

VIRTUAL VEHICLE DRIFTING METHOD AND DEVICE IN VIRTUAL WORLD, AND STORAGE MEDIUM

RELATED APPLICATION

[0001] The present disclosure claims priority to Chinese Patent Application No. 201811433526.3, entitled "METHOD AND APPARATUS FOR VIRTUAL VEHICLE DRIFTING IN VIRTUAL WORLD, AND STORAGE MEDIUM" and filed with the China Nation Intellectual Property Agency on November 28, 2018, which is incorporated herein by reference in its entirety.

FIELD OF THE TECHNOLOGY

[0002] The present disclosure relates to the field of computer programs, and in particular, to a method and an apparatus for virtual vehicle drifting in a virtual world, and a storage medium.

BACKGROUND OF THE DISCLOSURE

[0003] Automobile racing games are quite popular among users. At present, most automobile racing games are three-dimensional, and are implemented in a three-dimensional virtual world.

[0004] In conventional technology, a user uses a smartphone to run an automobile racing game application. When being run, a user interface of the automobile racing game application is displayed on the smartphone. The user interface includes a driving image of a racing automobile that travels in a race track in a virtual world, and further includes a left-direction button, a right-direction button, and a drifting widget that overlay with the driving image. When a user presses a direction button and then the drifting widget, the automobile racing game application controls the racing automobile to be in a drifting state, according to the press operations performed by the user.

[0005] In conventional technology, drifting of the racing automobile can only be triggered and maintained when the user presses the direction button and the drifting widget simultaneously. Cumbersome human-machine interaction brings difficulties to rapid operations of a user in a scenario such as a subway or a bus. In case of events such as a collision or a wobble, drifting of the racing automobile is apt to be accidentally interrupted.

SUMMARY

[0006] A method and an apparatus for virtual vehicle drifting in a virtual world, and a storage medium are provided according to embodiments of the present disclosure.

[0007] A method for virtual vehicle drifting in a virtual world is provided. The method is performed by a terminal, and includes:

receiving an event indicating a start of an operation corresponding to a widget for interacting with a target, during travelling of a virtual vehicle in the virtual world;

controlling, according to the event indicating the start of the operation, the virtual vehicle to be in a state of drifting in the virtual world; and

controlling the virtual vehicle to keep the state of drifting, in a case that an angle between a direction pointed by a head of the virtual vehicle and a direction of the travelling is greater than or equal to a first threshold, after an event indicating an end of the operation corresponding to the widget is received.

[0008] An apparatus for virtual vehicle drifting in a virtual world is provided. The apparatus includes:

an interaction module, configured to receive an event indicating a start of an operation corresponding to a widget for interacting with a target, during travelling of a virtual vehicle in the virtual world; and

a control module, configured to:

control, according to the event indicating the start of the operation, the virtual vehicle to be in a state of drifting in the virtual world; and

control the virtual vehicle to keep the state of drifting, in a case that an angle between a direction pointed by a head of the virtual vehicle and a direction of the travelling is greater than or equal to a first threshold, after an event indicating an end of the operation corresponding to the widget is received.

[0009] A terminal is provided, including a processor and a memory. The memory stores computer-readable instructions. The computer-readable instructions, when executed by the processor, configures the processor to perform following operations:

receiving an event indicating a start of an operation corresponding to a widget for interacting with a target, during travelling of a virtual vehicle in the virtual world;

controlling, according to the event indicating the start of the operation, the virtual vehicle to be in a state of drifting in the virtual world; and

controlling the virtual vehicle to keep the state of drifting, in a case that an angle between a direction pointed by a head of the virtual vehicle and a direction of the travelling is greater than or equal to a first threshold, after an event indicating an end of the operation corresponding to the widget is received.

[0010] A non-volatile computer-readable storage medium is provided. The storage medium stores computer-readable instructions. The computer-readable instructions, when executed by one or more processors, configure the one or more processors to perform following operations:

receiving an event indicating a start of an operation corresponding to a widget for interacting with a target, during travelling of a virtual vehicle in the virtual world;

controlling, according to the event indicating the start of the operation, the virtual vehicle to be in a state of drifting in the virtual world; and

controlling the virtual vehicle to keep the state of drifting, in a case that an angle between a direction pointed by a head of the virtual vehicle and a direction of the travelling is greater than or equal to a first threshold, after an event indicating an end of the operation corresponding to the widget is received.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] For clearer illustration of the technical solutions according to embodiments of the present disclosure or conventional techniques, hereinafter briefly described are the drawings to be applied in embodiments of the present disclosure or conventional techniques. Apparently, the drawings in the following descriptions are only some embodiments of the present disclosure, and other drawings may be obtained by those skilled in the art based on the provided drawings without creative efforts.

[0012] Figure 1 is a flowchart of a method for virtual vehicle drifting in a virtual world according to an embodiment of the present disclosure;

[0013] Figure 2 is schematic images of an interface in a method for virtual vehicle drifting in a virtual world according to an embodiment of the present disclosure.

