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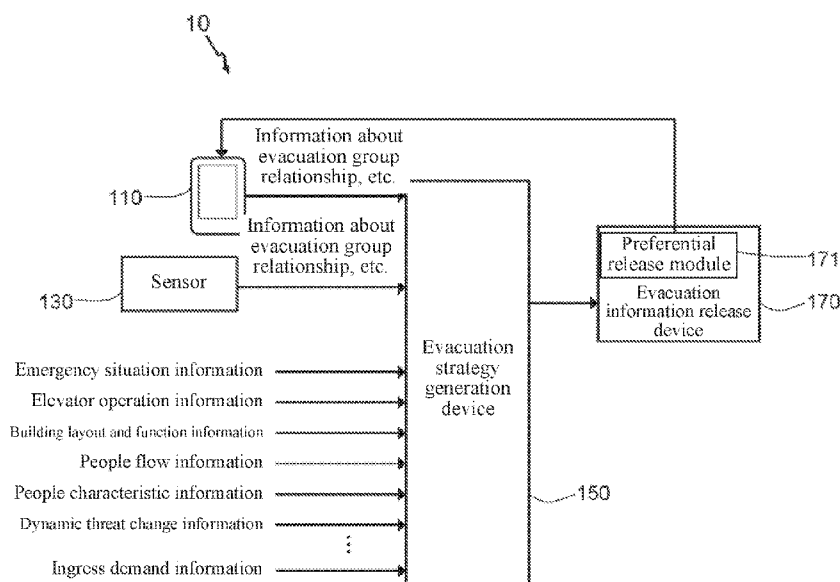


FIG. 1

(57) Abstract: The present invention provides an evacuation system and an evacuation method, and belongs to the technical field of intelligent evacuation. The evacuation system and the evacuation method provided by the present invention generate or update corresponding evacuation strategies based on information about an evacuation group relationship between people.

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A EVACUATING SYSTEM AND EVACUATING METHOD

TECHNICAL FIELD

[0001] The present invention belongs to the technical field of intelligent evacuation and relates to an evacuation system and an evacuation method for buildings.

BACKGROUND ART

[0002] With the increase of the height of buildings and the increasing amount of appearances of high-rise buildings, when sudden accidents (such as fires, earthquakes and terrorist attacks) happen, it becomes very important to safely, rapidly and effectively evacuate a great number of people in the buildings. Therefore, people increasingly concern about intelligent evacuation techniques for buildings.

SUMMARY OF THE INVENTION

[0003] According to one aspect of the present invention, an evacuation system is provided for evacuating a plurality of people inside a building under an emergency situation. The evacuation system comprises an evacuation strategy generation device configured to generate or update corresponding evacuation strategies based on information about an evacuation group relationship between the people.

[0004] According to another aspect of the present invention, an evacuation method is provided. The evacuation method comprises steps of:

acquiring information about an evacuation group relationship between people; and
generating or updating corresponding evacuation strategies based on the information about the evacuation group relationship between the people.

[0005] According to the description below and the drawings, the above-mentioned features and operations of the present invention will become more obvious.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] The above-mentioned and other purposes and advantages of the present invention will become more complete and clearer from the following detailed description with reference to the drawings, in which the same or similar elements are illustrated by the same reference signs.

[0007] FIG. 1 is a structural schematic diagram of modules of an evacuation system according to one embodiment of the present invention.

DETAILED DESCRIPTION

[0008] The present invention will be more completely described with reference to the drawings now. The drawings illustrate exemplary embodiments of the present invention. However, the present invention may be implemented in many different manners and shall not be understood as limited to the embodiments described herein. Contrarily, these embodiments are provided to make the present disclosure thorough and complete, and fully convey the concept of the present invention to the one skilled in the art. In the drawings, the same reference signs refer to the same components or parts, and thus the description thereof is omitted.

[0009] Some block diagrams illustrated in the drawings are functional entities, and do not necessarily have to correspond to physically or logically independent entities. These functional entities may be implemented by means of software, or these functional entities may be implemented in one or more hardware modules or integrated circuits, or these functional entities may be implemented in different networks and/or processor devices and/or microcontroller devices.

[0010] In the present application, buildings may include any type of accommodations, facilities, residences, shelters or other places suitable for human activities, and may also include a set of buildings such as accommodations and facilities, e.g., a set of a plurality of buildings such as campuses and towns. Moreover, it needs to be pointed out that, in the present application, “a building” is not limited to aboveground buildings, and any underground places suitable for human activities, such as metro stations are also included in the scope defined by “building” in the present application.

[0011] In the present application, “information about an evacuation group relationship” between people refers to information indicating that different people need to be restrictively evacuated in the form of groups as much as possible. For example, people having the same “information about an evacuation group relationship” need to restrictively get together when a distance therebetween does not exceed a predetermined value, so as to form the same evacuation group and evacuate through the same escape route. It reflects group evacuation demands of different people during evacuation.

