

METHOD AND DEVICE FOR CONTROLLING COLLISION VELOCITY, STORAGE MEDIUM AND ELECTRONIC DEVICE

[0001] The present application claims priority to Chinese Patent Application No. 202010607286.5, titled “METHOD AND DEVICE FOR CONTROLLING COLLISION VELOCITY, STORAGE MEDIUM AND ELECTRONIC DEVICE”, filed on June 29, 2020 with the China National Intellectual Property Administration, which is incorporated herein by reference in its entirety.

FIELD

[0002] The present disclosure relates to the technical field of data processing, and in particular, to a method and device for controlling a collision velocity, a storage medium and an electronic device.

BACKGROUND

[0003] Personal safety of passengers is under threat once a rail vehicle collision accident occurs. To reduce the loss caused by the rail vehicle collision accident, it is usually necessary to carry out a collision test on the rail vehicle to test the crashworthiness of various parts of the rail vehicle, so as to improve the rail vehicle and reduce the loss of the rail vehicle collision accident.

[0004] At present, in a rail vehicle collision test in which locomotive traction is used, as shown in Figure 1, a driving locomotive and a test vehicle are connected together by a coupler and draft gear, and move forward together. When the driving locomotive and the test vehicle reach a certain speed, the driving locomotive is separated from the test vehicle, and the test vehicle makes a free deceleration motion without traction. A speed and a position of the test vehicle when the driving locomotive is decoupled from the test vehicle are controlled by an operator, which may threaten personal safety of the operator. Moreover, the free deceleration motion of the test vehicle is an uncontrollable idle running process, and a collision velocity of the test vehicle cannot be accurately controlled.

[0005] Therefore, it is a major technical problem to be solved urgently by those skilled in the

art to provide a method for controlling a collision velocity, to improve the accuracy of controlling the collision velocity.

SUMMARY

5 **[0006]** In view of the above, a data processing method for a distributed lock is provided according to embodiments of the present disclosure, to solve the problems of the distributed lock such as a single point problem, a non-reentrant problem, a non-blocking problem, and a lock incapability problem.

10 **[0007]** To achieve the above objective, following technical solutions are provided according to embodiments of the present disclosure.

15 **[0008]** A method for controlling a collision velocity includes: obtaining a target parameter, where the target parameter includes an environmental parameter and test data corresponding to different environmental conditions; determining a vehicle motion mathematical model and a preset neural network based on the target parameter; and determining a decoupling position and
a decoupling velocity of a test vehicle by inputting an expected collision velocity into the vehicle motion mathematical model or the preset neural network.

20 **[0009]** Optionally, the environmental parameter includes a wind speed, a wind direction, a velocity of a test vehicle, a weight of the test vehicle, a counterweight, a rail moisture level, and a rail cleanliness. Determining the vehicle motion mathematical model based on the target
parameter includes: creating a wind resistance model based on the wind speed, the wind direction, and the velocity of the test vehicle, where an air resistance is outputted by the wind resistance model; creating a wheel-rail adhesion model based on the weight of the test vehicle, the counterweight, the rail moisture level, and the rail cleanliness, where a wheel-rail adhesive resistance is outputted by the wheel-rail adhesion model; creating a single-vehicle motion
25 control model and a grouped-vehicle motion control module based on the air resistance, the wheel-rail adhesive resistance, and a tractive force, where a target velocity and a target acceleration of a single-vehicle are outputted by the single-vehicle motion control model, and a target velocity and a target acceleration of a grouped-vehicle are outputted by the grouped-vehicle motion control model; and determining the wind resistance model, the wheel-rail
30 adhesion model, the single-vehicle motion control model, and the grouped-vehicle motion control module as the vehicle motion mathematical model.

[0010] Optionally, the method for controlling a collision velocity further includes: obtaining an actual acceleration of the test vehicle; and correcting the single-vehicle motion control model and the grouped-vehicle motion control model based on the actual acceleration, the target acceleration of a single-vehicle, and the target acceleration of a grouped-vehicle.