[0014] Figure 3 is a flowchart of a method for virtual vehicle drifting in a virtual world according to another embodiment of the present disclosure;

- [0015] Figure 4 is a force analysis diagram of a virtual vehicle traveling normally in a virtual world according to another embodiment of the present disclosure;
- [0016] Figure 5 is a force analysis diagram of a virtual vehicle traveling in a keep-drifting state in a virtual world according to another embodiment of the present disclosure;
- [0017] Figure 6 is a flowchart of a method for virtual vehicle drifting in a virtual world according to another embodiment of the present disclosure;
- [0018] Figure 7 is a schematic image of an interface in a method for virtual vehicle drifting in a virtual world according to an embodiment of the present disclosure;
- [0019] Figure 8 is a schematic image of an interface in a method for virtual vehicle drifting in a virtual world according to an embodiment of the present disclosure;
- [0020] Figure 9 is a graph of a corresponding relationship between dynamic drifting traction and friction according to an embodiment of the present disclosure;
- [0021] Figure 10 is a schematic interface diagram of a method for virtual vehicle drifting in a virtual world according to an embodiment of the present disclosure;
- [0022] Figure 11 is a schematic diagram of a apparatus for virtual vehicle drifting in a virtual world according to an embodiment of the present disclosure; and
- [0023] Figure 12 is a schematic structural diagram of a computer device according to an embodiment of the present disclosure.

DESCRIPTION OF EMBODIMENTS

[0024] In order to clarify objectives, technical solutions, and advantages of the present disclosure, hereinafter embodiments of the present disclosure are further described in detail in conjunction with the drawings.

[0025] Embodiments of the present disclosure may be applied to following scenarios.

[0026] Automobile racing game application. An application is provided for one or more players to race in a same race track. The application allows a travelling racing automobile to be in a state of drifting. The application may be a standalone application or a network application. The application allows various racing modes, such as individual racing w/o items, or team racing w/o items. A racing automobile provided in the application may be at least one of: a motorbike, a go-kart, a car, an electric vehicle, and a cartoon vehicle.

[0027] Gunfight game application. An application is provided for one or more players to combat in an open world. The application allows a game character to drive a military vehicle in the open world, and drift with the military vehicle when driving. The military vehicle is, for example, an infantry fighting vehicle, an armored personnel carrier, a scout car, a communication vehicle, a tracked vehicle, a tank, or an armored car.

[0028] Sandbox game application. An application provides a creative open-world, includes one or more map areas, and integrates various game elements such as action, shooting, fighting, and driving. The application allows a game character to drive various types of civilian vehicles in a virtual open world, and drift with the vehicles when driving.

[0029] In relevant technology, a virtual vehicle is subject to ground friction (and a wind drag) in a virtual environment. In a case that a user stops a drift operation, the ground friction decelerates the virtual vehicle rapidly. Thereby, the virtual vehicle quits the state of drifting, and even decelerates to zero speed.

[0030] Currently, many applications are developed based on smartphones or tablets. When controlling the virtual racing automobile via a smartphone or a tablet to on a means of transport, it is likely that the user is subject to collisions and jolts, and hence the racing automobile cannot be continuously kept in a state of drifting. Hereinafter embodiments of the present disclosure are provided to address the foregoing technical issue.

[0031] Figure 1 is a flowchart of a method for virtual vehicle drifting in a virtual world according to an embodiment of the present disclosure. In this embodiment, it is taken as an example that the method is applied to a terminal running an application. The application allows the travelling virtual vehicle to be in a state of drifting. The method includes following steps S101 to S103.

[0032] In step S101, an event indicating a start of an operation, which corresponds to a widget for interacting with a target, is received during travelling of a virtual vehicle in a virtual world.

[0033] The application may be an automobile racing game application, an online game application, a mobile game application, or the like. The application provides the virtual world, and the virtual vehicle exists in the virtual world. It is taken as an example that the application is the automobile racing game application, and the virtual vehicle may be a racing automobile.

[0034] The virtual world is three-dimensional, and is constructed by a three-dimensional virtual engine. A ground environment is provided in the three-dimensional virtual world, for the

travelling of the virtual vehicle. The ground environment includes at least one of: a wilderness, a highway, a race track, and an urban street.

[0035] The application generates a user interface, which includes a driving image and the target-interacting widget overlaying with the driving image. The driving image presents a view from a first-person perspective or a third-person perspective of the virtual vehicle. The widget for interacting with the target is a widget or a group of widgets, which is configured to trigger a state of drifting of the virtual vehicle.

[0036] In step S102, the virtual vehicle is controlled to be in a state of drifting in the virtual world, according to the event indicating the start of the operation.

