screen requiring user input acknowledging receipt of the notification (e.g., based on pressing a button the client device 120).

[0066] In some embodiments, the ACS 110 generates the inspection transmission to include at least one of a location or a status of other inspector(s) (e.g., other client devices 120 associated with other inspectors). The client device 120 can receive the inspection transmission and execute the APP 122 to provide for display the at least one of the location or the status of the other inspectors. As such, each designated inspector can view the locations and movement of other designated inspectors in real time.

[0067] In some embodiments, the ACS 110 generates the inspection transmission to include a route to the determined current location. For example, the ACS 110 can execute a route calculation function based on (1) a location of the client device 120 associated with the designated inspector and (2) the determined current location. The route may be an optimal route, such as a quickest route. In some embodiments, the client device 120 can execute the APP 122 to determine the route to the determined current location. In various such embodiments, the client device 120 can execute the APP 122 to provide the determined route for display.

[0068] The client device 120 can execute the APP 122 to include a user interface with an alarm state object. The alarm state object can include at least one of a false alarm indication or genuine emergency indication. Responsive to receiving user input indicating a selection of the false alarm indication or the genuine emergency indication (e.g., a press of a button of the client device 120), the client device 120 can generate an update transmission based on the user input and transmit the update transmission to the ACS 110. The ACS 110 can receive the update transmission, and extract the selection of the false alarm indication or the genuine emergency indication to determine an alarm state of the alarm. The ACS 110 can generate and transmit a subsequent transmission to one or more client devices 120 indicating the alarm state. For example, the subsequent transmission can indicate that the situation is safe, or can cause client devices 120 associated with designate inspectors to

provide for display a list of evacuation step(s). The subsequent transmission can cause the client device 120 to display a screen requesting an acknowledgement. The subsequent transmission can cause the client device 120 to execute the APP 122 to display an emergency evacuation route.

[0069] In some embodiments, the ACS 110 uses the locations of the users maintained in the user database to determine whether any users are present in the building (or in specific spaces in the building). For example, the ACS 110 can determine the current location of each user and an uncertainty associated with each current location. Responsive to determining that at least one current location indicates a user is not outside the building within a threshold uncertainty, the ACS 110 can generate an indication that at least one user may be present in the building (or similarly, within a particular region of the building).

[0070] Referring now to FIG. 7, a computer-implemented method 200 for providing users with improved emergency notification capabilities is shown according to an embodiment of the present disclosure. The method 200 may be performed by various systems and devices disclosed herein, such as the system 100 (e.g., the client device 120).

[0071] At 205, a building occupancy application (APP) is downloaded by one or more processors of a client device. The APP can be downloaded from an application server.

[0072] At 210, the APP is launched by the one or more processors.

[0073] At 215, a link is provided by the one or more processors. The link can be provided to report an emergency condition. The link can be provide upon (e.g., responsive to) launching the APP.

[0074] At 220, a user input is received, by the one or more processors via the APP, indicating selection of the link. For example, the one or more processors can detect actuation of a button or touchscreen of the client device corresponding to the link.

[0075] At 225, a notification is transmitted by the one or more processors, using a communications interface of the client device, to report the emergency condition. The notification can be transmitted for receipt by one or more remote devices corresponding to one or more designated inspectors. The notification can be generated and transmitted upon the reporting of the emergency condition via the APP based on selection of the link. The

notification can be generated to include a current location of the client device upon which the APP was downloaded. In some embodiments, transmitting a notification to one or more designated inspectors includes causing the corresponding one or more remote devices to perform one or more of displaying a flashing main image, vibrating, or sounding a siren. In some embodiments, transmitting the notification includes generate the notification to cause the one or more remote devices to require user input from the designated inspector to acknowledge receipt of the notification based on the user input.

[0076] Referring now to FIG. 8, a method 300 for aiding with reporting an emergency and subsequent evacuation procedure is shown according to an embodiment of the present disclosure. The method may be performed by various systems and devices disclosed herein, such as the system 100 (e.g., the ACS 110).

[0077] At 305, a database is maintained by one or more processors of an alarm communication system. The database includes a plurality of user identifiers associated with a plurality of users of a building, each user identifier associated with at least one location data structure, the at least one location data structure including at least one of (1) a location associated with an access controller of the building or (2) a location associated with a client device associated with the user.