5 **[0011]** Optionally, the test data corresponding to different environmental conditions includes a real-time position, a velocity, an acceleration, a collision velocity, and a collision stress of both a driving locomotive and a test vehicle. Determining the preset neural network based on the target parameter includes: training the preset neural network based on the real-time position, the velocity, the acceleration, the collision velocity, and the collision stress of the test vehicle;
10 and testing the preset neural network based on the real-time position, the velocity, the acceleration, the collision velocity, and the collision stress of both the driving locomotive and the test vehicle.

[0012] A device for controlling a collision velocity includes: a first obtaining module, configured to obtain a target parameter, where the target parameter includes an environmental
15 parameter and test data corresponding to different environmental conditions; a first determination module, configured to determine a vehicle motion mathematical model and a preset neural network based on the target parameter; and a second determination module, configured to determine a decoupling position and a decoupling velocity of a test vehicle by inputting an expected collision velocity into the vehicle motion mathematical model or the
20 preset neural network.

[0013] Optionally, the environmental parameter includes a wind speed, a wind direction, a velocity of a test vehicle, a weight of the test vehicle, a counterweight, a rail moisture level, and a rail cleanliness. The first determination module includes: a first creating unit, configured to create a wind resistance model based on the wind speed, the wind direction, and the velocity of
25 the test vehicle, where an air resistance is outputted by the wind resistance model; a second creating unit, configured to create a wheel-rail adhesion model based on the weight of the test vehicle, the counterweight, the rail moisture level, and the rail cleanliness, where a wheel-rail adhesive resistance is outputted by the wheel-rail adhesion model; a third creating unit, configured to create a single-vehicle motion control model and a grouped-vehicle motion
30 control module based on the air resistance, the wheel-rail adhesive resistance, and a tractive force, where a target velocity and a target acceleration of a single-vehicle are outputted by the

single-vehicle motion control model, and a target velocity and a target acceleration of a grouped-vehicle are outputted by the grouped-vehicle motion control model; and a determination unit, configured to determine the wind resistance model, the wheel-rail adhesion model, the single-vehicle motion control model, and the grouped-vehicle motion control module as the vehicle motion mathematical model.

[0014] Optionally, the device for controlling a collision velocity further includes: a second obtaining module, configured to obtain an actual acceleration of the test vehicle; and a correction module, configured to correct the single-vehicle motion control model and the grouped-vehicle motion control model based on the actual acceleration, the target acceleration of a single-vehicle, and the target acceleration of a grouped-vehicle.

[0015] Optionally, the test data corresponding to different environmental conditions includes a real-time position, a velocity, an acceleration, a collision velocity, and a collision stress of both a driving locomotive and a test vehicle. The first determination module further includes: a training unit, configured to train the preset neural network based on the real-time position, the velocity, the acceleration, the collision velocity, and the collision stress of the test vehicle; and a test unit, configured to test the preset neural network based on the real-time position, the velocity, the acceleration, the collision velocity, and the collision stress of both the driving locomotive and the test vehicle.

[0016] A storage medium includes a program. The program, when executed, controls a device where the storage medium is located to perform the method for controlling a collision velocity described above.

[0017] An electronic device includes at least one processor, at least one memory connected to the processor, and a bus. The processor and the memory communicate with each other through the bus, and the processor is configured to call a program instruction stored in the memory to perform the method for controlling a collision velocity described above.

