

CLAIMS

What is claimed is:

1. A system, comprising:

a hardware processor; and

a non-transitory machine-readable storage medium encoded with instructions executable by the hardware processor to perform a method comprising:

receiving a 3D image captured from a vehicle on a pathway;

transforming the 3D image into a first 2D image; and

determining a location of the vehicle along the pathway, comprising:

comparing the first 2D image to a plurality of second 2D images each captured at a respective known location along the pathway,

selecting one or more of the second 2D images based on the comparing, and

determining the location of the vehicle along the pathway based on the known location where the selected one or more of the second 2D images was captured.

2. The system of claim 1, the method further comprising:

capturing the 3D image.

3. The system of claim 2, wherein capturing the 3D image comprises:

capturing LIDAR data with a LIDAR unit mounted on the vehicle.

4. The system of claim 1, wherein transforming the 3D image into a first 2D image comprises:

converting LIDAR data for a point in the 3D image into color data in a color space for a corresponding point in the first 2D image, wherein each of the second 2D images comprises a plurality of points each having color data in the color space.

5. The system of claim 4, wherein the LIDAR data for each point in the 3D image comprises a distance value and a reflectivity value.

6. The system of claim 5, wherein converting the LIDAR data for a point comprises:

mapping the distance value for the point to a value of a first component of the color space; and

mapping the reflectivity value for the point to a value of a second component of the color space.

7. The system of claim 1, the method further comprising:

deselecting one or more of the selected second 2D images as false positive matches prior to determining the location of the vehicle.

8. The system of claim 1, wherein comparing the first 2D image to the plurality of second 2D images comprises:
- extracting a plurality of keypoints from each of the first and second 2D images;
 - generating a respective descriptor for each of the first and second 2D images based on the respective keypoints; and
 - comparing the descriptor of the first 2D image to the descriptors of each of the second 2D images.
9. The system of claim 1, wherein the vehicle on a pathway is a train on a track.
10. A non-transitory machine-readable storage medium encoded with instructions executable by a hardware processor of a computing component, the machine-readable storage medium comprising instructions to cause the hardware processor to perform a method comprising:
- receiving a 3D image captured from a vehicle on a pathway;
 - transforming the 3D image into a first 2D image; and
 - determining a location of the vehicle along the pathway, comprising:
 - comparing the first 2D image to a plurality of second 2D images each captured at a respective known location along the pathway,
 - selecting one or more of the second 2D images based on the comparing, and

determining the location of the vehicle along the pathway based on the known location where the selected one or more of the second 2D images was captured.

11. The non-transitory machine-readable storage medium of claim 10, the method further comprising:

capturing the 3D image.

12. The non-transitory machine-readable storage medium of claim 11, wherein capturing the 3D image comprises:

capturing LIDAR data with a LIDAR unit mounted on the vehicle.

13. The non-transitory machine-readable storage medium of claim 10, wherein transforming the 3D image into a first 2D image comprises:

converting LIDAR data for a point in the 3D image into color data in a color space for a corresponding point in the first 2D image, wherein each of the second 2D images comprises a plurality of points each having color data in the color space.

14. The non-transitory machine-readable storage medium of claim 13, wherein the LIDAR data for each point in the 3D image comprises a distance value and a reflectivity value.

15. The non-transitory machine-readable storage medium of claim 14, wherein converting the LIDAR data for a point comprises:

mapping the distance value for the point to a value of a first component of the color space; and

mapping the reflectivity value for the point to a value of a second component of the color space.

16. The non-transitory machine-readable storage medium of claim 10, the method further comprising:

deselecting one or more of the selected second 2D images as false positive matches prior to determining the location of the vehicle.

17. The non-transitory machine-readable storage medium of claim 10, wherein comparing the first 2D image to the plurality of second 2D images comprises:

extracting a plurality of keypoints from each of the first and second 2D images;

generating a respective descriptor for each of the first and second 2D images based on the respective keypoints; and

comparing the descriptor of the first 2D image to the descriptors of each of the second 2D images.

18. The non-transitory machine-readable storage medium of claim 10, wherein the vehicle on a pathway is a train on a track.

19. A computer-implemented method comprising:

receiving a 3D image captured from a vehicle on a pathway;

transforming the 3D image into a first 2D image; and

determining a location of the vehicle along the pathway, comprising:

comparing the first 2D image to a plurality of second 2D images each captured at a respective known location along the pathway,

selecting one or more of the second 2D images based on the comparing, and

determining the location of the vehicle along the pathway based on the known location where the selected one or more of the second 2D images was captured.

20. The computer-implemented method of claim 19, further comprising:

capturing the 3D image.

21. The computer-implemented method of claim 20, wherein capturing the 3D image comprises:

capturing LIDAR data with a LIDAR unit mounted on the vehicle.

22. The computer-implemented method of claim 19, wherein transforming the 3D image into a first 2D image comprises:

converting LIDAR data for a point in the 3D image into color data in a color space for a corresponding point in the first 2D image, wherein each of the second 2D images comprises a plurality of points each having color data in the color space.

23. The computer-implemented method of claim 22, wherein the LIDAR data for each point in the 3D image comprises a distance value and a reflectivity value.

24. The computer-implemented method of claim 23, wherein converting the LIDAR data for a point comprises:

mapping the distance value for the point to a value of a first component of the color space; and

mapping the reflectivity value for the point to a value of a second component of the color space.

25. The computer-implemented method of claim 19, further comprising:

deselecting one or more of the selected second 2D images as false positive matches prior to determining the location of the vehicle.

26. The computer-implemented method of claim 19, wherein comparing the first 2D image to the plurality of second 2D images comprises:

extracting a plurality of keypoints from each of the first and second 2D images;

generating a respective descriptor for each of the first and second 2D images based on the respective keypoints; and

comparing the descriptor of the first 2D image to the descriptors of each of the second 2D images.

27. The computer-implemented method of claim 19, wherein the vehicle on a pathway is a train on a track.