[0078] At 310, a first transmission is received by one or more processors via a communications interface of the alarm communication system. The first transmission is received from a first client device of a first user of the plurality of users.

[0079] At 315, location information is extracted from the first transmission by the one or more processors. The location information is associated with an emergency condition, such as by identifying a location of the emergency condition.

[0080] At 320, a second transmission is generated by the one or more processors. The second transmission is generated based on the location information associated with the emergency condition. The second transmission identifies the location of the emergency condition.

[0081] At 325, one or more second client dev ices are identified by the one or more processors. The one or more second client devices can be identified using the database. For

example, the one or more processors can search the database to identify second client devices associated with user identifiers indicating a designated inspector user type.

[0082] At 330, the second transmission is transmitted, by the one or more processors via the communications interface, to the identified one or more second client devices. As such, the designated inspectors can be notified of the emergency condition and the location thereof.

[0083] The construction and arrangement of the systems and methods as shown in the various exemplary embodiments are illustrative only. Although only a few embodiments have been described in detail in this disclosure, many modifications are possible (e.g., variations in sizes, dimensions, structures, shapes and proportions of the various elements, values of parameters, mounting arrangements, use of materials, colors, orientations, etc.). For example, the position of elements can be reversed or otherwise varied and the nature or number of discrete elements or positions can be altered or varied. Accordingly, all such modifications are intended to be included within the scope of the present disclosure. The order or sequence of any process or method steps can be varied or re-sequenced according to alternative embodiments. Other substitutions, modifications, changes, and omissions can be made in the design, operating conditions and arrangement of the exemplary embodiments without departing from the scope of the present disclosure.

[0084] The present disclosure contemplates methods, systems and program products on any machine-readable media for accomplishing various operations. The embodiments of the present disclosure can be implemented using existing computer processors, or by a special purpose computer processor for an appropriate system, incorporated for this or another purpose, or by a hardwired system. Embodiments within the scope of the present disclosure include program products comprising machine-readable media for carrying or having machine-executable instructions or data structures stored thereon. Such machine-readable media can be any available media that can be accessed by a general purpose or special purpose computer or other machine with a processor. By way of example, such machine-readable media can comprise RAM, ROM, EPROM, EEPROM, CD-ROM or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to carry or store desired program code in the form of machine-executable instructions or data structures and which can be accessed by a general purpose or special purpose computer or other machine with a processor. Combinations of

the above are also included within the scope of machine-readable media. Machine-executable instructions include, for example, instructions and data which cause a general purpose computer, special purpose computer, or special purpose processing machines to perform a certain function or group of functions.

[0085] Although the figures show a specific order of method steps, the order of the steps may differ from what is depicted. Also two or more steps can be performed concurrently or with partial concurrence. Such variation will depend on the software and hardware systems chosen and on designer choice. All such variations are within the scope of the disclosure. Likewise, software implementations could be accomplished with standard programming techniques with rule based logic and other logic to accomplish the various connection steps, processing steps, comparison steps and decision steps.

WHAT IS CLAIMED IS:

1. A computer implemented method of providing users with improved emergency notification capabilities, the method comprising:
 - downloading, by one or more processors of a client device from an application server, a building occupancy application (APP);
 - launching, by the one or more processors, the APP;
 - providing a link, by the one or more processors upon launching the APP, to report an emergency condition;
 - receiving, by the one or more processors via the APP, a user input indicating selection of the link; and
 - transmitting, by the one or more processors using a communications interface of the client device, a notification for receipt by one or more remote devices corresponding to one or more corresponding designated inspectors, upon reporting the emergency condition via the APP based on selection of the link, the notification including a current location of the client device upon which the APP was downloaded.
2. The method of claim 1, further comprising providing, by at least one of the one or more remote devices, upon receiving the notification, a route to the current location of the client device based on a current location of the at least one remote device.
3. The method of claim 1, further comprising providing, by the one or more processors of the client device, a second screen via the APP specifying that the notification has been transmitted.
4. The method of claim 1, wherein transmitting the notification for receipt by the one or more remote devices includes causing the corresponding one or more remote devices to perform one or more of displaying a flashing main image, vibrating, or sounding a siren.
5. The method of claim 1, wherein transmitting the notification includes generate the notification to cause the one or more remote devices to require user input from the designated inspector to acknowledge receipt of the notification based on the user input.
6. The method of claim 1, further comprising providing the designated inspector with location and status of other inspectors so that the designated inspector can see other inspectors' location and movement in real time.

