CLAIMS

WHAT IS CLAIMED IS:

[Claim 1]

An environment perception device of a mobile vehicle, comprising:

a camera module disposed on the mobile vehicle and configured to photograph a field near the mobile vehicle to generate a three-dimensional (3D) image frame;

a LiDAR module disposed on the mobile vehicle and configured to scan the field to generate a 3D scanned frame;

a database configured to store a 3D map; and

a processing circuit coupled to the camera module and the LiDAR module to receive the 3D image frame and the 3D scanned frame,

wherein the processing circuit is configured to fuse the 3D image frame and the 3D scanned frame to generate a fused 3D object information corresponding to an object in the field,

the processing circuit is configured to determine whether the object in the field is a static object or a moving object by comparing the fused 3D object information with the 3D map,

in a case where the object in the field is the moving object, the processing circuit performs an analysis and calculation on the fused 3D object information to obtain a movement characteristic of the moving object, and

in a case where the object in the field is the static object, the processing circuit skips the analysis and calculation on the fused 3D object information.

[Claim 2]

The environment perception device according to claim 1, wherein the camera module comprises a depth camera, and the 3D image frame comprises a depth image frame.

[Claim 3]

The environment perception device according to claim 1, wherein the processing circuit comprises:

a first partition circuit coupled to the camera module to receive the 3D image frame, wherein the first partition circuit is configured to perform a first algorithm to segment a first region corresponding to the object from the 3D image frame;

a second partition circuit coupled to the LiDAR module to receive the 3D scanned frame, wherein the second partition circuit is configured to perform a second algorithm to segment a second region corresponding to the object from the 3D scanned frame; and

an object recognition circuit coupled to the first partition circuit and the second partition circuit,

wherein the object recognition circuit performs a fusion operation to fuse the first region and the second region that match each other into the fused 3D object information,

the object recognition circuit compares the fused 3D object information with the 3D map to determine whether the object in the field is the static object or the moving object,

in the case where the object in the field is the moving object, the object recognition circuit performs the analysis and calculation on the fused 3D object information, and

in the case where the object in the field is the static object, the object recognition circuit skips the analysis and calculation on the fused 3D object information.

[Claim 4]

The environment perception device according to claim 3, wherein the fusion operation comprises an edge detection algorithm, and the edge detection algorithm is configured to process the first region and the second region to generate the first region after edge detection and the second region after edge detection.

[Claim 5]

The environment perception device according to claim 1, wherein the movement characteristic comprises at least one of a size, a position, a distance, a speed, an acceleration, and a direction.

[Claim 6]

The environment perception device according to claim 1, wherein the analysis and calculation further obtains a movement trend of the object in the field based on the movement characteristic, and the processing circuit further determines whether to trigger an obstacle alarm based on the movement trend.

[Claim 7]

An environment perception method of a mobile vehicle, comprising:

photographing a field near the mobile vehicle by a camera module disposed on the mobile vehicle to generate a three-dimensional (3D) image frame;

scanning the field by a LiDAR module disposed on the mobile vehicle to generate a 3D scanned frame;

fusing the 3D image frame and the 3D scanned frame by a processing circuit to generate a fused 3D object information corresponding to an object in the field;

determining whether the object in the field is a static object or a moving object by comparing the fused 3D object information with a 3D map stored in a database by the processing circuit to determine whether the object in the field is a static object or a moving object;

in a case where the object in the field is the moving object, performing an analysis and calculation on the fused 3D object information by the processing circuit to obtain a movement characteristic of the moving object; and

in a case where the object in the field is the static object, skipping the analysis and

calculation on the fused 3D object information by the processing circuit.

[Claim 8]

The environment perception method according to claim 7, wherein the camera module comprises a depth camera, and the 3D image frame comprises a depth image frame.

[Claim 9]

The environment perception method according to claim 7, further comprising:

performing a first algorithm by a first partition circuit of the processing circuit to segment a first region corresponding to the object from the 3D image frame;

performing a second algorithm by a second partition circuit of the processing circuit to segment a second region corresponding to the object from the 3D scanned frame;

performing a fusion operation by an object recognition circuit of the processing circuit to fuse the first region and the second region that match each other into the fused 3D object information;

comparing the fused 3D object information with the 3D map by the object recognition circuit to determine whether the object in the field is the static object or the moving object;

in the case where the object in the field is the moving object, performing the analysis and calculation on the fused 3D object information by the object recognition circuit; and

in the case where the object in the field is the static object, skipping the analysis and calculation on the fused 3D object information by the object recognition circuit.

[Claim 10]

The environment perception method according to claim 9, wherein the fusion operation comprises an edge detection algorithm, and the edge detection algorithm is configured to process the first region and the second region to generate the first region after edge detection and the second region after edge detection.

[Claim 11]

The environment perception method according to claim 7, wherein the movement characteristic comprises at least one of a size, a position, a distance, a speed, an acceleration, and a direction.

[Claim 12]

The environment perception method according to claim 7, further comprising:

performing the analysis and calculation by the processing circuit to obtain a movement trend of the object in the field based on the movement characteristic; and

determining by the processing circuit whether to trigger an obstacle alarm based on the movement trend.