[0018] A method for controlling a collision velocity is provided according to embodiments of the present disclosure. In the method, a target parameter is obtained, where the target parameter includes an environmental parameter and test data corresponding to different environmental conditions. A vehicle motion mathematical model and a preset neural network are determined based on the target parameter. Then an expected collision velocity is inputted into the vehicle motion mathematical model or the preset neural network, to determine a

decoupling position and a decoupling velocity of a test vehicle. In the method for controlling a collision velocity provided by the embodiments of the present disclosure, the vehicle motion mathematical model and the preset neural network are created and used to predict the decoupling position and decoupling velocity of the test vehicle corresponding to the expected collision velocity, therefore improving the accuracy of controlling the collision velocity.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] In order to more clearly illustrate technical solutions in embodiments of the present disclosure or in the conventional technology, drawings used in the description of the embodiments or the conventional technology are introduced briefly hereinafter. Apparently, the drawings described in the following illustrate some embodiments of the present disclosure; other drawings may be obtained by those ordinarily skilled in the art based on these drawings without any creative efforts.

[0020] Figure 1 is a schematic diagram of a system for a rail vehicle collision test in which locomotive traction is used according to an embodiment of the present disclosure;

[0021] Figure 2 is a schematic flow chart of a method for controlling a collision velocity according to an embodiment of the present disclosure;

[0022] Figure 3 is a flow block diagram of a method for controlling a collision velocity according to an embodiment of the present disclosure;

[0023] Figure 4 is a flow block diagram of a method for controlling a collision velocity according to another embodiment of the present disclosure;

[0024] Figure 5 is an application architecture diagram of a method for controlling a collision velocity according to an embodiment of the present disclosure;

[0025] Figure 6 is a schematic flow chart of a method for controlling a collision velocity according to another embodiment of the present disclosure;

[0026] Figure 7 is a schematic flow chart of a method for controlling a collision velocity according to another embodiment of the present disclosure;

[0027] Figure 8 is a schematic flow chart of a method for controlling a collision velocity according to another embodiment of the present disclosure;

[0028] Figure 9 is a schematic structural diagram of a device for controlling a collision velocity according to an embodiment of the present disclosure; and

[0029] Figure 10 is a hardware structural diagram of a device for controlling a collision velocity according to an embodiment of the present disclosure.

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DETAILED DESCRIPTION

[0030] Referring to Figure 2, a method for controlling a collision velocity is provided according to an embodiment of the present disclosure, and the method includes following steps S21 to S23.

10 **[0031]** In step S21, obtain a target parameter.

[0032] The target parameter includes an environmental parameter and test data corresponding to different environmental conditions.

[0033] In step S22, determine a vehicle motion mathematical model and a preset neural network based on the target parameter.

15 **[0034]** In step S23, determine a decoupling position and a decoupling velocity of a test vehicle by inputting an expected collision velocity into the vehicle motion mathematical model or the preset neural network.

[0035] In this embodiment, a data-based vehicle collision test model and a data-physics-based vehicle collision test hybrid model are established based on a data-driven modeling
20 method, to determine a reasonable decoupling position and decoupling velocity in a collision test, as shown in Figure 3. Then, artificial intelligence and machine learning algorithms are applied to explore internal connections among multiple time-varying factors, non-time-varying factors, the decoupling position and the decoupling velocity. After that, data driven and physic models are organically combined, to realize real-time adaptive control of decoupling the vehicle
25 from the locomotive, as shown in Figure 4.

[0036] The inventor considers that a single-vehicle, a grouped-vehicle, train weight, resistance and environmental factors will all have an impact on an idle running process of a test vehicle. Thus idle running tests for different single-vehicles, different grouped-vehicles, vehicles with different weights, and different environments are designed. Since it is difficult to

realize a physical collision test in a certain environment (environment parameters include temperature, wheel-rail humidity, atmospheric pressure or the like), the reproducibility of the physical collision test is poor, and the consumption of test materials and manpower is large, the software simulation Railsim is utilized, to minimize the defects of the physical collision test and obtain enough test data in a reduced number of physical tests.

[0037] When comprehensively analyzing detection data of the collision tests, relevant data is collected according to determined data analysis contents. Specifically, first-hand data is detected by means such as a track inspection vehicle, a portable add-on device and a static detection device, and then second-hand data is obtained by performing data processing on the first-hand data. The data processing includes methods such as elimination of interference values, mileage correction and detection data synchronization.