[0012] FIG. 1 illustrates a structural schematic diagram of modules of an evacuation system according to one embodiment of the present invention. As illustrated in FIG. 1, the evacuation system 10 may be arranged in a building. Under an emergency situation, the evacuation system 10 is used for evacuating a plurality of people (or called escapers) inside the building. The emergency situation may be but not limited to fires, earthquakes and the like. The arrangement and the working principle of the evacuation system 10 will be specifically

and exemplarily described below, and an evacuation method of the evacuation system 10 will be exemplarily described.

[0013] The applicant needs to point out that the existing intelligent evacuation system and evacuation method may automatically generate evacuation strategies including escape routes and the like according to information collected by terminals such as sensors to guide people to evacuate rapidly. However, generally the generated evacuation strategies do not consider personalized demands of each person during evacuation, e.g., do not consider evacuation strategy demands of escapers who hold a baby, and do not consider evacuation demands that a plurality of escapers need to be evacuated in the form of a group, either. This being the case, even though the evacuation strategies transmitted or pushed to the escapers are relatively safe and rapid, they are easily considered as unreasonable by the escapers or cannot be accepted by the escapers.

[0014] In one embodiment of the present invention, the evacuation system 10 mainly comprises an evacuation strategy generation device 150 used for generating and/or updating evacuation strategies. The evacuation strategies may include but not limited to escape routes, and may also include display control methods of escape routes, control strategies of elevators under emergency situations, regional release control of acoustic information, etc., for example. The specific content and specific representation form of the evacuation strategies are not restricted. In case of different building structures, different types of emergency situations, etc., the evacuation strategies are possibly very different.

[0015] In one embodiment, the evacuation strategy generation device 150 may acquire various information required for generating the evacuation strategies from various terminals or devices (such as temperature sensors, smoke sensors, vision sensors and elevator control systems) in the building. For example, the information includes but not limited to emergency situation information, elevator operation information, building layout and function information, people flow information, people characteristic information, dynamic threat change information and/or ingress demand information.

[0016] Herein, the emergency situation information may include information such as an emergency situation type, an emergency situation trend and an emergency situation stage, may be determined according to information acquired by various sensors installed inside the building and may also be urgently input by working personnel from corresponding devices inside the building. It should be understood that corresponding evacuation strategies that may be generated corresponding to different emergency situations are very possibly different (e.g., possibly an elevator is allowed to operate and possibly the elevator is not allowed to operate).

At different development stages of the emergency situation, the generated evacuation strategies are possibly continuously updated and changed.

[0017] Herein, the elevator operation information, such as a current elevator operation state and an elevator operation mode may be acquired from an elevator control device or a control system. The generated evacuation strategies possibly include active control strategies of the evacuation system 10 for the elevator (such as screening of an elevator call request, automatic dispatch of the elevator to a certain floor and no stop of the elevator between an initial floor and a destination floor), and are sent to the elevator control device, such that the elevator can rapidly and safely evacuate people. In addition, state information of the elevator in an operation process under the control of the evacuation strategies may be sent to the evacuation strategy generation device 150, such that the escape routes and the like are dynamically updated according to a state of the elevator, a current evacuation demand, a threat situation change and the like.

[0018] Herein, the building layout and function information may be stored in the evacuation strategy generation device 150 of the evacuation system 10 in advance, and includes but not limited to internal function layout situations of a building, such as a fire emergency exit layout.

[0019] Herein, the people flow information may be obtained through analysis and processing of field images acquired by the vision sensors, for example, and includes information such as a people flow mode, a people flow moving speed, a people flow number and/or a people flow crowdedness degree. Image processing methods adopted for analyzing and processing images acquired in the field are not restrictive. It needs to be stated that the vision sensors for acquiring the people flow information may be the same as sensors 130 in the embodiment illustrated in FIG. 1 or may be integrally arranged with the sensors 130. The evacuation strategy generation device 150 may dynamically update and generate evacuation strategies suitable for evacuation under the current people flow situation according to the people flow information.

[0020] Herein, the people characteristic information is information of the escapers about themselves, may be obtained through analysis and processing of the field image information and/or depth (D) information acquired by the sensors (such as RGB-D sensors), for example, and may also be input from the intelligent terminals carried by the people, for another example. The people characteristic information includes but not limited to age characteristic information, body figure information (e.g., indicating whether the people are disabled), facial expression information and/or gender information. Any people characteristic

information facilitating rapid and safe evacuation may be provided to the evacuation strategy generation device 150 to generate corresponding evacuation strategies. It needs to be stated that the sensors for acquiring the people characteristic information may be the same sensors as the sensors 130 in the embodiment illustrated in FIG. 1 or may be integrally arranged with the sensors 130; and the intelligent terminals for inputting certain people characteristic information may be intelligent terminals 110 in the embodiment illustrated in FIG. 1, which are carried by the escapers; and the people characteristic information may be input in advance before the emergency situation happens, e.g., the input is completed when the people enter the building, facilitating the evacuation strategy generation device 150 to rapidly respond to the input in time under the emergency situation to generate evacuation strategies.