7. The method of claim 1, further comprising enabling the designated inspector to designate that the emergency condition was one of a false alarm or a genuine emergency by pressing a respective button on the inspector's smartphone.
8. The method of claim 7, further comprising, upon designating the emergency condition was a false alarm, transmitting a subsequent notification that the situation is safe.
9. The method of claim 7, further comprising, upon designating the emergency condition was a genuine emergency, transmitting a subsequent notification to all designated inspectors to take necessary evacuation steps.
10. The method of claim 7, further comprising, upon designating the emergency condition was a genuine emergency, transmitting a subsequent notification to take necessary evacuation steps.
11. The method of claim 10, further comprising, upon transmitting the subsequent notification to take necessary evacuation steps, requiring an acknowledgement response associated with the subsequent notification.
12. The method of claim 10, further comprising, upon acknowledging the subsequent notification, displaying an emergency evacuation route.
13. An article of manufacture comprising a computer storage device including instructions that when executed cause a system to:
 - communicate with an APP stored on a client device;
 - track a current location of a user based on a location of the client device; and
 - receive one or more emergency notifications, wherein each notification indicates that a fire is detected, and the current location of the fire.

14. A method of operating an alarm communication system, comprising:
- maintaining, by one or more processors of the alarm communication system, a database including a plurality of user identifiers associated with a plurality of users of a building, each user identifier associated with at least one location data structure, the at least one location data structure including at least one of (1) a location associated with an access controller of the building or (2) a location associated with a client device associated with the user;
 - receiving, by the one or more processors via a communications interface of the alarm communication system from a first client device of a first user of the plurality of users, a first transmission;
 - extracting, by the one or more processors from the first transmission, location information associated with an emergency condition;
 - generating, by the one or more processors based on the location information associated with the emergency condition, a second transmission identifying a location of the emergency condition;
 - identifying, by the one or more processors using the user database, one or more second client devices, the one or more second client devices each associated with a user identifier indicating a designated inspector user type; and
 - transmitting, by the one or more processors via the communications interface, the second transmission to the one or more second client devices.
15. The method of claim 14, wherein generating the second transmission includes configuring the second transmission to cause the one or more second client devices to request an acknowledgement of the second transmission.
16. The method of claim 14, wherein maintaining the database includes executing a data expiration policy to delete the at least one location data structure based on a time at which corresponding location information was received.
17. The method of claim 14, further comprising maintaining, by the one or more processors, a building map database including a map for the building, and assigning the at least one of (1) the location associated with an access controller of the building or (2) the location associated with a client device associated with the user to a corresponding location of the map for the building.

18. The method of claim 14, further comprising determining, by the one or more processors, a current location of a second user of the plurality of users by retrieving, from the database, each location data structure associated with the second user, and calculating a weighted average of each retrieved location data structure.

19. The method of claim 18, wherein determining calculating the weighted average includes assigning a first weight to at least one location corresponding to a WiFi device and a second weight to at least one location corresponding to a Bluetooth device, wherein the second weight is greater than the first weight.

20. The method of claim 14, wherein generating the second transmission includes generating the second transmission to include a route from a current location of the one or more second client devices to the location of the emergency condition.