[0038] Based on the theory of multi-body system dynamics and collision mechanics, the longitudinal and three-dimensional collision dynamics theories are used to study the idle running process of the single-vehicle, the idle running process of the grouped-vehicle, and further to create a wind resistance model and a wheel-rail adhesion model. Thus various laws of the idle running process of vehicles and dynamic response of a structure of the vehicles are mastered.

[0039] Based on the above embodiment and combined with the architecture of Figure 5, a specific implementation method for determining a vehicle motion mathematical model based on the target parameter is provided according to an embodiment of the present disclosure. The environmental parameter includes a wind speed, a wind direction, a velocity of a test vehicle, a weight of the test vehicle, a counterweight, a rail moisture level, and a rail cleanliness. As shown in Figure 6, determining the vehicle motion mathematical model based on the target parameter includes steps S61 to S64.

[0040] In step S61, create a wind resistance model based on the wind speed, the wind direction, and the velocity of the test vehicle. An air resistance is outputted by the wind resistance model.

[0041] In step S62, create a wheel-rail adhesion model based on the weight of the test vehicle, the counterweight, the rail moisture level, and the rail cleanliness. A wheel-rail adhesive resistance is outputted by the wheel-rail adhesion model.

[0042] In step S63, create a single-vehicle motion control model and a grouped-vehicle motion control module based on the air resistance, the wheel-rail adhesive resistance, and a tractive force. A target velocity and a target acceleration of a single-vehicle are outputted by the single-vehicle motion control model, and a target velocity and a target acceleration of a grouped-vehicle are outputted by the grouped-vehicle motion control model.

[0043] In step S64, determine the wind resistance model, the wheel-rail adhesion model, the single-vehicle motion control model, and the grouped-vehicle motion control module as the vehicle motion mathematical model.

[0044] Based on the above embodiment, referring to Figure 7, the method for controlling a collision velocity according to an embodiment of the present disclosure may further include following steps S71 and S72.

[0045] In step S71, obtain an actual acceleration of the test vehicle.

[0046] In step S72, correct the single-vehicle motion control model and the grouped-vehicle motion control model based on the actual acceleration, the target acceleration of a single-vehicle, and the target acceleration of a grouped-vehicle.

[0047] That is, after the single-vehicle motion control model and the grouped-vehicle motion control model are created, the single-vehicle motion control model and the grouped-vehicle motion control model are further corrected in the embodiment of the present disclosure.

[0048] Referring to Figure 8, a specific implementation method for determining a preset neural network based on the target parameter is provided according to an embodiment of the present disclosure. The test data corresponding to different environmental conditions includes a real-time position, a velocity, an acceleration, a collision velocity, and a collision stress of both a driving locomotive and a test vehicle. Determine the preset neural network based on the target parameter includes following steps S81 to S82.

[0049] In step S81, train the preset neural network based on the real-time position, the velocity, the acceleration, the collision velocity, and the collision stress of the test vehicle.

[0050] In step S82, test the preset neural network based on the real-time position, the velocity, the acceleration, the collision velocity, and the collision stress of both the driving locomotive and the test vehicle.

[0051] For example, the test data may be divided into three parts, two of which are used for

testing the preset neural network, and one of which is used for training the preset neural network. It should be noted that, in this embodiment, data used for training the neural network may be obtained by deleting data related to the driving locomotive from a vehicle motion model library.

[0052] Based on the above embodiment, referring to Figure 9, a device for controlling a collision velocity is provided according to an embodiment of the present disclosure. The device includes a first obtaining module 91, a first determination module 92 and a second determination module 93.

[0053] The first obtaining module 91 is configured to obtain a target parameter, where the target parameter includes an environmental parameter and test data corresponding to different environmental conditions.

