CLAIMS

What is claimed is:

1. An inspection pose detection system for a rail-transportation rolling stock, characterized by comprising:

a reference datum disposed at a side of a railway where a vehicle to be detected is parked, along an extending direction of the railway;

a pose detection device disposed on an inspection robot for the rail-transportation rolling stock and configured to detect distance information of the inspection robot for the rail-transportation rolling stock with respect to the reference datum; and

a processing device communicatively connected to the pose detection device and configured to calculate a pose deviation of the inspection robot for the rail-transportation rolling stock with respect to a datum coordinate on basis of the distance information of the inspection robot for the rail-transportation rolling stock with respect to the reference datum;

wherein the datum coordinate contains a first datum plane and a first direction; the reference datum comprises a datum scale; the datum scale is attached to a side of the railway proximal to the inspection robot for the rail-transportation rolling stock, along the extending direction of the railway;

the pose detection device comprises a first distance detecting device, the first distance detecting device is disposed at a first site on a side of the inspection robot for the rail-transportation rolling stock proximal to the datum scale and communicatively connected to the processing device, and the first distance detecting device is configured to detect distance information of the first site with respect to the datum scale in the first direction to obtain a first detection distance;

the processing device is configured to calculate a pose deviation of the first site with respect to the first datum plane in the first direction on basis of the first detection distance.

2. The inspection pose detection system for the rail-transportation rolling stock of claim 1, characterized in that the datum coordinate contains a second datum plane and a second direction; the reference datum comprises a datum ramp, the datum ramp is disposed at an end of the datum scale distal from a ground where the rail-transportation rolling stock travels, and the datum ramp is oblique with respect to the datum scale;

the pose detection device further comprises a second distance detecting device disposed at a second site on the inspection robot for the rail-transportation rolling stock, the first site and the second site are located on the same face of the inspection robot for the rail-transportation rolling stock, the second distance detecting device is communicatively connected to the processing device and configured to detect distance information of the second site with respect to the datum ramp in the first direction to obtain a second detection distance; and

the processing device is configured to calculate a pose deviation of inspection robot for the rail-transportation rolling stock with respect to the second datum plane in the second direction on basis of the first detection distance and the second detection distance.

3. The inspection pose detection system for the rail-transportation rolling stock of claim 2, characterized in that the first site and the second site are located on a straight line perpendicular to the second datum plane.

4. The inspection pose detection system for the rail-transportation rolling stock of claim 1, characterized in that the datum coordinate contains a second direction, the pose detection device further comprises a third distance detecting device, the third distance detecting device is disposed at a third site on the inspection robot for the rail-transportation rolling stock, the third site and the first site are located on the same face of the inspection robot for the rail-transportation rolling stock and located at different positions in the extending direction of the railway, the third distance detecting device is communicatively connected to the processing device and configured to detect distance information of the third site with respect to the datum scale in the first direction to obtain a third detection distance;

the processing device is configured to calculate a rotation angle of the inspection robot for the rail-transportation rolling stock with respect to the second direction on basis of the first detection distance and the third detection distance.

5. The inspection pose detection system for the rail-transportation rolling stock of any one of claims 1-4, characterized in that the datum coordinate contains a third datum plane and a third direction;

the reference datum comprises a datum scale containing scale information, the pose detection device comprises an identification device configured to identify the scale

information in the datum scale and obtain position information of inspection robot for the rail-transportation rolling stock with respect to the third datum plane in the third direction.

6. The inspection pose detection system for the rail-transportation rolling stock of claim 5, characterized in that the datum coordinate further contains a first datum plane and a first direction;

the datum scale is a two-dimensional code band;

the identification device is an image acquisition device configured to acquire information in the two-dimensional code band to obtain image information;

the pose detection device further comprises a first processing mechanism communicatively connected to the image acquisition device and configured to obtain position information of the inspection robot for the rail-transportation rolling stock with respect to the first datum plane in the first direction and position information of the inspection robot for the rail-transportation rolling stock with respect to the third datum plane in the third direction on basis of the image information.

7. The inspection pose detection system for the rail-transportation rolling stock of claim 5, characterized in that the datum scale is a two-dimensional code band or a bar code band;

the identification device is a code reader configured to identify information in the two-dimensional code band or the bar code band; and

the pose detection device further comprises a second processing mechanism communicatively connected to the code reader and configured to obtain position information of the inspection robot for the rail-transportation rolling stock with respect to the third datum plane in the third direction on basis of the information in the two-dimensional code band or the bar code band.

8. The inspection pose detection system for the rail-transportation rolling stock of claim 1, characterized in that the pose detection device further comprises a fourth distance detecting device disposed on a top of the inspection robot for the rail-transportation rolling stock and communicatively connected to the processing device, the fourth distance detecting device is configured to detect distance information of a bottom of the vehicle to be detected with respect to the fourth distance detecting device to obtain a fourth detection distance;

the processing device is configured to calculate a pose deviation of the vehicle to be

detected on basis of the fourth detection distance.

