

CLAIMS

What is claimed is:

1. A method for detecting misalignment of a container loaded onto an autonomous vehicle, the method comprising:

receiving data comprising an indication that the container is loaded onto the autonomous vehicle;

capturing, by a scanning device mounted on the autonomous vehicle, a plurality of data points in the vicinity of the container;

identifying, by a misalignment detection module, a first data point of the plurality of data points and a second data point of the plurality of data points;

determining, by the misalignment detection module, whether the container is misaligned on the autonomous vehicle based on a height difference between a height of the first data point and a height of the second data point; and

providing an indication of whether the container is misaligned.

2. The method of claim 1, wherein the container is misaligned when the height difference is greater than a height difference threshold.

3. The method of claim 1 or claim 2, wherein the first data point is located on a top front left corner of the container and the second data point is located on a top front right corner of the container.

4. The method of any of the preceding claims, further comprising identifying, using a misalignment detection module, heights associated with each of the plurality of data points; and identifying a maximum height of the plurality of data points that defines a rooftop of the container.

5. The method of any of the preceding claims, wherein the plurality of data points comprises a plurality of light and detection ranging (LiDAR) data points.
6. The method of claim 4, wherein the first data point and the second data point are identified from a subset of the plurality of datapoints located within a designated three-dimensional region surrounding the container.
7. The method of claim 6, wherein the first data point and the second data point are further identified from the subset based on a height that is greater than the maximum height minus an error correction value.
8. The method of any of the preceding claims, wherein the autonomous vehicle comprises a head and a trailer for loading of the container, and the scanning device is a light and detection ranging (LiDAR) scanning device mounted on a center line of the head.
9. The method of claim 8, wherein the LiDAR scanning device is mounted perpendicular to a top of the head of the autonomous vehicle.
10. The method of any of the preceding claims, wherein the autonomous vehicle is an autonomous prime mover.
11. The method of any of the preceding claims, wherein the container is automatically loaded or unloaded onto the autonomous vehicle without manual intervention by a gantry crane, and the indication is provided by either the gantry crane or user input.

12. The method of any of the preceding claims, wherein when the container is misaligned, an alarm is triggered to facilitate human-aided manual re-loading or unloading of the container onto the autonomous vehicle.

13. A system for detecting misalignment of a container loaded onto an autonomous vehicle, the system comprising:

at least one data processor; and

memory storing instructions, which when executed by at least one data processor, result in operations for implementing operations comprising:

receiving data comprising an indication that the container is loaded onto the autonomous vehicle;

capturing, by a scanning device mounted on the autonomous vehicle, a plurality of data points in the vicinity of the container;

identifying, by a misalignment detection module, a first data point of the plurality of data points and a second data point of the plurality of data points;

determining, by the misalignment detection module, whether the container is misaligned on the autonomous vehicle based on a height difference between a height of the first data point and a height of the second data point; and

providing an indication of whether the container is misaligned.

14. The system of claim 13, wherein the container is misaligned when the height difference is greater than a height difference threshold.

15. The system of claim 13 or claim 14, wherein the first data point is located on a top front left corner of the container and the second data point is located on a top front right corner of the container.

16. The systems of any of claim 13 to claim 15, wherein the operations further comprise identifying, using a misalignment detection module, heights associated with each of the plurality of data points; and identifying a maximum height of the plurality of data points that defines a rooftop of the container.

17. The system of claim 16, wherein the first data point and the second data point are identified from a subset of the plurality of datapoints located within a designated three-dimensional region surrounding the container based on a height that is greater than the maximum height minus an error correction value.

18. The system of any of claim 13 to claim 17, wherein the autonomous vehicle comprises a head and a trailer for loading of the container, and the scanning device is a light and detection ranging (LiDAR) scanning device mounted on a center line of the head, and wherein the LiDAR scanning device is mounted perpendicular to a top of the head of the autonomous vehicle.

19. The system of any of claim 13 to claim 18, wherein the autonomous vehicle is an autonomous prime mover.

20. A non-transitory computer program product storing instructions which, when executed by at least one data processor forming part of at least one computing device, implement operations comprising:

receiving data comprising an indication that the container is loaded onto the autonomous vehicle;

capturing, by a scanning device mounted on the autonomous vehicle, a plurality of data points in the vicinity of the container;

identifying, by a misalignment detection module, a first data point of the plurality of data points and a second data point of the plurality of data points;

determining, by the misalignment detection module, whether the container is misaligned on the autonomous vehicle based on a height difference between a height of the first data point and a height of the second data point; and

providing an indication of whether the container is misaligned.