[0004] In the overhead transport vehicle described above, there is a possibility that, for example, a protruding part of peripheral equipment in close proximity to the elevating holding unit may be misjudged as an obstacle. In addition, the overhead transport vehicle described above may not be able to reliably detect an obstacle due to the narrow detection range of the look-down sensor.

[0005] Embodiments of the present invention seek to provide an overhead transport vehicle capable of accurately and reliably determining the presence or absence of an obstacle.

Solution to Problem

[0006] According to a first aspect of the present invention, there is provided an overhead transport vehicle comprising a holding unit that is provided to be liftable and lowerable and configured to hold an article; a three-dimensional ranging sensor that has a detection range to include surroundings of a lower space formed directly below the article held by the holding unit; and a control device that is configured to determine presence or absence of an obstacle based on a detection result of the three-dimensional ranging sensor, wherein

the detection range of the three-dimensional ranging sensor includes at least one of the holding unit and the article held by the holding unit, and

the control device determines at least one of swaying, tilting, and rotating of the article held by the holding unit based on a detection result of the three-dimensional ranging sensor.

[0007] In this overhead transport vehicle, the three-dimensional ranging sensor can detect an object in a wider detection range than a look-down sensor or the like does. In addition, since the three-dimensional ranging sensor can detect an object in the detection range in three dimensions, it is possible to suppress misjudgments such as determining that a protruding portion of peripheral equipment or the like, located at a high position, for example, is an obstacle. Therefore, it is possible to accurately and reliably determine the presence or absence of an

obstacle.

[0008] In the overhead transport vehicle according to an example of the present invention, the detection range of the three-dimensional ranging sensor may include at least one of the holding unit and the article held by the holding unit, and the control device may determine at least one of swaying, tilting, and rotating of the article held by the holding unit based on a detection result of the three-dimensional ranging sensor. In this case, during the transfer of the article, the lifting, lowering, or the like of the holding unit can be controlled using, for example, the determination result of at least on one of the swaying, tilting, and rotating of the article, making it possible to prevent an error in the transfer of the article.

[0009] In the overhead transport vehicle according to an example of the present invention, at least one of the holding unit and the article held by the holding unit may include a light emitter, and the three-dimensional ranging sensor may detect light emitted by the light emitter. This makes it possible to determine at least one of swaying, tilting, and rotating of an article using the light emitted by the light emitter.

[0010] In the overhead transport vehicle according to an example of the present invention, at least one of the holding unit and the article held by the holding unit may have an AR marker, and the three-dimensional ranging sensor may detect the AR marker. This makes it possible to determine at least one of swaying, tilting, and rotating of an article using the AR marker.

[0011] In the overhead transport vehicle according to an example of the present invention, the three-dimensional ranging sensor may include a

stereo camera. In this case, even if there is a device using another infrared sensor or the like in the surroundings of the overhead transport vehicle, the stereo camera does not interfere with the other infrared sensor or the like, so an adverse effect of the three-dimensional ranging sensor on the other infrared sensor or the like can be suppressed.

[0012] In the overhead transport vehicle according to an example of the present invention, the stereo camera may be installed at a position above the holding unit to have an overhead view of the holding unit, and may include, in the angle of view, the holding unit at its lowest position. In this case, the stereo camera can be effectively used as a three-dimensional ranging sensor.

[0013] The overhead transport vehicle according to an example of the present invention may include a lifting drive unit that is configured to lift and lower the holding unit, in which the three-dimensional ranging sensor is disposed in the lifting drive unit at a position directly above the article held by the holding unit. In this case, an effective arrangement configuration of the three-dimensional ranging sensor can be achieved.

[0014] The overhead transport vehicle according to an example of the present invention may include a gyro sensor and an acceleration sensor that are configured to detect swaying and tilting of the three-dimensional ranging sensor. In this case, it is possible to accurately and reliably determine the presence or absence of an obstacle.

Advantageous Effects of Invention

[0015] According to an example of the present invention, it is possible to provide an overhead transport vehicle capable of accurately and reliably determining the presence or absence of an obstacle.

CLAIMS

[Claim 1] An overhead transport vehicle comprising:

a holding unit that is provided to be liftable and lowerable and configured to hold an article;

a three-dimensional ranging sensor that has a detection range to include surroundings of a lower space formed directly below the article held by the holding unit; and

a control device that is configured to determine presence or absence of an obstacle based on a detection result of the three-dimensional ranging sensor, wherein

the detection range of the three-dimensional ranging sensor includes at least one of the holding unit and the article held by the holding unit, and

the control device determines at least one of swaying, tilting, and rotating of the article held by the holding unit based on a detection result of the three-dimensional ranging sensor.

[Claim 2] The overhead transport vehicle according to claim 1, wherein

at least one of the holding unit and the article held by the holding unit includes a light emitter, and

the three-dimensional ranging sensor detects light emitted by the light emitter.

[Claim 3] The overhead transport vehicle according to claim 1, wherein

at least one of the holding unit and the article held by the holding unit has an AR marker, and

the three-dimensional ranging sensor detects the AR marker.

[Claim 4] The overhead transport vehicle according to any one of claims 1 to 3, wherein the three-dimensional ranging sensor includes a stereo camera.

[Claim 5] The overhead transport vehicle according to claim 4, wherein the stereo camera is installed at a position above the holding unit to have an overhead view of the holding unit and include, in an angle of view, the holding unit at a lowest position.

[Claim 6] The overhead transport vehicle according to any one of claims 1 to 5, comprising a lifting drive unit that is configured to lift and lower the holding unit, wherein

the three-dimensional ranging sensor is disposed in the lifting drive unit at a position directly above the article held by the holding unit.

[Claim 7] The overhead transport vehicle according to any one of claims 1 to 6, comprising a gyro sensor and an acceleration sensor that are configured to detect swaying and tilting of the three-dimensional ranging sensor.