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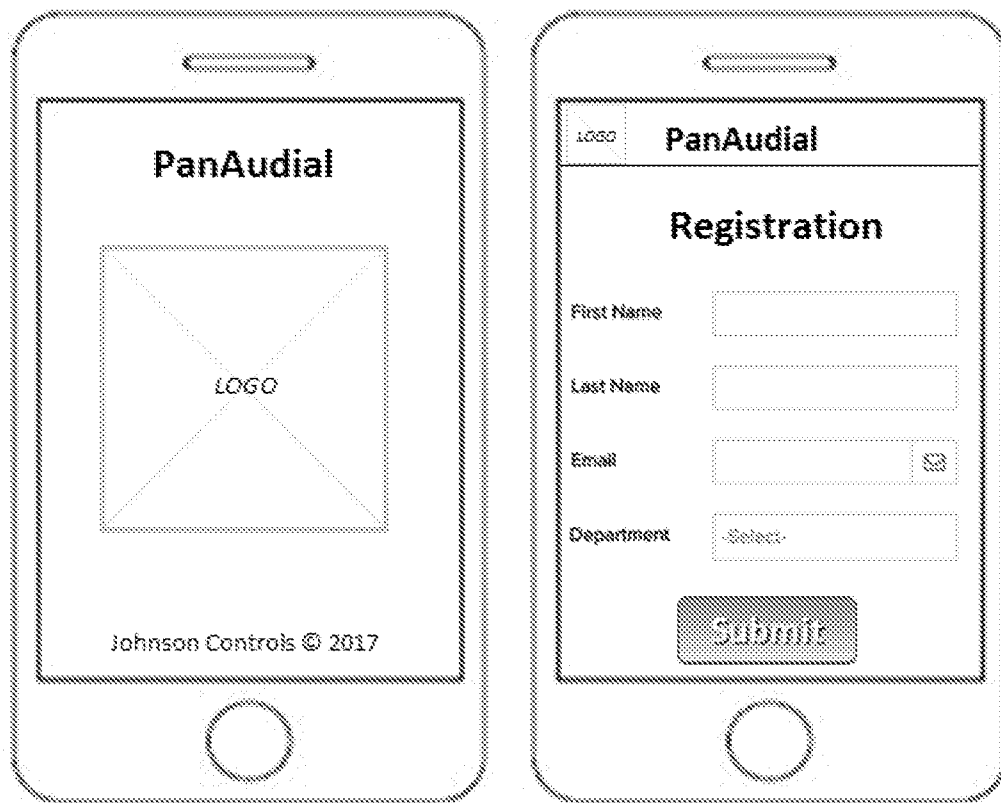


FIG. 1

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FIG. 2

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FIG. 3

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FIG. 4

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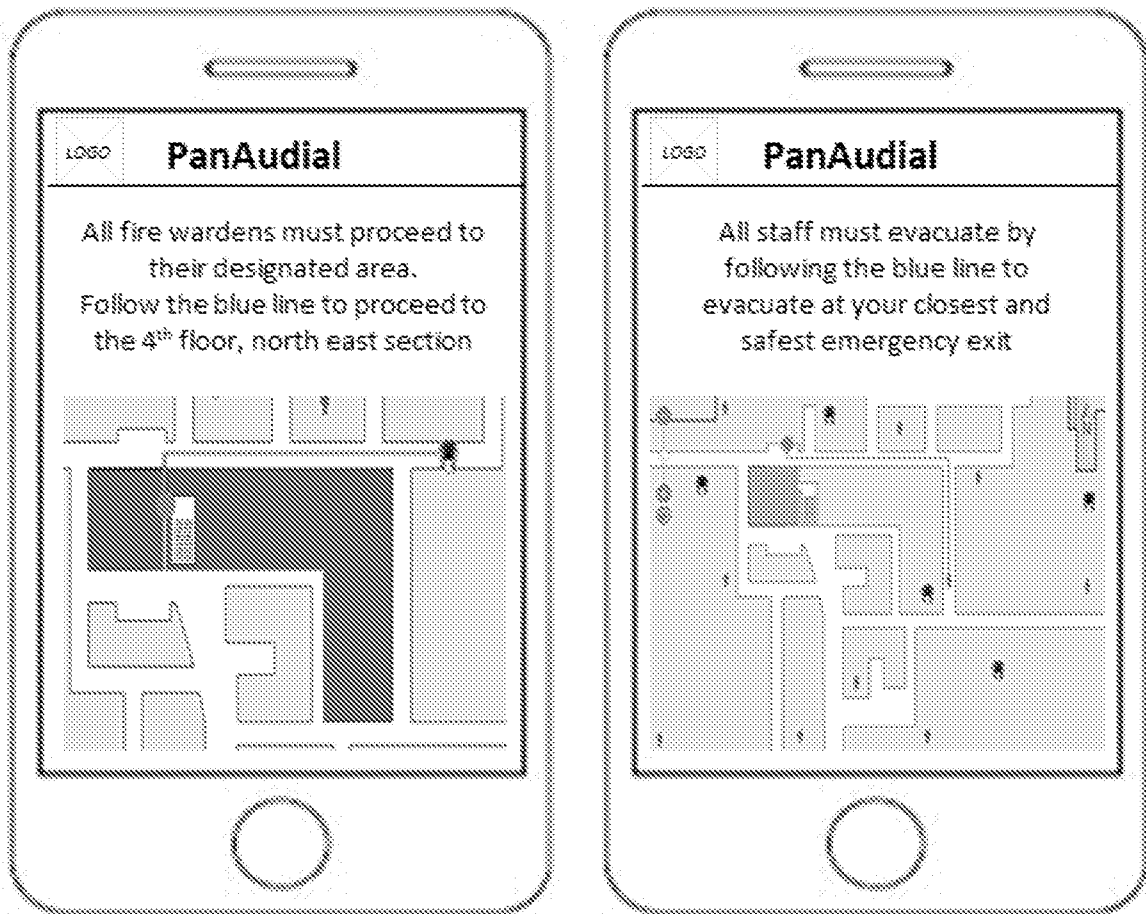