[0054] The first determination module 92 is configured to determine a vehicle motion mathematical model and a preset neural network based on the target parameter.

[0055] The second determination module 93 is configured to determine a decoupling position and a decoupling velocity of a test vehicle by inputting an expected collision velocity into the vehicle motion mathematical model or the preset neural network.

[0056] The environmental parameter includes a wind speed, a wind direction, a velocity of a test vehicle, a weight of the test vehicle, a counterweight, a rail moisture level, and a rail cleanliness. The first determination module includes a first creating unit, a second creating unit, a third creating unit and a determination unit.

[0057] The first creating unit is configured to create a wind resistance model based on the wind speed, the wind direction, and the velocity of the test vehicle. An air resistance is outputted by the wind resistance model.

[0058] The second creating unit is configured to create a wheel-rail adhesion model based on the weight of the test vehicle, the counterweight, the rail moisture level, and the rail cleanliness.

A wheel-rail adhesive resistance is outputted by the wheel-rail adhesion model.

[0059] The third creating unit is configured to create a single-vehicle motion control model and a grouped-vehicle motion control module based on the air resistance, the wheel-rail adhesive resistance, and a tractive force. A target velocity and a target acceleration of a single-vehicle are outputted by the single-vehicle motion control model, and a target velocity and a target acceleration of a grouped-vehicle are outputted by the grouped-vehicle motion control

model.

[0060] The determination unit is configured to determine the wind resistance model, the wheel-rail adhesion model, the single-vehicle motion control model, and the grouped-vehicle motion control module as the vehicle motion mathematical model.

5 **[0061]** The device for controlling a collision velocity according to an embodiment of the disclosure further includes a second obtaining module and a correction module.

[0062] The second obtaining module is configured to obtain an actual acceleration of the test vehicle.

10 **[0063]** The correction module is configured to correct the single-vehicle motion control model and the grouped-vehicle motion control model based on the actual acceleration, the target acceleration of a single-vehicle, and the target acceleration of a grouped-vehicle.

[0064] The test data corresponding to different environmental conditions includes a real-time position, a velocity, an acceleration, a collision velocity, and a collision stress of both a driving locomotive and a test vehicle. The first determination module further includes a training unit
15 and a test unit.

[0065] The training unit is configured to train the preset neural network based on the real-time position, the velocity, the acceleration, the collision velocity, and the collision stress of the test vehicle.

20 **[0066]** The test unit is configured to test the preset neural network based on the real-time position, the velocity, the acceleration, the collision velocity, and the collision stress of both the driving locomotive and the test vehicle.

[0067] The working principle of the device for controlling a collision velocity in this embodiment may refer to that in the above method embodiment, which will not be described again herein.

25 **[0068]** The device for controlling a collision velocity includes a processor and a memory. The first obtaining module, the first determination module, and the second determination module are all stored in the memory as program units, and the program units stored in the memory are executed by the processor to realize corresponding functions.

[0069] The processor includes a kernel, and the kernel is configured to call a corresponding

program unit in the memory. One or more kernels may be set, and the accuracy of controlling the collision velocity may be improved by adjusting a parameter of the kernel.

[0070] A storage medium is provided according to an embodiment of the present disclosure, and the storage medium is stored with a program. The program, when executed by a processor,
5 causes the process to perform the aforementioned method for controlling a collision velocity.

[0071] A processor is provided according to an embodiment of the present disclosure, and the processor is configured to execute a program. The program, when executed by the processor, causes the process to perform the aforementioned method for controlling a collision velocity.

[0072] An electronic device is provided according to an embodiment of the present disclosure,
10 as shown in Figure 10, the electronic device includes: at least one processor 101, at least one memory 102 connected to the processor, and a bus 103. The processor and the memory communicate with each other through the bus, and the processor is configured to call a program instruction stored in the memory to perform the aforementioned method for controlling a collision velocity. The electronic device may be a server, a PC, a PAD, a mobile phone, etc.

