

INTEGRATED PERCEPTUAL POSITIONING SYSTEM BASED ON 3-DIMENSIONAL INFORMATION MODEL

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a building drawing information positioning technology of the property management, and especially relates to an integrated perceptual positioning system based on 3-dimensional information model capable for applying to the building drawing information management technology of the large place (such as school, factory, exposition, ship, airplane) and cooperating with the mobile device to download the building drawing so as to check and look up the instruments elements.

2. Description of Related Art

With the development of the economy, the buildings are built everywhere. The property management is very complicated and important, especially for repairing each facilities in the buildings and the problems for managing information. For example, the status of repairing physical facilities is recorded by hand or electronic equipment and then each information is calculated and recorded. However, some record or data/information may be lost so that the entire information is not complete tie result in the problems of management.

The physical facilities in the buildings are miscellaneous and the attributes thereof are also different. If the information management is not truly complete, it may result in the problems of purchasing new objects and is hard to precisely and completely count and calculate the information. Each physical facility is 3-dimensional and exists in the buildings to result in the management and maintaining problems.

The conventional 3-dimensional spatial positioning technology is embedded or arranged a large number of sensors in the building and sensing the emitter worn on the user via Wi-Fi. It needs more additional space to arranged the sensors and stable network to position.

Please reference to Taiwanese patent no. I511080, it disclosed a space for building location-based information system, comprising: a database module, which has an indoor equipment inside the building at least one information space; a positioning module, which the system can detect the positioning of the building space information; an image capture module, which can be retrieved from the system within the building space a reality screen; and a display module; whereby building space-based positioning system based on the positioning information from the information database module obtain information corresponding to the indoor unit and generates a device information corresponding to the interior of the virtual screen; and the screen with a virtual reality display on the screen of the display module to provide the user directly check and look up the images and information of the

indoor instruments in the building.

However, please refer to paragraph [0028] of the patent I511080, it disclosed that “...a virtual-reality picture 82 is combined the reality picture 80 with the virtual reality picture 81 so as to display on the display module 40. The position and information of the instrument are identified with the pictures and information (shown as in FIG 5)” Please also refer to paragraph [0029] of the patent I511080, it disclosed that “ In addition, in FIG 5, when the display module 40 displays the virtual-reality picture 82, the instrument information module 50 may have operational menu in the virtual-reality picture 82 so as to provide the user to look up the detail information or repair history corresponding to the instrument.” That is, Patent I511080 must have the operational menu to provide the user to look up the detail information corresponding to the instrument after the virtual-reality picture 82 is combined the reality picture 80 with the virtual picture 81.

However, it is hard to precisely complete the combination of the reality picture 80 and the virtual picture 81 without any tool before showing the operational menu. It is not convenient and smooth to operate and use.

In view of the foregoing circumstances, the inventor has invested a lot of time to study the relevant knowledge, compare the pros and cons, research and develop related products. After quite many experiments and tests, the “integrated perceptual positioning system”

of this invention is eventually launched to improve the foregoing shortcomings, to meet the public use.

SUMMARY OF THE IN VENTION

An object of this invention is providing an integrated perceptual positioning system based on 3-dimensional information model. The integrated perceptual positioning module continuously positions the moving track of the real location and coordinate of the mobile device shown in the building drawing and on the display monitor, and the cursor unit is moved corresponding to the movement of the mobile unit shown on the display monitor. The building drawing on the display monitor is compared with the structures, the instruments, and facilities, and the high efficient management of checking and verifying the instrument element(s) of the building drawing(s) and the reality structure may be achieved.

Another object of this invention is providing an integrated perceptual positioning system based on 3-dimensional information model. The mobile device may obtain the structures, relief instruments, and escape information in the building drawing of the database so as to improve the efficiency of escaping, guiding, and reliving. The safety of the relief workers may be ensured and the sufferer may be saved in golden window.

