METHOD AND APPARATUS OF PROCESSING POSITIONING INFORMATION, ELECTRONIC DEVICE, AND STORAGE MEDIUM

TECHNICAL FIELD

[0001] The present disclosure relates to a field of a positioning technology, and in particular, to a field of a three-dimensional positioning technology in an enclosed space, and specifically to a method and an apparatus of processing a positioning information, an electronic device, and a storage medium.

BACKGROUND

[0002] In a process of cargo transportation, flight cases, containers and other loading tools play a role of cargo containers and are basic units of transportation. Therefore, flight cases, containers and other loading tools are also a focus of detection in a security inspection process. During the security inspection process, if a suspicious object is detected, it is inevitable to take out the suspicious object for inspection.

[0003] Due to a complex internal environment of the flight cases, containers and other loading tools, in a related art, even if a virtual position of the suspicious object is detected by a tomography technology, it is difficult for a security personnel to take out the suspicious object from an interior of the flight cases, containers and other loading tools according to the virtual position, and it has a poor accuracy in positioning the suspicious object.

SUMMARY

[0004] In view of the above, the present disclosure provides a method and an apparatus of processing a positioning information, an electronic device, a storage medium, and a computer program product.

[0004a] Aspects of the invention are defined in the independent claims. Some optional features of the invention are defined in the dependent claims.

[0005] An exemplary method of processing a positioning information is provided, including: acquiring, in response to a positioning request, a distance information of each of a

plurality of base stations for a terminal device; determining, based on a plurality of distance information, a first position information of the terminal device in a first reference system determined based on the plurality of base stations; and determining a positioning information of the terminal device for a target object based on the first position information and a position information of the target object, where the position information of the target object is determined from a tomography result.

[0006] According to embodiments of the present disclosure, the plurality of base stations include a plurality of base station groups meeting a predetermined condition, and the predetermined condition indicates that a plurality of base stations in the base station group are not coplanar; the determining, based on a plurality of distance information, a first position information of the terminal device in a first reference system determined based on the plurality of base stations includes: determining, for each base station group, a second position information of the terminal device in the first reference system based on a plurality of distance information related to the base station group; and determining the first position information based on a plurality of second position information respectively related to the plurality of base station groups.

[0007] According to embodiments of the present disclosure, the plurality of base stations form a detection space including an internal space of a cuboid-shaped flight case, the plurality of base stations include eight UWB base stations fixed at vertices on an outer side of the flight case, the eight UWB base stations are divided into two base station groups, a first base station group includes three UWB base stations on a first surface of the flight case and one UWB base station on a second surface of the flight case, a second base station group includes one UWB base station on the first surface and three UWB base stations on the second surface, and the first surface and the second surface are opposite to each other.

[0008] According to embodiments of the present disclosure, the determining the first position information based on a plurality of second position information respectively related to the plurality of base station groups includes: acquiring a set of historical position information of the terminal device in the first reference system; determining, based on the set of historical position information, a predicted position information of the terminal device at a request initiation moment of the positioning request; and determining the first position information based on the predicted position information and the plurality of second position information.

[0009] According to embodiments of the present disclosure, the determining, based on

the set of historical position information, a predicted position information of the terminal device at a request initiation moment of the positioning request includes: generating a displacement curve of the terminal device based on the set of historical position information; and predicting a position of the terminal device at the request initiation moment based on the displacement curve, so as to obtain the predicted position information.

[0010] According to embodiments of the present disclosure, the set of historical position information includes a plurality of historical position information, the historical position information is configured with a recording moment; the generating a displacement curve of the terminal device based on the set of historical position information includes: extracting, from the set of historical position information, a plurality of first target historical position information with recording moments closest to the request initiation moment; performing an interpolation on the plurality of first target historical position information by using a Catmull-Rom interpolation algorithm, so as to obtain a plurality of interpolation point position information; and generating the displacement curve of the terminal device based on the plurality of target historical position information and the plurality of interpolation point position information.