[0021] Herein, the dynamic threat change information includes but not limited to change information of threat situations at each location point in the building, such as a spreading degree and a speed of fire at a certain location. The evacuation strategy generation device 150 may determine whether a certain location point may be used as part of an escape route based on the dynamic threat change information, or determine whether to preferentially evacuate people at a certain location point, etc. The dynamic threat change information may be obtained through analysis and processing of information acquired by various sensors (such as smoke sensors, temperature sensors and/or vision sensors) installed in the field.

[0022] Herein, the ingress demand information may be input by rescue working personnel according to their mastered emergency situation information. For example, if the rescue working personnel have a rescue demand of entering a location point of a certain floor, when the evacuation strategy generation device 150 generates an escape route, generation of an ingress route needs to be considered at the same time, so as to prevent mutual interference between the escapers and rescuers which influences the escape efficiency and rescue efficiency.

[0023] Further, as illustrated in FIG. 1, the evacuation strategy generation device 150 further can acquire information about an evacuation group relationship between people in the building, and is configured to generate or update corresponding evacuation strategies based on the information about the evacuation group relationship between the people. When the evacuation strategy generation device 150 uses the information about the evacuation group relationship, the information about the evacuation group relationship may be used when the evacuation strategies (such as escape routes) are initially generated, and may also be used when the generated evacuation strategies are updated, so as to optimize the evacuation strategies.

[0024] It needs to be stated that the information about the evacuation group relationship reflects a level of concern of different people about the safety of other people. Different people

having the same evacuation group relationship hope to be jointly and simultaneously evacuated during evacuation as much as possible to form an evacuation group. Therefore, the information about the evacuation group relationship is a reflection of an evacuation group. In a registration process of the people in the building in the evacuation system 10, the information about the evacuation group relationship corresponding to the people may be stored in advance. For example, if person A and person B have the same evacuation group relationship, it indicates that person A and person B hope to form a group during evacuation and to be evacuated at the same time. The information about the evacuation group relationship may also be acquired in real time when the emergency situation happens. The above-mentioned two manners may be separately and respectively applied, and may also be simultaneously and jointly applied.

[0025] It needs to be stated that the information about the evacuation group relationship may be determined through an inference according to information about a social relationship between people. For example, members of the same family have a family social relationship therebetween, and they may be automatically set to correspond to the same evacuation group relationship; members of the same group entering a building have an organization group relationship and thus they may be automatically set to correspond to the same evacuation group relationship. The information about the social relationship between the people may be stored in advance as well, and may also be acquired in real time.

[0026] In one embodiment, as illustrated in FIG. 1, the evacuation system 10 includes intelligent terminals 110 carried by the people. For example, the intelligent terminals 110 may be smart phones, IPADs, smart wristbands and the like carried by people, and the specific types thereof are not restrictive. The intelligent terminals 110 are coupled with the evacuation strategy generation module 150, and information may be transmitted therebetween. The intelligent terminals 110 may be installed with a corresponding program in advance (such as an App) to realize transmission of the corresponding information about the evacuation group relationship between the people corresponding to the intelligent terminals 110 to the evacuation strategy generation device 150. For example, if person A and person B work or live long in a building, they have a very close relationship therebetween. Person A and person B may submit information about their evacuation group relationship in advance through respective corresponding intelligent terminals 110 by means of registration and the like (such as registration by opening a corresponding App), this indicates that person A and person B hope to form one evacuation group and be jointly evacuated during evacuation. Of course, one of person A and person B may also submit the information about their evacuation group relationship in advance through the intelligent terminal 110 thereof, and the submitted

information about the evacuation group relationship is sent to the intelligent terminal 110 of the other person to confirm and pass. In this way, when an emergency situation happens, if the intelligent terminals 110 corresponding to person A and person B are located inside the building, the evacuation strategy generation device 150 may rapidly call and apply the information about the evacuation group relationship, so as to generate rapid and safe evacuation strategies which can be relatively easily accepted,. The evacuation strategies can improve the probability of joint and simultaneous evacuation of person A and person B in an emergency evacuation process, and prevent one of person A and person B from being not normally evacuated according to the evacuation route because of the worry about the safety of the other person (e.g., person A advances reverse to the escape route in order to rescue person B), facilitating an improvement of orderliness during evacuation, improving the evacuation efficiency and greatly decreasing inner anxieties and worries of the people to be evacuated and improving evacuation experiences of the people.

[0027] Of course, in another embodiment, the information about the evacuation group relationship between the people inside the building may also be stored in advance in the respective corresponding intelligent terminals 110, and may be broadcasted when an emergency situation happens, to remind each person to open the corresponding program (such as an App) of the intelligent terminals, such that the information about the evacuation group relationship stored in the intelligent terminals 110 is automatically uploaded via a network, and the evacuation strategy generation device 150 may also use the information about the evacuation group relationship to generate or update corresponding escape strategies.

[0028] Therefore, a corresponding evacuation group relationship information input module (not shown in FIG. 1) may be provided in the intelligent terminal 110 to realize a function of transmitting the information about the evacuation group relationship between the people corresponding to the intelligent terminal 110 to the evacuation strategy generation device 150. In another embodiment, the information about the evacuation group relationship set in the intelligent terminal 110 may be automatically uploaded to the evacuation strategy generation device 150 after the input is completed.