In order to achieve above mentioned effects, an integrated

perceptual positioning system based on 3-dimensional information model is provided. The system may comprise a building information model and facility instrument database, instructed by interiors of buildings, and open space areas of the buildings, schools, interiors and exteriors of factories, or navigation transportations, the database is built in a host and a cloud server, the database includes at least one building drawing, a cursor unit, and a plurality of instrument information display units, the building drawing has a plurality of instrument elements constructed by 3-dimensional digital drawing information, each instrument element is a facility structure, an electric motor equipment, a power equipment, or an equipment pipeline; and a mobile device, having a transmission unit, a record unit, a display monitor, a photographing unit, and an integrated perceptual positioning module, the integrated perceptual positioning module includes one of a deep camera lens, a gyroscope, an electronic compass, a Wi-Fi, a Bluetooth, and an Internet of Things, the transmission unit downloads from the database of the host or the cloud server to the record unit, the display monitor displays the building drawing, the integrated perceptual positioning module of the mobile device obtains a reality absolute coordinate from an interior of reality and an original location point from a plan view of the 3-dimensional digital drawing information in the building drawing, the original location point in the reality absolute coordinate corresponds to an original positioning point in a virtual

spatial coordinate, the integrated perceptual positioning module calculates and overlaps a location in the reality absolute coordinate and the original positioning point in the virtual spatial coordinate of the 3-dimensional digital drawing information in the building drawing, the integrated perceptual positioning module continuously calculates, overlaps, and corrects an accumulated coordinate error resulted from the mobile device moving in reality, the integrated perceptual positioning module continuously positions a moving track of a real location and coordinate of the mobile device, the reality absolute coordinate is displayed to a location in the virtual spatial coordinate in the 3-dimensional drawing information of the building drawing by calculating and overlapping the reality absolute coordinate and the virtual spatial coordinate, it is advantageous to applying to Virtual Reality(VR) and Augmented Reality(AR), the integrated perceptual positioning module continuously positions the movement of the mobile device which is shown on the display monitor to map to the building drawing by the cursor unit, a user compares the building drawing shown on the display monitor with the structures, equipment, and facilities in reality, and the instrument elements in the building drawing and the real construction structure are synchronously checked and verified.

In some embodiments, the integrated perceptual positioning module further includes a GPS(Global Positioning System), a user

holding the mobile device in the exterior in reality obtains the reality absolute coordinate with the integrated perceptual positioning module, and the original location point is defined and compared by the reality absolute coordinate and the virtual spatial coordinate.

In some embodiments, the photographing unit captures a reality picture of a real structure corresponding to the instrument elements, the reality picture is uploaded to the cloud server by the transmission unit so as to provide a back-end drafter to synchronously correct the drawing information and a construction site, and further record entire information.

In some embodiments, the instrument element further includes a relief device having escape information and path so as to provide the user holding the mobile device to download from the cloud server to relieve, the display monitor shows the building drawing and a position correction in reality to guide to escape or relieve, a location of the user in reality is shown by video or text messages shown on the mobile device to improve the efficiency of relieving, escaping, guiding, and searching and make relief workers safe.

In some embodiments, the user holding the mobile device clicks each instrument element of the building drawing and an instrument information display unit is popped up to check and review each instrument element of the building drawing, and the photographing unit captures the reality picture of the real structure corresponding to each

instrument element and then compare and overlap the building drawing.

In some embodiments, each instrument information display unit includes name, location, category, group name, and repair history corresponding to each instrument element.

In some embodiments, the building drawing has a conversion between two dimensions and three dimensions, when the building drawing shown on the display monitor is three dimensions, a plane contracted drawing is shown on the display monitor and located in a corner of the building drawing by Plane Positioning Technology so that it corresponds to a plane location of the cursor unit.

In some embodiments, the mobile device is a smart phone, a tablet, a PDA(Personal Digital Assistant), a laptop computer, or a wearable device.