[0011] According to embodiments of the present disclosure, the predicting a position of the terminal device at the request initiation moment based on the displacement curve so as to obtain the predicted position information includes: determining a second target historical position information from the plurality of first target historical position information, where a recording moment of the second target historical position information is closest to the request initiation moment; determining, based on the displacement curve, a predicted velocity information associated with the second target historical position information; determining a predicted displacement information according to the predicted velocity information, the request initiation moment, and the recording moment of the second target historical position information; and determining the predicted position information based on the predicted displacement information and the second target historical position information.

[0012] According to embodiments of the present disclosure, the determining the first position information based on the predicted position information and the plurality of second position information includes: calculating, for each second position information, a distance between a coordinate indicated by the predicted position information and a coordinate indicated by the second position information, so as to obtain a distance value; determining a target

distance value from a plurality of distance values respectively related to the plurality of second position information, where the target distance value is a minimum value in the plurality of distance values; and determining the second position information related to the target distance value as the first position information.

[0013] According to embodiments of the present disclosure, the determining the first position information based on a plurality of second position information respectively related to the plurality of base station groups includes: determining information weights respectively related to the plurality of second position information based on signal attenuation amounts of the plurality of base station groups; and determining the first position information based on the plurality of second position information and the information weights respectively related to the plurality of second position information.

[0014] According to embodiments of the present disclosure, the determining the first position information based on a plurality of second position information respectively related to the plurality of base station groups includes: calculating an average value of coordinates indicated by the plurality of second position information, so as to obtain the first position information.

[0015] According to embodiments of the present disclosure, the determining a positioning information of the terminal device for a target object based on the first position information and a position information of the target object includes: determining a second reference system based on the tomography result; processing the position information of the target object by using a conversion strategy between the first reference system and the second reference system, so as to obtain a third position information of the target object in the first reference system; and generating the positioning information based on the first position information and the third position information.

[0016] According to embodiments of the present disclosure, the method further includes: sending the positioning information to the terminal device, so as to display the positioning information on the terminal device.

[0017] According to embodiments of the present disclosure, the method further includes: scanning a detection space formed by the plurality of base stations by using an electronic computer tomography scanner, so as to obtain the tomography result.

[0018] Further, an exemplary apparatus of processing a positioning information is

provided, including: an acquisition module configured to acquire, in response to a positioning request, a distance information of each of a plurality of base stations for a terminal device; a first determination module configured to determine, based on a plurality of distance information, a first position information of the terminal device in a first reference system determined based on the plurality of base stations; and a second determination module configured to determine a positioning information of the terminal device for a target object based on the first position information and a position information of the target object, where the position information of the target object is determined from a tomography result.

[0019] Further, an exemplary electronic device is provided, including: one or more first processors; and a memory for storing one or more instructions, where the one or more instructions are configured to, when executed by the one or more processors, cause the one or more first processors to implement the method described above.

[0020] Further, an exemplary computer readable storage medium having computer executable instructions therein is provided, and the instructions are configured to, when executed, implement the method described above.

[0021] Further, an exemplary computer program product containing computer executable instructions is provided, and the instructions are configured to, when executed, implement the method described above.

[0022] According to embodiments of the present disclosure, the terminal device may be provided with a positioning tag to achieve the positioning of the terminal device by the base station. When positioning the target object in response to the positioning request, it is possible to determine the first position information of the terminal device according to the positioning information of each base station for the terminal device, and then process the first position information and the position information of the target object determined from the tomography result, so as to determine the positioning information of the terminal device for the target object. The positioning information may be used to guide the inspector holding the terminal device to find the target object in the detection space. Therefore, the technical problem of poor positioning accuracy for the target object in the security inspection process of the loading tool in the related art may be at least partially overcome, so that a positioning accuracy for the target object may be effectively improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] The above and other objectives, features and advantages of the present disclosure will be clearer with following descriptions of the present disclosure with reference