[0029] In another embodiment, as illustrated in FIG. 1, the evacuation system 10 includes sensors 130 installed inside the building. The sensors 130 are coupled with the evacuation strategy generation device 150, are used for sensing the people inside the building and recognizing the information about the evacuation group relationship between the people, and can transmit the recognized information about the evacuation group relationship between the people to the evacuation strategy generation device 150. The sensors 130 may be various

types of vision sensors, depth (D) information sensors (such as Time-of-Flight (ToF) sensors) or a combination thereof, for example, the specific types thereof are not restrictive, and even may use sensors which will emerge after the application date of the present invention and more accurately acquire the information about the evacuation group relationship with the development of the sensor technology. In addition, the number, the installation positions and the like of the sensors 130 are also not restrictive.

[0030] The sensor 130 specifically may include a corresponding sensing unit (not shown in FIG. 1) for sensing at least information about the people inside the building, and further includes an evacuation group relationship information generation module (not shown in FIG. 1) used for analyzing and processing the information about the people sensed by the sensing unit to generate the information about the evacuation group relationship, i.e., an analysis and processing module. In one embodiment, the evacuation group relationship information generation module may be used for analyzing and processing its acquired image data or depth information data and the like to generate the information about the evacuation group relationship by means of analysis and processing. The evacuation group relationship information generation module is not limited to be arranged at an installation position of the sensor 130, and for example, it may be a computing part or a computer system which is separately arranged relative to the sensing unit of the sensor 130 and even may be intensively arranged with the evacuation strategy generation device 150.

[0031] In an example where the sensor 130 is a vision sensor, images regarding person A, B and C may be acquired by the sensing unit of the sensor 130, the evacuation group relationship information generation module of the sensor 130 extracts information such as body figure information of person A, B and C and analyzes to acquire the corresponding information about the evacuation group relationship based on an association relationship between respective body figure information. For example, if a distance between person A, B and C within a predetermined time period always does not exceed a predetermined value, or if person A, B and C have close action behaviors therebetween (such as a hug and hand in hand), it is determined that person A, B and C very possibly require to be jointly and simultaneously evacuated during evacuation as much as possible, they have the same information about the evacuation group relationship and thus the information about the evacuation group relationship between person A, B and C is extracted.

[0032] It needs to be stated that the information about the evacuation group relationship may be acquired by the sensor 130 when an emergency situation happens or may be acquired before an emergency situation happens.

[0033] In one embodiment, if the sensor 130 has already extracted the information about the evacuation group relationship between person A, B and C, the information about the evacuation group relationship may be directly sent to the evacuation strategy generation device 150. In this case, each person entering the building may be identified by the corresponding device (such as an ID card, a smart phone or an RFID) carried by each person. The evacuation system 10 is further configured to be capable of positioning the location of the person in the building through the corresponding device. Therefore, an evacuation information release device 170 pushes the same evacuation strategy (such as the same escape route) to the corresponding devices of people having the same information about the evacuation group relationship (i.e., the people in the same evacuation group) or broadcasts the same evacuation strategy in an area of the locations of the corresponding devices of the people in the same evacuation group. In another embodiment, the information about the evacuation group relationship between person A, B and C extracted by the sensor 130 is sent to the intelligent terminals 110 of person A, B and C illustrated in FIG. 1. The information about the evacuation group relationship is determined to be effective only after at least one of person A, B and C confirms it from the corresponding intelligent terminal 110 thereof, otherwise, it is considered as ineffective and is not sent to the evacuation strategy generation device 150. Thus, the accuracy of the information about the evacuation group relationship can be improved.

[0034] It needs to be pointed out that only one of the sensor 130 and the intelligent terminal 110 may be configured to acquire the information about the evacuation group relationship between the people, a combination of both may also be used to acquire the information about the evacuation group relationship between the people; and the information about the evacuation group relationship acquired by the sensor 130 and the information about the evacuation group relationship acquired by the intelligent terminal 110 may be used for mutual check and verification, and may also be used for mutual supplementation, so as to obtain more comprehensive and accurate information about the evacuation group relationship.

[0035] Continuously as illustrated in FIG. 1, the evacuation strategy generation device 150 may be configured to receive the information about the evacuation group relationship between the people from one or more sensors 130 and/or one or more intelligent terminals 110. The evacuation strategy generation device 150 is configured to generate or update corresponding evacuation strategies at least based on the information about the evacuation group relationship, so as to realize evacuation of people in the same evacuation group according to the same evacuation strategy as much as possible and improve the probability that they are jointly evacuated.