[0073] A computer program product is provided according to an embodiment of the present disclosure. The computer program product, when executed by a data processing device, executes a program that is initialized with following method steps:

obtaining a target parameter, where the target parameter includes an environmental parameter and test data corresponding to different environmental conditions;

20 determining a vehicle motion mathematical model and a preset neural network based on the target parameter; and

determining a decoupling position and a decoupling velocity of a test vehicle by inputting an expected collision velocity into the vehicle motion mathematical model or the preset neural network.

[0074] Optionally, the environmental parameter includes a wind speed, a wind direction, a velocity of a test vehicle, a weight of the test vehicle, a counterweight, a rail moisture level, and a rail cleanliness, determining the vehicle motion mathematical model based on the target
25 parameter includes:

creating a wind resistance model based on the wind speed, the wind direction, and the
30 velocity of the test vehicle, where an air resistance is outputted by the wind resistance model;

creating a wheel-rail adhesion model based on the weight of the test vehicle, the counterweight, the rail moisture level, and the rail cleanliness, where a wheel-rail adhesive resistance is outputted by the wheel-rail adhesion model;

5 creating a single-vehicle motion control model and a grouped-vehicle motion control module based on the air resistance, the wheel-rail adhesive resistance, and a tractive force, where a target velocity and a target acceleration of a single-vehicle are outputted by the single-vehicle motion control model, and a target velocity and a target acceleration of a grouped-vehicle are outputted by the grouped-vehicle motion control model; and

10 determining the wind resistance model, the wheel-rail adhesion model, the single-vehicle motion control model, and the grouped-vehicle motion control module as the vehicle motion mathematical model.

[0075] Optionally, the program executed by the computer program product further includes:

obtaining an actual acceleration of the test vehicle; and

15 correcting the single-vehicle motion control model and the grouped-vehicle motion control model based on the actual acceleration, the target acceleration of a single-vehicle, and the target acceleration of a grouped-vehicle.

[0076] Optionally, the test data corresponding to different environmental conditions includes a real-time position, a velocity, an acceleration, a collision velocity, and a collision stress of both a driving locomotive and a test vehicle, determining the preset neural network based on
20 the target parameter includes:

training the preset neural network based on the real-time position, the velocity, the acceleration, the collision velocity, and the collision stress of the test vehicle; and

25 testing the preset neural network based on the real-time position, the velocity, the acceleration, the collision velocity, and the collision stress of both the driving locomotive and the test vehicle.

[0077] In summary, a method and device for controlling a collision velocity, a storage medium and an electronic device are provided according the present disclosure. In the method, a target parameter is obtained, where the target parameter includes an environmental parameter and test data corresponding to different environmental conditions. A vehicle motion
30 mathematical model and a preset neural network are determined based on the target parameter.

Then an expected collision velocity is inputted into the vehicle motion mathematical model or the preset neural network, to determine a decoupling position and a decoupling velocity of a test vehicle. In the method for controlling a collision velocity provided by the embodiments of the present disclosure, the vehicle motion mathematical model and the preset neural network
5 are created and used to predict the decoupling position and decoupling velocity of the test vehicle corresponding to the expected collision velocity, therefore improving the accuracy of controlling the collision velocity.

[0078] The present disclosure is described with reference to flowcharts and/or block diagrams of the methods, devices (systems) and computer program products according to the
10 embodiments. It should be understood that, each flow or a combination of flows in the flowcharts and/or each block or a combination of blocks in the block diagrams may be implemented by computer program instructions. The computer program instructions may be provided to a general-purpose computer, a dedicated computer, an embedded processor or processors of other programmable data processing devices to generate a machine, so that the
15 instructions executed by the computer or the processors of the other programmable data processing devices generate a device for implementing functions specified in one or more flows of the flowcharts and/or one or more blocks of the block diagrams.

[0079] In a typical configuration, the device includes one or more processors (CPUs), memory, and buses. The device may also include input/output interfaces, network interfaces,
20 and so on.