9. An inspection pose detection method for a rail-transportation rolling stock, characterized by comprising:

acquiring a pose deviation of a vehicle to be detected with respect to a datum coordinate, thereby obtaining a vehicle pose deviation;

acquiring a pose deviation of an inspection robot for the rail-transportation rolling stock with respect to the datum coordinate, thereby obtaining a robot pose deviation; and

obtaining a rail-transportation rolling stock inspection pose deviation on basis of the vehicle pose deviation and the robot pose deviation;

wherein the datum coordinate contains a first datum plane and a first direction, the acquiring the pose deviation of the inspection robot for the rail-transportation rolling stock with respect to the datum coordinate thereby obtaining the robot pose deviation comprises:

acquiring distance information of a first site on the inspection robot for the rail-transportation rolling stock with respect to the first datum plane in the first direction thereby obtaining first distance information;

acquiring recorded information of the first site with respect to the first datum plane in the first direction, thereby obtaining first recorded information;

calculating a pose deviation of the first site with respect to the first datum plane in the first direction on basis of the first distance information and the first recorded information;

wherein the acquiring the distance information of the first site on the inspection robot for the rail-transportation rolling stock with respect to the first datum plane in the first direction thereby obtaining the first distance information comprises:

detecting a distance between the first site and a datum scale of a reference datum by a first distance detecting device disposed at the first site on the inspection robot, to obtain a first detection distance, and

calculating the first distance information based on the first detection distance and a distance of the datum scale with respect to the first datum plane in the first direction；

wherein the datum scale is attached to a side of the railway where the vehicle to be detected is parked proximal to the inspection robot, along the extending direction of the railway.

10. The method of claim 9, characterized in that the datum coordinate contains a second datum plane and a second direction, the acquiring the pose deviation of the inspection robot for the rail-transportation rolling stock with respect to the datum coordinate thereby obtaining the robot pose deviation further comprises:

acquiring distance information of a second site on the inspection robot for the rail-transportation rolling stock with respect to a datum ramp in the first direction, thereby obtaining second distance information, wherein the datum ramp is oblique with respect to the second datum plane, and the first site and the second site are located on the same face of the inspection robot for the rail-transportation rolling stock and on a straight line perpendicular to the second datum plane;

obtaining a pose deviation of the inspection robot for the rail-transportation rolling stock with respect to the second datum plane in the second direction on basis of the first distance information and the second distance information.

11. The method of claim 9, characterized in that the datum coordinate contains a second direction, the acquiring the pose deviation of the inspection robot for the rail-transportation rolling stock with respect to the datum coordinate thereby obtaining the robot pose deviation further comprises:

acquiring distance information of a third site on the inspection robot for the rail-transportation rolling stock with respect to the first datum plane in the first direction, thereby obtaining third distance information, wherein the third site and the first site are located on the same face of the inspection robot for the rail-transportation rolling stock and located at different positions in the extending direction of the railway;

obtaining a rotation angle of the inspection robot for the rail-transportation rolling stock with respect to the second direction on basis of the first distance information and the third distance information.

12. The method of claim 9, characterized in that the datum coordinate contains a second datum plane, a third datum plane, a second direction, and a third direction, and the acquiring the pose deviation of the vehicle to be detected with respect to the datum coordinate thereby obtaining the vehicle pose deviation comprises:

acquiring distance information of respective sites disposed on a bottom of the vehicle along the third direction with respect to the second datum plane in the second direction and

distance information of the respective sites with respect to the third datum plane in the third direction, thereby obtaining bottom height-length curve information;

acquiring standard bottom height-length curve information of the vehicle to be detected;

obtaining a pose deviation of the vehicle to be detected with respect to the second datum plane in the second direction and a pose deviation of the vehicle to be detected with respect to the third datum plane in the third direction on basis of the bottom height-length curve information and the standard height-length curve information.

13. The method of claim 12, characterized in that the obtaining the pose deviation of the vehicle to be detected with respect to the second datum plane in the second direction and the pose deviation of the vehicle to be detected with respect to the third datum plane in the third direction on basis of the bottom height-length curve information and the standard height-length curve information comprises:

obtaining distance information of a wheelset site on the vehicle to be detected with respect to the first datum plane in the first direction on basis of the bottom height-length curve information, thereby obtaining wheelset position information;

obtaining standard distance information of the wheelset site on the vehicle to be detected with respect to the first datum plane in the first direction on basis of the standard height-length curve information, thereby obtaining standard wheelset position information; and

obtaining a pose deviation of the vehicle to be detected with respect to the second datum plane in the second direction and a pose deviation of the vehicle to be detected with respect to the third datum plane in the third direction on basis of the wheelset position information and the standard wheelset position information.