[0036] For example, person A and person B are in a parent-son relationship, person B is a child and needs to be cared by person A in an emergency evacuation process, and person A certainly has a great anxiety and worry and even quits escaping himself if person A cannot see person B in the emergency evacuation process; and after person A and person B forms the information about the evacuation group relationship based on the above-mentioned exemplary method or manner, the evacuation strategy generation device 150 may consider person A and person B as a group during generation of an evacuation strategy, generate the same evacuation route aiming at the group, uniformly notify the same evacuation route through broadcasting and further notify information about the location of person B to person A (such as by pushing the information about the location of person B through the intelligent terminal 110) at the same time. Therefore, the probability that person A and person B are jointly and simultaneously evacuated is improved. In addition, even though person A cannot see person B in the evacuation process, person A may also know whether person B is in the evacuation process (i.e., may know a safety condition of person B) based on the information about the location of person B, or rapidly find or wait for person B and then they jointly continue the evacuation process.

[0037] For another example, if teacher A and N children led by teacher A are in floor M of a building, teacher A inputs information about an evacuation group relationship through, for example, an intelligent terminal 110 (such as a mobile phone) carried by teacher A. The information about the evacuation group relationship may reflect that the number of people is great (because N children are included), and teacher A and N children led by teacher A need to form a group in an emergency evacuation process. After the evacuation strategy generation device 150 acquires the information about the evacuation group relationship, in consideration of a relatively large number of people corresponding to the information about the evacuation group relationship and an inclusion of many children that need to be cared, the evacuation strategy generation device 150 may generate an evacuation strategy aiming at the information about the evacuation group relationship between teacher A and N children. For example, one or more elevators are preferentially dispatched to floor M to realize the effect that teacher A and N children can be jointly, simultaneously and rapidly evacuated.

[0038] It needs to be understood that a specific algorithm used by the evacuation strategy generation device 150 for generating the above-mentioned evacuation strategy may be correspondingly configured according to specific requirements, conditions of hardware in the building and the like. For example, if the number of people in the same evacuation group is great and it is not suitable to evacuate them through route A in the building, when the evacuation strategy is generated, route B may be selected for people corresponding to the

evacuation group (because route B is more suitable for simultaneous evacuation of more people than route A) to form a corresponding evacuation route.

[0039] Continuously as illustrated in FIG. 1, the evacuation information release device 170 configured in the evacuation system 10 is used for releasing evacuation information such as evacuation strategies to a plurality of people inside the building. The evacuation information may be information converted from the evacuation strategy generated by the evacuation strategy generation device 150, may be transmitted to the evacuation information release device 170 after generated through a conversion at the evacuation strategy generation device 150, and may also be generated through the conversion at the evacuation information release device 170 according to the evacuation strategy. The evacuation information release device 170 may be realized through a building information management system, for example, such that the evacuation information is correspondingly sent to all information release terminals (such as indicator lamps, underground lamps and broadcasting devices) in the building, thereby the people in the building can acquire the evacuation information in time and be evacuated based on the evacuation information, i.e., basically corresponding to the evacuation strategy.

[0040] In one embodiment, the intelligent terminals 110 carried by the people to be evacuated are also used as part of the evacuation information release device 170 for releasing the evacuation strategy information, and the evacuation strategy information or evacuation information may be pushed in real time to the intelligent terminals 110 of the people in the same evacuation group, such that the evacuation strategy is directly displayed on the intelligent terminals 110. For example, the same evacuation strategy is pushed to and displayed on the intelligent terminals 110 of person A and person B in the same evacuation group, person A and person B may be jointly and simultaneously evacuated at a higher probability under the guidance of the same evacuation strategy, avoiding the situation that any one of them does not follow the evacuation strategy because of the worry about the safety state of the other one is avoided, so that the evacuation strategy can be easily accepted by the escapers, the evacuation order is relatively better, the evacuation efficiency can be guaranteed and the experience such as a safety sense of the people to be evacuated is better.

[0041] It needs to be stated that the intelligent terminals 110 are not limited to be used for displaying the evacuation strategies generated or updated based on the information about the evacuation group relationship, but may also be used for displaying other evacuation strategies generated without considering the information about the evacuation group relationship. When the evacuation strategy information corresponding to the information about the evacuation group relationship is sent to the intelligent terminals 110 of a plurality of people

in the same evacuation group, a preferential release module 171 may be configured in the evacuation information release device 170 for preferentially sending the evacuation strategy corresponding to the information about the evacuation group relationship to the intelligent terminals 110 of the plurality of people in the same evacuation group, so as to improve the probability that the plurality of people are jointly and simultaneously evacuated.

[0042] The function that the intelligent terminal 110 displays the evacuation strategy may be realized through an evacuation strategy display module on the intelligent terminal 110, e.g., through a corresponding program or an APP. When an emergency situation happens, a speech may be broadcasted to remind the people to open the corresponding program or APP on the intelligent terminals 110 carried by the people.

[0043] In another embodiment, the intelligent terminal 110 may also send other information in addition to the information about the evacuation group relationship to the evacuation strategy generation device 150. For example, the information includes but not limited to location information, rescue information, threat information at a location and the like. Apparently, the intelligent terminal 110 may also be used for inputting the above-mentioned people characteristic information (i.e., characteristic information of the escapers). The above-mentioned information sent by the intelligent terminal 110 comes from the escapers themselves, and thus the information is more accurate and reliable. In addition, the intelligent terminal 110 may send information about the escapers which cannot be acquired, or cannot be accurately acquired or cannot be acquired in time by the sensing terminals such as sensors (e.g., because there are blind points during detection by the sensors for the internal environment of the building, the information about the escapers at blind point locations cannot be acquired), thus the evacuation strategy generation device 150 may acquire more comprehensive and accurate field information or people characteristic information and the evacuation strategies generated based on these information are relatively more scientific, optimal and/or reliable.