[0080] The memory may be implemented by computer readable medium of a non-persistent memory, a random-access memory (RAM), and/or a non-volatile memory, such as a read only memory (ROM) or a flash RAM. The memory includes at least one memory chip. The memory is an example of the computer-readable medium.

[0081] The computer readable medium may include a persistent and non-persistent, and removable and non-removable medium. Information may be stored by any methods or technologies. The information may be computer readable instructions, data structures, program modules or other data. The storage medium of the computer may include but is not limited to a
25 phase change random-access memory (PRAM), a static random-access memory (SRAM), a dynamic random-access memory (DRAM), other types of random-access memory (RAM),
30 read-only memory (ROM), electrically erasable programmable read-only memory (EEPROM),

flash memory or other memory, compact disk read-only memory (CD-ROM), digital Versatile disc (DVD), or other optical storage, cassette tape, tape disk memory or other magnetic storage, or any non-transmission medium which can be used to store information accessible by the computer. As defined in the present disclosure, the computer readable medium does not include
5 transitory computer-readable media, such as a modulated data signal and carrier wave.

[0082] It should be noted that, terms "include", "comprise" or any other variants are intended to be non-exclusive. Therefore, a process, method, article or device including multiple elements includes not only the elements but also other elements that are not enumerated, or also include the elements inherent for the process, method, article or device. Unless expressively limited,
10 the statement "including a..." does not exclude the case that other similar elements may exist in the process, the method, the article or the device other than enumerated elements..

[0083] It should be understood by those skilled in the art that the embodiments of the present disclosure may be implemented as methods, systems or computer program products. Therefore, the present disclosure may be implemented by embodiments of only hardware, only software,
15 or a combination of hardware and software. The present disclosure may be implemented as computer program products on one or more computer storage mediums (including but not limited to a magnetic disk memory, CD-ROM and an optical memory or the like) including computer-readable program codes.

[0084] The above are merely embodiments of the present disclosure, and are not to limit the present disclosure. For those skilled in the art, various modifications and changes may be made to the embodiments of the present disclosure. Any modification, equivalent replacement, improvement made within the spirit and principle of the present disclosure shall be included in the scope defined by the claims of the present disclosure.
20

CLAIMS

1. A method for controlling a collision velocity, comprising:

obtaining a target parameter, wherein the target parameter comprises an environmental parameter and test data corresponding to different environmental conditions;

5 determining a vehicle motion mathematical model and a preset neural network based on the target parameter; and

determining a decoupling position and a decoupling velocity of a test vehicle by inputting an expected collision velocity into the vehicle motion mathematical model or the preset neural network.

10 2. The method for controlling a collision velocity according to claim 1, wherein the environmental parameter comprises a wind speed, a wind direction, a velocity of a test vehicle, a weight of the test vehicle, a counterweight, a rail moisture level, and a rail cleanliness; and wherein determining the vehicle motion mathematical model based on the target parameter comprises:

15 creating a wind resistance model based on the wind speed, the wind direction, and the velocity of the test vehicle, wherein an air resistance is outputted by the wind resistance model;

creating a wheel-rail adhesion model based on the weight of the test vehicle, the counterweight, the rail moisture level, and the rail cleanliness, wherein a wheel-rail adhesive resistance is outputted by the wheel-rail adhesion model;

20 creating a single-vehicle motion control model and a grouped-vehicle motion control module based on the air resistance, the wheel-rail adhesive resistance, and a tractive force, wherein a target velocity and a target acceleration of a single-vehicle are outputted by the single-vehicle motion control model, and a target velocity and a target acceleration of a grouped-vehicle are outputted by the grouped-vehicle motion control model; and

25 determining the wind resistance model, the wheel-rail adhesion model, the single-vehicle motion control model, and the grouped-vehicle motion control module as the vehicle motion mathematical model.