The various objectives and advantages of the present invention will be more readily understood from the following detailed description when read in conjunction with the appended drawing.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG 1 is a block diagram of an integrated perceptual positioning system based on 3-dimensional information model of the present invention;

FIG 2 is a block diagram of a building information model and

facility instrument database while uploading to a cloud and providing a mobile device to indirectly download from the cloud;

FIG. 3 is a perspective view of the display monitor while displaying downloaded building drawing;

FIG. 4 is a perspective view of the integrated perceptual positioning system based on 3-dimensional information model of the present invention while loading the 3-dimensional building drawing;

FIG. 5 is a perspective view of the integrated perceptual positioning system based on 3-dimensional information model of the present invention while the instrument information display units are popped up; and

FIG. 6 is a perspective view of the integrated perceptual positioning system based on 3-dimensional information model of the present invention while overlapping the reality picture.

DETAILED DESCRIPTION OF THE INVENTION

To describe clearly that the present invention achieves the foregoing objective and function, the technical features and desired function are described with reference to a preferred embodiment and accompanying drawings.

Please reference to FIGs. 1 to 6, an integrated perceptual positioning system based on 3-dimensional information model of the present invention while of present invention may comprise a building information model and facility instrument database 1 and a mobile

device 2. The building information model and facility instrument database 1 is instructed by interiors of buildings, and open space areas of the buildings, schools, interiors and exteriors of factories, or navigation transportations. The database 1 is built in a host 10 and a cloud server 30. The database 1 includes at least one building drawing 11, a cursor unit 12, and a plurality of instrument information display units 13. The building drawing 11 has a plurality of instrument elements 111 which is constructed by 3-dimensional digital drawing information. Each instrument element 111 may be a facility structure, an electric motor equipment, a power equipment, or an equipment pipeline.

The mobile device 2 has a transmission unit 21, a record unit 22, a display monitor 23, a photographing unit 24, and an integrated perceptual positioning module 25. The integrated perceptual positioning module 25 includes one of a deep camera lens, a gyroscope, an electronic compass, a Wi-Fi, a Bluetooth, and an Internet of Things. The transmission unit 21 downloads from the database 1 of the host 10 or the cloud server 30 to the record unit 25. The display monitor 23 displays the building drawing(s) 11. the integrated perceptual positioning module 25 of the mobile device 2 obtains a reality absolute coordinate from an interior of reality and an original location point from a plan view of the 3-dimantional digital drawing information in the building drawing 11. The original location point in the reality

absolute coordinate corresponds to an original positioning point in a virtual spatial coordinate. The integrated perceptual positioning module 25 calculates and overlaps a location in the reality absolute coordinate and the original positioning point in the virtual spatial coordinate of the 3-dimensional digital drawing information in the building drawing 11. The integrated perceptual positioning module 25 continuously calculates, overlaps, and corrects an accumulated coordinate error resulted from the mobile device 2 moving in reality. The integrated perceptual positioning module 25 continuously positions a moving track of a real location and coordinate of the mobile device 2. The reality absolute coordinate is displayed to a location in the virtual spatial coordinate in the 3-dimensional drawing information of the building drawing 11 by calculating and overlapping the reality absolute coordinate and the virtual spatial coordinate. It is advantageous to applying to Virtual Reality (VR) and Augmented Reality (AR). The integrated perceptual positioning module 25 continuously positions the movement of the mobile device 2 which is shown on the display monitor 23 to map to the building drawing 11 by the cursor unit 12. A user may compare the building drawing(s) 11 shown on the display monitor 23 and the structures, equipment, and facilities and the instrument elements 111 in the building drawing(s) 11 and the real construction structure are synchronously checked and verified.

The above mentioned embodiment is the main skill feature of

this invention and corresponds to the claim 1 of this invention to understand the objective and embodiments of this invention in detail. And the skill features of the depending claims are for describing the claim 1 in detail or adding more skill features, but not limited thereto. It should be known that the claim 1 is not necessary to include the skill features of the depending claims.

