CLAIMS

What is claimed is:

1. A method for detecting location aspects of an autonomous vehicle to avoid collisions, the method comprising:

receiving, from a first scanning device mounted on a centerline of an autonomous vehicle in a perpendicular manner to a front plate of a trailer of the autonomous vehicle, data comprising a plurality of points characterizing the trailer;

defining a first plane associated with the trailer based on a number of the plurality of points exceeding or equaling a first predetermined threshold; determining whether the first plane is perpendicular to a ground;

based on the first plane being perpendicular to the ground, determining an orientation of the trailer based on the first plane; and

controlling maneuvering of the autonomous vehicle through one or more commands based on the orientation of the trailer.

2. The method of claim 1, further comprising:

receiving, from a second scanning device, a plurality of side points characterizing a side of the trailer;

defining a second plane associated with a side of the trailer based on the plurality of side points exceeding or equaling a second predetermined threshold; determining whether the second plane is perpendicular to the ground; and

based on the second plane being perpendicular to the ground and a radiance difference between the first plane and the second plane being less than a third predetermined threshold, adjusting the orientation of the trailer based on the first plane and the second plane.

3. The method of claim 2, wherein the second predetermined threshold is at least four times larger than the first predetermined threshold.

4. The method of claim 2 or claim 3, wherein the second scanning device is mounted on a right side of a front bumper of the autonomous vehicle or on a left side of the front bumper.

5. The method of any of claim 2 to claim 4, wherein at least one of the first plane or the second plane is determined using a random sample consensus model.

6. The method of any of claim 2 to claim 5, wherein at least one of the first scanning device or the second scanning device is a light and detection ranging (LiDAR) device and the plurality of points or the plurality of side points comprises a plurality of LiDAR points.

7. The method of any of the preceding claims, wherein the autonomous vehicle is an autonomous prime mover and wherein the maneuvering of the autonomous vehicle is within a shipping port environment.

8. The method of claim 1, wherein the first predetermined threshold comprises 100 data points.

9. The method of claim 1, further comprising determining a position of the trailer based on a combination of a length of the trailer, a width of the trailer, a height of the trailer, and a rotation point location of the trailer.

10. A system for detecting location aspects of an autonomous vehicle to avoid collisions, 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, from a first scanning device mounted on a centerline of an autonomous vehicle in a perpendicular manner to a front plate of the trailer of the autonomous vehicle, data comprising a plurality of points characterizing the trailer;

defining a first plane associated with the trailer based on a number of the plurality of points exceeding or equaling a first predetermined threshold; determining whether the first plane is perpendicular to a ground

based on the first plane being perpendicular to the ground, determining an orientation of the trailer based on the first plane; and

controlling maneuvering of the autonomous vehicle through one or more commands based on the orientation of the trailer.

11. The system of claim 10, further comprising:

receiving, from a second scanning device, a plurality of side points characterizing a side of the trailer;

defining a second plane associated with a side of the trailer based on the plurality of side points exceeding or equaling a second predetermined threshold; determining whether the second plane is perpendicular to the ground; and

based on the second plane being perpendicular to the ground and a radian difference between the first plane and the second plane being less than a third predetermined threshold, adjusting the orientation of the trailer based on the first plane and the second plane.

12. The system of claim 11, wherein the second predetermined threshold is at least four times larger than the first predetermined threshold.

13. The system of claim 11 or claim 12, wherein the second scanning device is mounted on a right side of a front bumper of the autonomous vehicle or on a left side of the front bumper.

14. The system of any of claim 11 to claim 13, wherein at least one of the first plane or the second plane is determined using a random sample consensus model.

15. The system of any of claim 11 to claim 14, wherein at least one of the first scanning device or the second scanning device is a light and detection ranging (LiDAR) device and the plurality of points or the plurality of side points comprises a plurality of LiDAR data points.

16. The system of any of claim 10 to claim 15, wherein the autonomous vehicle is an autonomous prime mover and wherein the maneuvering of the autonomous vehicle is within a shipping port environment.

17. A non-transitory computer program product for detecting location aspects of an autonomous vehicle to avoid collisions, the 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, from a first scanning device mounted on a centerline of an autonomous vehicle in a perpendicular manner to a front plate of the trailer of the autonomous vehicle, data comprising a plurality of points characterizing a trailer of an autonomous vehicle;

defining a first plane associated with the trailer based on a number of the plurality of points exceeding a first predetermined threshold; determining whether the first plane is perpendicular to a ground;

based on the first plane being perpendicular to the ground, determining an orientation of the trailer based on the first plane; and

controlling maneuvering of the autonomous vehicle through one or more commands based on the orientation of the trailer.

18. The non-transitory computer program product of claim 17 further comprising:

receiving, from a second scanning device, a plurality of side points characterizing a side of the trailer;

defining a second plane associated with a side of the trailer based on the plurality of side points exceeding a second predetermined threshold; determining whether the second plane is perpendicular to the ground; and

based on the second plane being perpendicular to the ground and a radian difference between the first plane and the second plane being less than a third predetermined threshold, adjusting the orientation of the trailer based on the first plane and the second plane.

19. The non-transitory computer program product of claim 18, wherein the second predetermined threshold is at least four times larger than the first predetermined threshold.

20. The non-transitory computer program product of claim 18 or claim 19, wherein the second scanning device is mounted on a right side of a front bumper of the autonomous vehicle or on a left side of the front bumper.

21. The non-transitory computer program product of any of claim 18 to claim 20, wherein at least one of the first plane or the second plane is determined using a random sample consensus model.

22. The non-transitory computer program product of any of claim 18 to claim 21, wherein at least one of the first scanning device or the second scanning device is a light and detection ranging (LiDAR) device and the plurality of points or the plurality of side points comprises a plurality of LiDAR data points.

23. The non-transitory computer program product of any of claim 17 to claim 22, wherein the autonomous vehicle is an autonomous prime mover and wherein the maneuvering of the autonomous vehicle is within a shipping port environment.

24. The non-transitory computer program product of any of claim 17 to claim 23, wherein the first scanning device is mounted in a perpendicular manner on the autonomous vehicle.