FIG. 5

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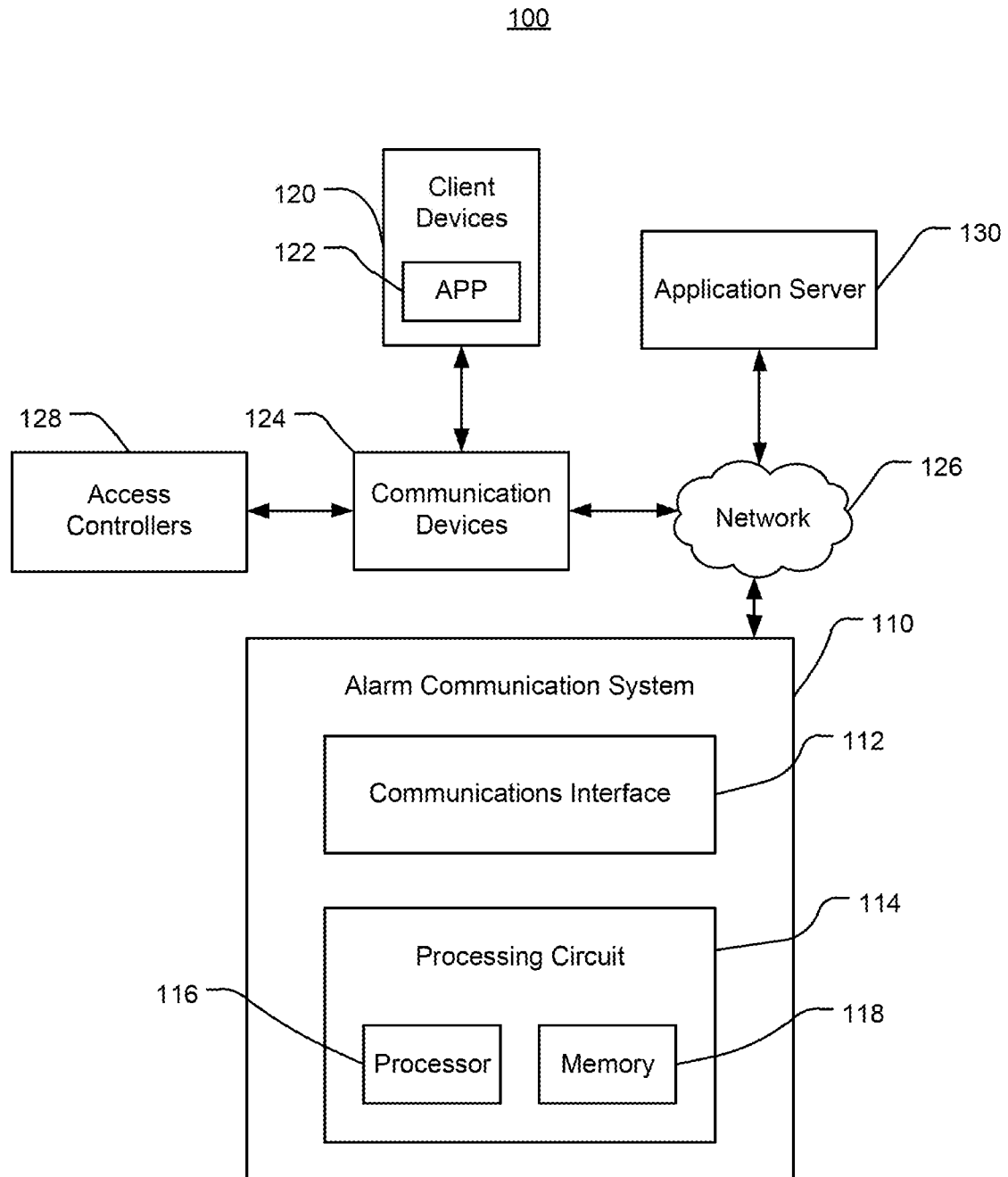