[0044] For example, person A carrying an intelligent terminal 110 cannot move conveniently in an evacuation process (e.g., person A is a disabled person) or cannot escape himself/herself, it is very dangerous when person A is alone, detection terminals such as sensors very possibly omit to detect or recognize person A (because of envelop by smoke, for example) and consider that there are no people who need to escape at the location of the floor, and therefore no relatively effective and reliable evacuation strategy is generated aiming at person A (e.g., no special elevator is dispatched for person A). Person A sends information such as rescue information, location information and/or characteristic information about movement inconvenience to the evacuation strategy generation device 150 of the evacuation

system 10 through the intelligent terminal 110, then the evacuation strategy generation device 150 may generate a corresponding evacuation strategy based on the information to generate a scientific and effective escape route for person A (e.g., a corresponding elevator is dispatched to the floor at which person A is located) and notify the escape route to person A in time by means of broadcasting or push the escape route to the intelligent terminal 110 of person A, such that person A can be rapidly and safely evacuated under the dangerous situation.

[0045] Further, in one embodiment, by configuring the evacuation information release device 170, the intelligent terminal 110 can not only send information in addition to the information about the evacuation group relationship to the evacuation strategy generation device 150, but also receive information sent by the intelligent terminals 110 of other people corresponding to the information about the evacuation group relationship. For example, the evacuation information release device 170 can send the information received from one intelligent terminal 110 to the intelligent terminals 110 of other people corresponding to the information about the evacuation group relationship. In this way, other group people concerning about the person corresponding to the intelligent terminal 110 can know the information input by the person in time, thereby mutual information sharing in the emergency evacuation process is facilitated and a behavior judgment beneficial to the safety of the other person can be made in time.

[0046] Specifically, once all group people carrying the intelligent terminals 110 are under an emergency situation when the information about the evacuation group relationship is determined, these evacuation group people may be grouped into the same information sharing group by the evacuation information release device 170 by means of “grouping”, thus a corresponding information sharing group is established for these group people, the evacuation strategy generated corresponding to the information about the group relationship may be released to the information sharing group, other information (such as location information, rescue information and threat information) in addition to the information about the evacuation group relationship sent by any one of group people may also be directly released, the people in the same evacuation group relationship not only are information “consumers” of the same evacuation strategy, but also are possibly information sharers, such that the group people can more rapidly and effectively obtain the information they want to acquire in the evacuation process, and this is very helpful to emergency evacuation.

[0047] It needs to be stated that the sensors 130 may also acquire the above-mentioned people characteristic information such as the above-mentioned age characteristic information, body figure information (for example, reflecting whether the person is a disabled person), facial

expression information and/or gender information in addition to the information about the evacuation group relationship, and send the information to the evacuation strategy generation device 150. The people characteristic information may be acquired through computation of image information and/or depth information by analysis and processing parts of the sensors 130, such that the evacuation strategy generation device 150 generates more effective and reliable escape routes aiming at certain people after the people characteristic information is received by the evacuation strategy generation device 150.

[0048] The evacuation system 10 in the above-mentioned embodiments and the evacuation method used by the evacuation system 10 can consider personalized demands of the escapers in the evacuation process as much as possible, and especially can satisfy the personalized demands that relevant people jointly form an evacuation group based on the information about the evacuation group relationship, the generated evacuation strategies are more reliable and can be easily considered as reasonable and effective by the escapers, the worries and panics of the escapers can be decreased, the evacuation order can be effectively guaranteed, and the rapidness and safety of evacuation can be guaranteed.

[0049] The above-mentioned examples mainly describe the evacuation device and various evacuation methods provided by the present invention. Although only some implementations of the present invention are described, one skilled in the art should understand that the present invention may be implemented through many other manners without departing from the essence and scope of the present invention. Therefore, the presented examples and implementations should be considered as exemplary instead of restrictive, and the present invention may cover various modifications and replacements without departing from the spirit and scope of the present invention as defined by the attached claims.

CLAIMS

1. An evacuation system used for evacuating a plurality of people inside a building under an emergency situation, comprising an evacuation strategy generation device, characterized in that the evacuation strategy generation device is configured to generate or update corresponding evacuation strategies based on information about an evacuation group relationship between the people.

2. The evacuation system according to claim 1, characterized in that the evacuation system further comprises:

an evacuation information release device configured to be at least capable of sending the same evacuation strategies to the people belonging to the same evacuation group.

3. The evacuation system according to claim 1 or 2, characterized in that the evacuation strategy generation device is configured to receive the information about the evacuation group relationship input by the people on intelligent terminals carried by the people.