Please refer to FIGs. 1 to 6, the integrated perceptual positioning module 25 may further include a GPS (Global Positioning System). A user holding the mobile device 2 in the exterior of reality obtains the reality absolute coordinate with the integrated perceptual positioning module 25. And the original location point is defined and compared by the reality absolute coordinate and the virtual spatial coordinate. The photographing unit 24 may capture a reality picture 1111 of a real structure corresponding to the instrument elements 111. The reality picture 1111 is uploaded to the cloud server 30 by the transmission unit 21 so as to provide a back-end drafter to synchronously correct the drawing information and synchronously correct a construction site, and further record entire information. Additionally, the instrument element 111 may further include a relief device having escape information and path so as to provide the user holding the mobile device 2 to download from the cloud server 30 to relieve. The display monitor 23 shows the building drawing(s) 11 and a position correction in reality to guide to escape or relieve. A location of the user in reality may be shown by

video or text messages shown on the mobile device 2 to improve the efficiency of relieving, escaping, guiding, and searching and make relief workers safe. Besides, the user holding the mobile device 2 may click each instrument element 111 of the building drawing 11 and an instrument information display unit 13 is popped up to check and review each instrument element 111 of the building drawing 11. And the photographing unit 24 may capture the reality picture 1111 of the real structure corresponding to each instrument element 111 and then compare and overlap the building drawing 11. In addition, each instrument information display unit 13 may include name, location, category, group name, and repair history corresponding to each instrument element. The building drawing 11 has a conversion between two dimensions and three dimensions. When the building drawing 11 shown on the display monitor 23 is three dimensions, a plane contracted drawing is shown on the display monitor 23 and located in a corner of the building drawing 11 by Plane Positioning Technology so that it corresponds to a plane location of the cursor unit 12. Finally, the mobile device 2 may be a smart phone, a tablet, a PDA(Personal Digital Assistant), a laptop computer, or a wearable device.

As above mentioned, the user may use the mobile device 2 to download the database 1 from the host 10 or the cloud server 30 to store in the record unit 22. The user may use the mobile device to choose the present location or the floor plane drawing while being in

the construction site or not. In FIG 3, the display monitor 23 of the mobile device 2 displays the building drawing(s) 11. The conversion of the two dimensions and three dimensions is loaded to the 3-dimensional (3-D) building drawing(s), shown as the dash line in FIG 4.

In FIGs. 3 and 4, the building drawing(s) 11 is shown on the display monitor 23. The integrated perceptual positioning module 25 of the mobile device 2 obtains the absolute coordinate from the interior of the reality and an original location point from the plane drawing of the 3-D digital drawing information of the building drawing(s) 11. The original location point is the original positioning point of the reality absolute coordinate of the building drawing 11 in the virtual spatial coordinate. The reality absolute coordinate and the original location point of the 3-D digital drawing information of the building drawing(s) 11 in the spatial coordinate are calculated and overlapped by the integrated perceptual positioning module 25. The integrated perceptual positioning module 25 continuously calculates, overlaps, and corrects an accumulated coordinate error resulted from the mobile device 2 moving in reality. The integrated perceptual positioning module 25 continuously positions a moving track of the real location and coordinate of the mobile device 2. The reality absolute coordinate is displayed to the location in the virtual spatial coordinate in the 3-dimensional drawing information of the building drawing(s) 11 by

calculating and overlapping the reality absolute coordinate and the virtual spatial coordinate. It is advantageous to applying to Virtual Reality (VR) and Augmented Reality (AR). The integrated perceptual positioning module 25 continuously positions the movement of the mobile device which is shown on the display monitor 23 to map to the building drawing 11 by the cursor unit 12. Please refer to the upper right corner of FIG. 4, when the building drawing 11 shown on the display monitor 23 is three dimensions, a plane contracted drawing 11A is shown on the display monitor 23 and located in a corner of the building drawing 11 by Plane Positioning Technology so that it corresponds to a plane location of the cursor unit 12.