FIG. 6

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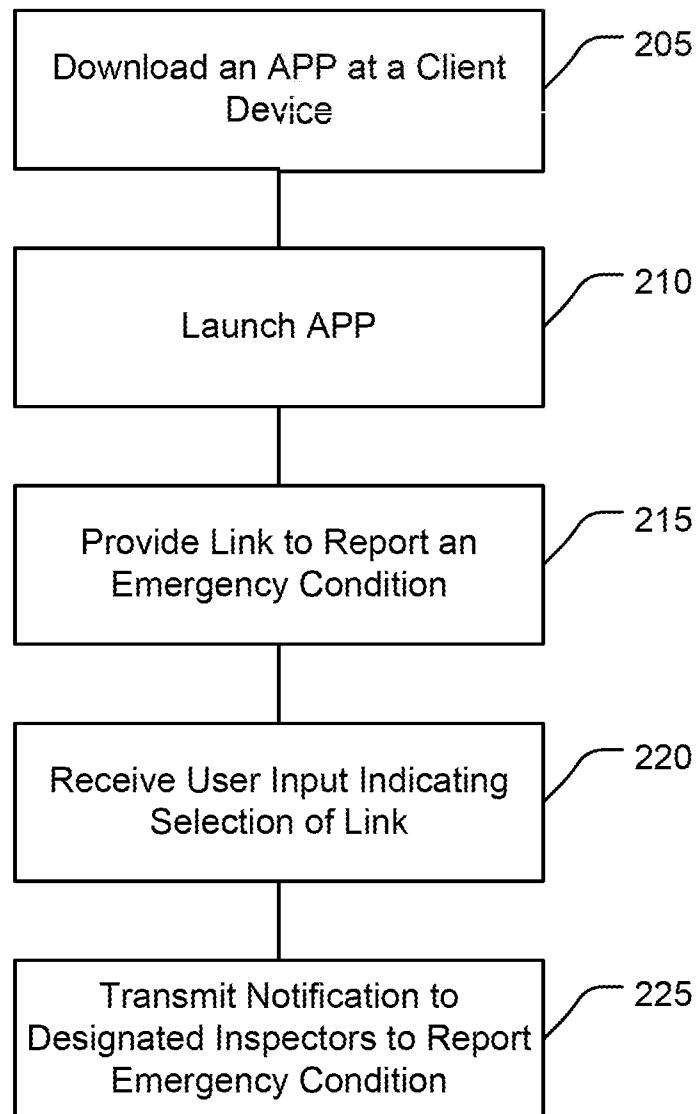
200