4. The evacuation system according to claim 1 or 2, characterized in that the information about the evacuation group relationship is acquired when the emergency situation happens, or is acquired before the emergency situation happens or is automatically transmitted to the evacuation strategy generation device after the people complete an input.

5. The evacuation system according to claim 2, characterized in that the evacuation information release device is further configured to send the evacuation strategies to the intelligent terminals carried by the people.

6. The evacuation system according to claim 5, characterized in that the evacuation information release device is further configured to, while sending the evacuation strategies to one of the people belonging to the same evacuation group, further send information about locations of other people in the same evacuation group.

7. The evacuation system according to claim 5, characterized in that the evacuation strategy generation device is further configured to be capable of receiving other information mastered by the people corresponding to the intelligent terminals in addition to the information about the evacuation group relationship input by the people through the intelligent terminals carried by the people,

wherein the evacuation strategy generation device is further configured to generate or update corresponding evacuation strategies based on the other information.

8. The evacuation system according to claim 7, characterized in that the other information comprises at least one of location information of the people, rescue information, threat information at the locations of the people and people characteristic information.

9. The evacuation system according to claim 7, characterized in that the evacuation information release device is further configured to establish a corresponding information sharing group for the intelligent terminals of the people belonging to the same evacuation group, wherein the evacuation

strategies and the other information are released to the information sharing group, and each of the people belonging to the same evacuation group can acquire the information in real time from the information sharing group.

10. The evacuation system according to claim 1 or 2, characterized in that the evacuation system further comprises sensors installed inside the building and coupled with the evacuation strategy generation device, which are at least used for sensing the people inside the building and analyzing and acquiring the information about the evacuation group relationship between the people.

11. The evacuation system according to claim 10, characterized in that the evacuation system further comprises the intelligent terminals carried by the people, wherein the intelligent terminals are configured to receive the information about the evacuation group relationship acquired by the sensors and give a feedback about whether to accept the information about the evacuation group relationship to the evacuation strategy generation device.

12. The evacuation system according to claim 10, characterized in that the sensor comprises:
a sensing unit used for acquiring image data and/or depth information data of the people; and
an evacuation group relationship information generation module used for analyzing and processing the image data and/or depth information data to acquire the information about the evacuation group relationship between the people.

13. The evacuation system according to claim 10, characterized in that the sensor is further configured to be capable of acquiring people characteristic information in addition to the information about the evacuation group relationship,

wherein the evacuation strategy generation device is further configured to generate or update corresponding evacuation strategies based on the people characteristic information.

14. The evacuation system according to claim 10 or 12, characterized in that the evacuation system is configured to be capable of positioning locations of the intelligent terminals in the building.

15. An evacuation method, characterized in that the evacuation method comprises steps of:
acquiring information about an evacuation group relationship between people; and
generating or updating corresponding evacuation strategies based on the information about the evacuation group relationship between the people.

16. The evacuation method according to claim 15, characterized in that the evacuation method further comprises a step of:

sending the same evacuation strategies to the people belonging to the same evacuation group relationship.

17. The evacuation method according to claim 15 or 16, characterized in that, in the step of acquiring the information about the evacuation group relationship, the information about the

evacuation group relationship between the people is input through intelligent terminals carried by the people.

18. The evacuation method according to claim 15, characterized in that the information about the evacuation group relationship is acquired when the emergency situation happens, is acquired before the emergency situation happens or is automatically transmitted to the evacuation strategy generation device after the people complete an input.

19. The evacuation method according to claim 16, characterized in that the same evacuation strategies are sent to the intelligent terminals carried by the people belonging to the same evacuation group.

20. The evacuation method according to claim 16, characterized in that, while the evacuation strategies are sent to one of the people belonging to the same evacuation group, information about locations of other people belonging to the same evacuation group is further sent.

21. The evacuation method according to claim 17, characterized in that the evacuation method further comprises a step of inputting other information mastered by the people corresponding to the intelligent terminals in addition to the information about the evacuation group relationship through the intelligent terminals carried by the people, wherein the other information comprises at least one of location information of the people, rescue information, threat information at the locations of the people and people characteristic information; and

in the step of generating or updating the evacuation strategies, corresponding evacuation strategies are further generated or updated based on at least part of the other information.