Please refer to FIG. 4 about the click hand 20, when the user holding the mobile device 2 clicks one of the instrument elements 111, an instrument information display unit 13 may be popped up. In FIG. 5, the instrument information display unit 13 may include name, location, category, group name, and repair history corresponding to each instrument element 111 so as to look up, check, and inventory each instrument element 111. The user may compare the building drawing(s) 11 shown on the display monitor 23 with the structures, equipment, and facilities in reality, and the instrument elements 111 in the building drawing(s) 11 and the real construction structure are synchronously checked and verified.

In FIG. 4, the photographing unit (24, shown as in FIGs. 1 and 2)

of the mobile device 2 is used. A rear lens may capture a reality picture 1111 of the reality structure corresponding to the instrument element 111. The instrument element (111, shown by dash line) and the reality picture (1111, shown by solid line) of the reality structure may be shown simultaneously so that the reality picture 1111 and the building drawing 11 are compared and overlapped, shown as in FIG. 6.

The reality picture 1111 is further uploaded to the cloud server 30 by the transmission unit 21 so as to provide a back-end drafter to synchronously correct the drawing information and a construction site, and further record entire information. The high efficient management of checking and verifying the instrument element(s) 111 of the building drawing(s) 11 and the reality structure may be achieved.

The instrument element(s) 111 of the building drawing(s) 11 further includes a relief device which has escape information and path so as to provide the user holding the mobile device 2 to download the building drawing 11 from the cloud server 30 to relieve. The display monitor 23 shows the building drawing 11 and a position correction in reality to guide to escape or relieve. A location of the user in reality is shown by video or text messages shown on the mobile device 2 to improve the efficiency of relieving, escaping, guiding, and searching and make relief workers safe.

As above mentioned, the database 1 arranged at the host 10 and the cloud server 30 has the building drawing 11, the cursor unit 12 and

a plurality of instrument information display units 13. It may cooperate with the transmission unit 21, the record unit 22, the display monitor 23, photographing unit 24 and the integrated perceptual positioning module 25 of the mobile device 2 so as to truly improve the spatial positioning technology. The advantages are described as follows.

Firstly, the integrated perceptual positioning module 25 continuously positions the moving track of the real location and coordinate of the mobile device 2 shown in the building drawing 11 and on the display monitor 23, and the cursor unit 23 is moved corresponding to the movement of the mobile unit 2 shown on the display monitor 23. The building drawing 11 on the display monitor 23 is compared with the structures, the instruments, and facilities, and the high efficient management of checking and verifying the instrument element(s) 111 of the building drawing(s) 11 and the reality structure may be achieved.

Secondly, the mobile device 2 may obtain the structures, relief instruments, and escape information in the building drawing 11 of the database 1 so as to improve the efficiency of escaping, guiding, and reliving. The safety of the relief workers may be ensured and the sufferer may be saved in golden window.

The foregoing descriptions are merely the exemplified embodiments of the present invention, where the scope of the claim of the present invention is not intended to be limited by the embodiments.

Any equivalent embodiments or modifications without departing from the spirit and scope of the present invention are therefore intended to be embraced.

The disclosed structure of the invention has not appeared in the prior art and features efficacy better than the prior structure which is construed to be a novel and creative invention, thereby filing the present application herein subject to the patent law.