FIG. 7

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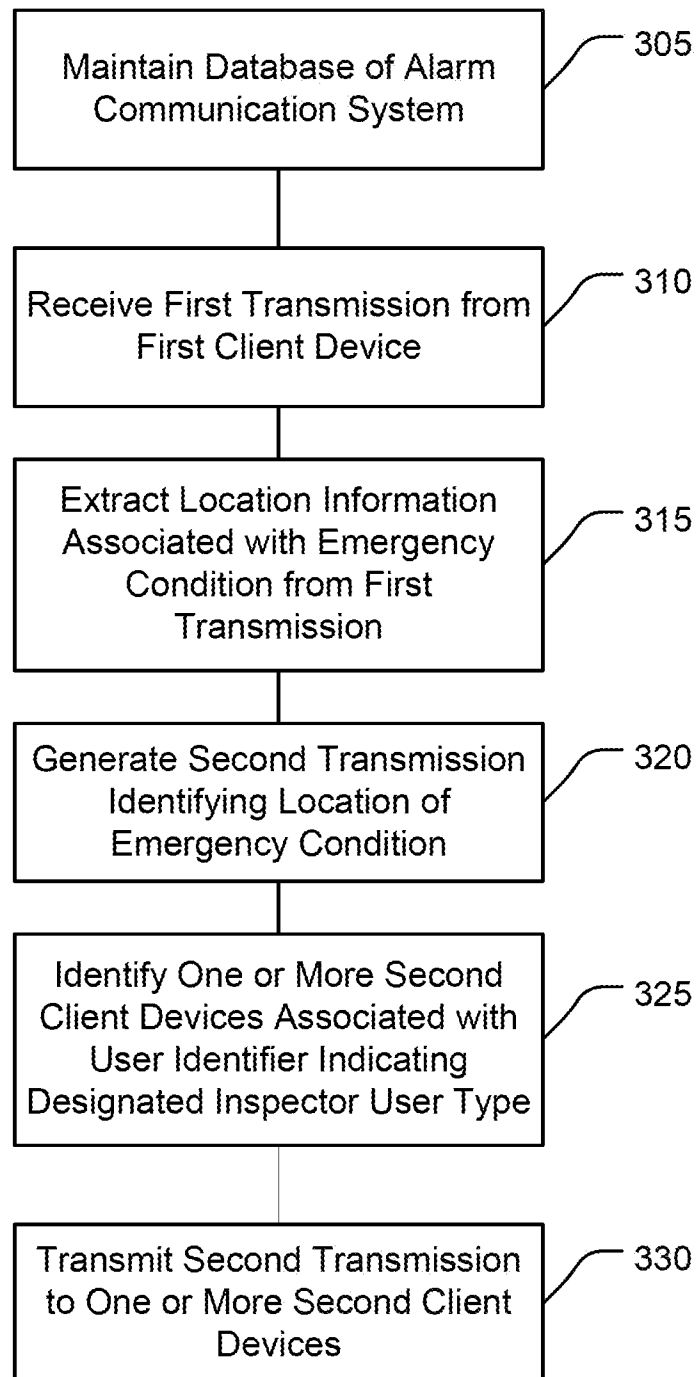
300

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2018/053002

A. CLASSIFICATION OF SUBJECT MATTER
INV. G08B21/02 G08B25/00 G08B25/10
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04H G06Q G08B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2016/115598 A1 (ALLIX DAVID [AU]) 28 July 2016 (2016-07-28)	1-3,7,8, 12
Y	paragraphs [0010] - [0014], [0037], [0052], [0055] figures 9,10,15,19	4-6,9-11
Y	----- US 2014/002241 A1 (ELGHAZZAWI ZIAD F [US]) 2 January 2014 (2014-01-02) figure 4 paragraphs [0024] - [0026], [0082], [0083]	5,6,9-11
Y	----- EP 2 963 626 A1 (KIM KYUNG JU [KR]) 6 January 2016 (2016-01-06) paragraph [0007]	4
	----- -/-	



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

9 July 2018

Date of mailing of the international search report

11/09/2018

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
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Authorized officer

Coffa, Andrew

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2018/053002

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2012/047083 A1 (QIAO LIFENG [CN] ET AL) 23 February 2012 (2012-02-23) figure 4 paragraphs [0024] - [0026] -----	4

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2018/053002

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2016115598	A1	28-07-2016	NONE
US 2014002241	A1	02-01-2014	CN 104541313 A 22-04-2015
			EP 2867875 A1 06-05-2015
			JP 2015529877 A 08-10-2015
			US 2014002241 A1 02-01-2014
			US 2017273116 A1 21-09-2017
			WO 2014003946 A1 03-01-2014
EP 2963626	A1	06-01-2016	CN 105243763 A 13-01-2016
			EP 2963626 A1 06-01-2016
			JP 2016015133 A 28-01-2016
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			TW 201602971 A 16-01-2016
			US 2016007179 A1 07-01-2016
			WO 2016002997 A1 07-01-2016
US 2012047083	A1	23-02-2012	CN 102058939 A 18-05-2011
			US 2012047083 A1 23-02-2012

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2018/053002

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

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Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-12

An emergency notification method.

2. claim: 13

A device tracking apparatus.

3. claims: 14-20

A method of operating an alarm communication system.