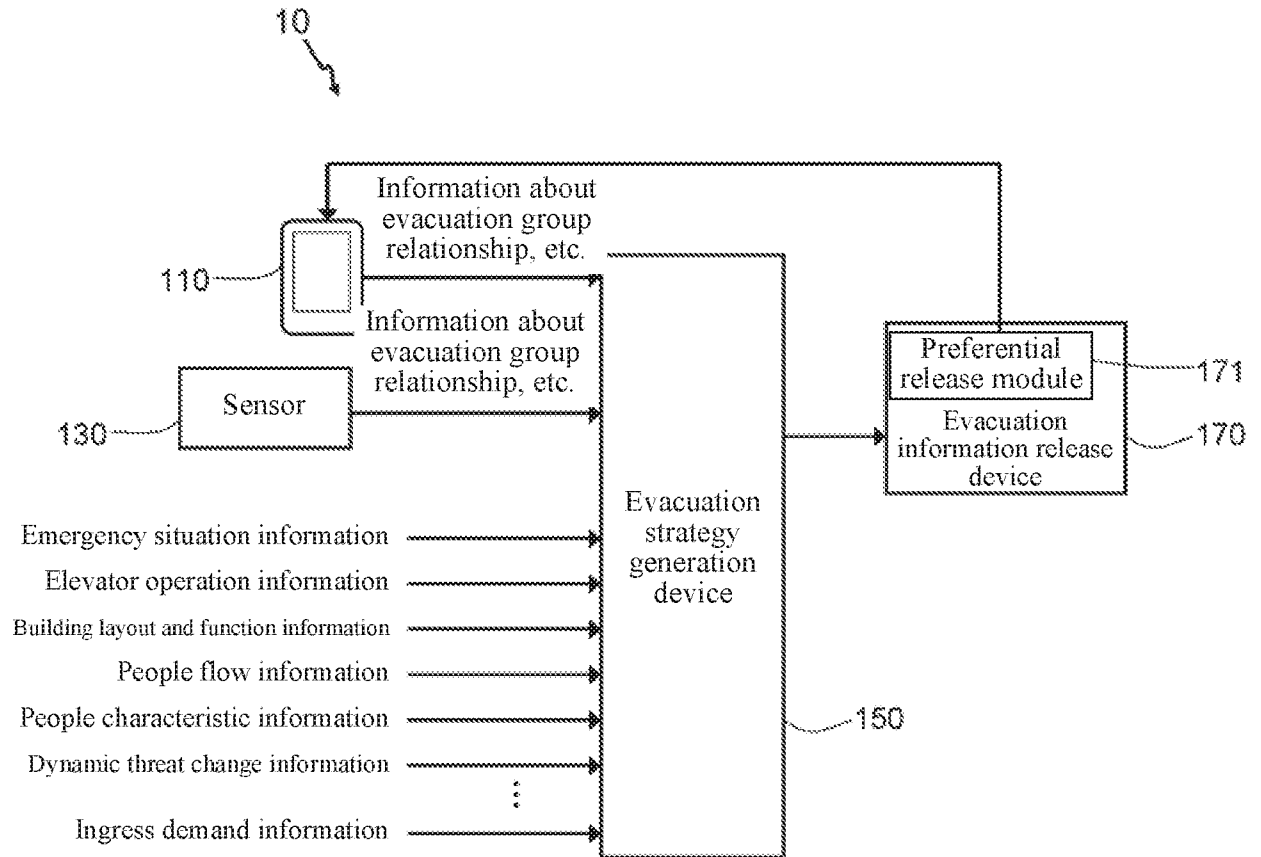
22. The evacuation method according to claim 21, characterized in that a corresponding information sharing group is established for the intelligent terminals of the people belonging to the same evacuation group, wherein the evacuation strategies and the other information are released to the information sharing group, and each of the people belonging to the same evacuation group can acquire the information in real time from the information sharing group through the intelligent terminals.

23. The evacuation method according to claim 16 or 17, characterized in that, in the step of acquiring the information about the evacuation group relationship, the people inside the building are sensed and the information about the evacuation group relationship between the people is analyzed and acquired through sensors.

24. The evacuation method according to claim 23, characterized in that the information about the evacuation group relationship acquired by the sensor is sent to the people corresponding to the information about the evacuation group relationship, and the corresponding people determine whether to accept the information about the evacuation group relationship.

25. The evacuation method according to claim 24, characterized in that the evacuation method further comprises a step of acquiring people characteristic information in addition to the information about the evacuation group relationship through the sensors; and

in the step of generating or updating the evacuation strategies, corresponding evacuation strategies are further generated or updated based on at least part of the people characteristic information.

**FIG. 1**

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2018/016974

A. CLASSIFICATION OF SUBJECT MATTER

INV. G06Q10/08

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)

G06Q

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 3 125 205 A1 (HONEYWELL INT INC [US]) 1 February 2017 (2017-02-01) abstract; figures 2,3 paragraph [0029] paragraph [0038] -----	1-25
X	WO 2017/021223 A1 (INVENTIO AG [CH]) 9 February 2017 (2017-02-09) abstract; figures 2, 3 page 9, line 7 - page 11, line 27 -----	1-25
X	US 2009/281850 A1 (BRUCE ALAN E [US] ET AL) 12 November 2009 (2009-11-12) abstract; figure 1A paragraph [0031] - paragraph [0032] -----	1-25



Further documents are listed in the continuation of Box C.



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"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

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"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

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2018/016974

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 3125205	A1	01-02-2017	CA 2936210 A1 27-01-2017
			CN 106408848 A 15-02-2017
			EP 3125205 A1 01-02-2017
			US 2017032632 A1 02-02-2017

WO 2017021223	A1	09-02-2017	AU 2016302407 A1 15-02-2018
			WO 2017021223 A1 09-02-2017

US 2009281850	A1	12-11-2009	NONE