3. The method for controlling a collision velocity according to claim 2, further comprising:

obtaining an actual acceleration of the test vehicle; and

correcting the single-vehicle motion control model and the grouped-vehicle motion control model based on the actual acceleration, the target acceleration of a single-vehicle, and the target acceleration of a grouped-vehicle.

4. The method for controlling a collision velocity according to claim 1, wherein the test data corresponding to different environmental conditions comprises a real-time position, a velocity, an acceleration, a collision velocity, and a collision stress of both a driving locomotive and a test vehicle; and wherein determining the preset neural network based on the target parameter comprises:

training the preset neural network based on the real-time position, the velocity, the acceleration, the collision velocity, and the collision stress of the test vehicle; and

testing the preset neural network based on the real-time position, the velocity, the acceleration, the collision velocity, and the collision stress of both the driving locomotive and the test vehicle.

5. A device for controlling a collision velocity, comprising:

a first obtaining module, configured to obtain a target parameter, wherein the target parameter comprises an environmental parameter and test data corresponding to different environmental conditions;

a first determination module, configured to determine a vehicle motion mathematical model and a preset neural network based on the target parameter; and

a second determination module, configured to determine a decoupling position and a decoupling velocity of a test vehicle by inputting an expected collision velocity into the vehicle motion mathematical model or the preset neural network.

6. The device for controlling a collision velocity according to claim 5, wherein the environmental parameter comprises a wind speed, a wind direction, a velocity of a test vehicle, a weight of the test vehicle, a counterweight, a rail moisture level, and a rail cleanliness; and wherein the first determination module comprises:

a first creating unit, configured to create a wind resistance model based on the wind speed, the wind direction, and the velocity of the test vehicle, wherein an air resistance is outputted by the wind resistance model;

a second creating unit, configured to create a wheel-rail adhesion model based on the weight of the test vehicle, the counterweight, the rail moisture level, and the rail cleanliness, wherein a wheel-rail adhesive resistance is outputted by the wheel-rail adhesion model;

a third creating unit, configured to create a single-vehicle motion control model and a grouped-vehicle motion control module based on the air resistance, the wheel-rail adhesive resistance, and a tractive force, wherein a target velocity and a target acceleration of a single-vehicle are outputted by the single-vehicle motion control model, and a target velocity and a target acceleration of a grouped-vehicle are outputted by the grouped-vehicle motion control model; and

a determination unit, configured to determine the wind resistance model, the wheel-rail adhesion model, the single-vehicle motion control model, and the grouped-vehicle motion control module as the vehicle motion mathematical model.

7. The device for controlling a collision velocity according to claim 6, further comprising:

a second obtaining module, configured to obtain an actual acceleration of the test vehicle;

and

a correction module, configured to correct the single-vehicle motion control model and the grouped-vehicle motion control model based on the actual acceleration, the target acceleration of a single-vehicle, and the target acceleration of a grouped-vehicle.

8. The device for controlling a collision velocity according to claim 5, wherein the test data corresponding to different environmental conditions comprises a real-time position, a velocity, an acceleration, a collision velocity, and a collision stress of both a driving locomotive and a test vehicle; and wherein the first determination module further comprises:

a training unit, configured to train the preset neural network based on the real-time position, the velocity, the acceleration, the collision velocity, and the collision stress of the test vehicle;

and

a test unit, configured to test the preset neural network based on the real-time position, the velocity, the acceleration, the collision velocity, and the collision stress of both the driving locomotive and the test vehicle.

9. A storage medium comprising a program, wherein the program, when executed, controls a device where the storage medium is located to perform the method for controlling a collision

velocity according to any one of claims 1 to 4.

10. An electronic device comprising at least one processor, at least one memory connected to the processor, and a bus; wherein the processor and the memory communicate with each other through the bus, and the processor is configured to call a program instruction stored in the memory to perform the method for controlling a collision velocity according to any one of claims 1 to 4.