WHAT IS CLAIMED IS:

1. An integrated perceptual positioning system based on 3-dimensional information model, comprising:

a building information model and facility instrument database, instructed by interiors of buildings, and open space areas of the buildings, schools, interiors and exteriors of factories, or navigation transportations, the database is built in a host and a cloud server, the database includes at least one building drawing, a cursor unit, and a plurality of instrument information display units, the building drawing has a plurality of instrument elements constructed by 3-dimensional digital drawing information, each instrument element is a facility structure, an electric motor equipment, a power equipment, or an equipment pipeline; and

a mobile device, having a transmission unit, a record unit, a display monitor, a photographing unit, and an integrated perceptual positioning module, the integrated perceptual positioning module includes one of a deep camera lens, a gyroscope, an electronic compass, a Wi-Fi, a Bluetooth, and an Internet of Things, the transmission unit downloads from the database of the host or the cloud server to the record unit, the display monitor displays the building drawing, the integrated perceptual positioning module of the mobile device obtains a reality absolute coordinate from an interior of reality and an original

location point from a plan view of the 3-dimensional digital drawing information in the building drawing, the original location point in the reality absolute coordinate corresponds to an original positioning point in a virtual spatial coordinate, the integrated perceptual positioning module calculates and overlaps a location in the reality absolute coordinate and the original positioning point in the virtual spatial coordinate of the 3-dimensional digital drawing information in the building drawing, the integrated perceptual positioning module continuously calculates, overlaps, and corrects an accumulated coordinate error resulted from the mobile device moving in reality, the integrated perceptual positioning module continuously positions a moving track of a real location and coordinate of the mobile device, the reality absolute coordinate is displayed to a location in the virtual spatial coordinate in the 3-dimensional drawing information of the building drawing by calculating and overlapping the reality absolute coordinate and the virtual spatial coordinate, it is advantageous to applying to Virtual Reality(VR) and Augmented Reality(AR), the integrated perceptual positioning module continuously positions the movement of the mobile device which is shown on the display monitor to map to the building drawing by the cursor unit, a user compares the building drawing shown on the display monitor with the structures, equipment, and facilities in reality, and the instrument elements in the building drawing and the real construction structure are synchronously

checked and verified.

2. The integrated perceptual positioning system based on 3-dimensional information model as claimed in claim 1, wherein the integrated perceptual positioning module further includes a GPS(Global Positioning System), a user holding the mobile device in the exterior in reality obtains the reality absolute coordinate with the integrated perceptual positioning module, and the original location point is defined and compared by the reality absolute coordinate and the virtual spatial coordinate.

3. The integrated perceptual positioning system based on 3-dimensional information model as claimed in claim 1, wherein the photographing unit captures a reality picture of a real structure corresponding to the instrument elements, the reality picture is uploaded to the cloud server by the transmission unit so as to provide a back-end drafter to synchronously correct the drawing information and a construction site, and further record entire information.

4. The integrated perceptual positioning system based on 3-dimensional information model as claimed in claim 1, wherein the instrument element further includes a relief device having escape information and path so as to provide the user holding the mobile device to download from the cloud server to relieve, the display monitor shows the building drawing and a position correction in reality to guide to escape or relieve, a location of the user in reality is shown

by video or text messages shown on the mobile device to improve the efficiency of relieving, escaping, guiding, and searching and make relief workers safe.

5. The integrated perceptual positioning system based on 3-dimensional information model as claimed in claim 1, wherein the user holding the mobile device clicks each instrument element of the building drawing and an instrument information display unit is popped up to check and review each instrument element of the building drawing, and the photographing unit captures the reality picture of the real structure corresponding to each instrument element and then compare and overlap the building drawing.

6. The integrated perceptual positioning system based on 3-dimensional information model as claimed in claim 1, wherein each instrument information display unit includes name, location, category, group name, and repair history corresponding to each instrument element.

7. The integrated perceptual positioning system based on 3-dimensional information model as claimed in claim 1, wherein the building drawing has a conversion between two dimensions and three dimensions, when the building drawing shown on the display monitor is three dimensions, a plane contracted drawing is shown on the display monitor and located in a corner of the building drawing by Plane Positioning Technology so that it corresponds to a plane location of the

cursor unit.

8. The integrated perceptual positioning system based on 3-dimensional information model as claimed in claim 1, wherein the mobile device is a smart phone, a tablet, a PDA(Personal Digital Assistant), a laptop computer, or a wearable device.