[0037] In some embodiments, the operation-start event is triggered when the operation of a user starts to act on the target-interacting widget. In an optional embodiment, the target-interacting widget includes a steering widget and a drifting widget that are displayed on a touch screen. Alternatively, the target-interacting widget corresponds to several physical components on a peripheral for simulating racing automobile driving.

[0038] In some embodiments, the operation-start event is triggered through a touch operation on a touch screen, or through a physical operation controlling an external input device. The external input device is, for example, a mouse, a VR controller, or the like.

[0039] In some embodiments, the operation of a user includes a single tap, multiple taps, a long press, a slide, or the like. A type of the touch operation is not limited in this embodiment.

[0040] For example, the operation-start event is generated when a user presses a left-direction button and a drifting widget simultaneously, or when a user presses a right-direction button and a drifting widget simultaneously.

[0041] The state of drifting refers to a movement state, in which there is a large angle between a head direction of a vehicle and a travelling direction of the vehicle, and a body of the vehicle passes a bend sideways. The head direction refers to a direction pointing toward a right front of a head of the vehicle. The traveling direction refers to a direction corresponding to a velocity of the traveling virtual vehicle, that is, an actual moving direction of the virtual vehicle in the ground environment.

[0042] In step S103, the virtual vehicle is controlled to keep the state of drifting, in a case that an angle between the head direction and the travelling direction is greater than or equal to a first threshold, after an event indicating an end of the operation corresponding to the widget for interacting with the target is received.

[0043] In some embodiments, the terminal needs to monitor the angle between the head direction and the traveling direction of the virtual vehicle. Illustratively, the monitoring includes, but is not limited to, at least one of four manners as follows.

[0044] In a first manner, the angle between the head direction and the traveling direction of the virtual vehicle is monitored in real time, when the virtual vehicle is in the state of drifting.

[0045] In a second manner, the terminal monitors the angle between the head direction and the traveling direction of the virtual vehicle in real time, after receiving the operation-end event corresponding to the target-interacting widget. The operation-end event is triggered when the operation of the user starts to disappear on the target-interacting widget. For example, the operation-end event is generated when stopping a touch operation of pressing the direction button and the drifting widget simultaneously.

[0046] In a third manner, the terminal monitors the angle between the head direction and the traveling direction of the virtual vehicle at a predetermined time interval.

[0047] In a fourth manner, the terminal monitors the angle between the head direction and the traveling direction of the virtual vehicle upon receiving a steering operation.

[0048] After the operation-end event corresponding to the target-interacting widget is received, the terminal controls the virtual vehicle to keep the state of drifting, in a case that the angle between the head direction and the traveling direction is greater than or equal to the first threshold. "Keeping the state of drifting" refers to: during drifting of the vehicle, even if the user performs no operation to trigger drifting, the terminal controls automatically the virtual vehicle to be in the state of drifting (in other words, keep the state of drifting continued), as long as the angle between the head direction and the traveling direction remains greater than or equal to the first threshold.

[0049] As shown in Figure 2, a terminal displays a user interface 20 of an automobile racing application. The user interface 20 includes a left-direction button 21, a right-direction button 22, a drifting button 23, and a virtual vehicle 24. The left-direction button 21 is a widget configured to control the virtual vehicle 24 to move leftward. The right-direction button 22 is a widget configured to control the virtual vehicle 24 to move rightward. The drifting button 23 is a widget configured to trigger the virtual vehicle 24 to be in a state of drifting.

[0050] When the virtual vehicle 24 travels in a bend, the user presses the right-direction button 22 and the drifting button 23 simultaneously, which serves as a drifting-triggering operation (a black-filled widget in the figure represents a widget being pressed). After receiving the

drifting-triggering operation, the terminal controls the virtual vehicle 24 to be in the state of drifting.

[0051] In a case that the user stops simultaneous presses on the right-direction button 22 and the drifting button 23 (a white-filled widget in the figure represents a widget not being pressed), the terminal detects that the drifting-triggering operation is over. Afterwards, the terminal may detect that an angle α between a head direction and a traveling direction of the virtual vehicle 24 is greater than or equal to a threshold. In such case, the terminal controls the virtual vehicle 24 to keep the state of drifting.

[0052] In summary, the method is provided in the forgoing embodiments. After the operation-end event corresponding to the target-interacting widget is received, the virtual vehicle is controlled to keep the state of drifting in a case that the angle between the head direction and the traveling direction is greater than or equal to the first threshold. Thereby, the user may merely control the angle between the head direction and the traveling direction, when controlling the virtual vehicle to keep the state of drifting. It is not necessary to press the direction button and the drifting widget simultaneously, and only the direction button needs to be pressed to the head direction. Operations are less difficult, facilitating human-machine interaction in scenarios not suitable for long-time bimanual operation.

[0053] Figure 3 is a flowchart of a method for virtual vehicle drifting in a virtual world according to another embodiment of the present disclosure. In this embodiment, it is taken as an example that the method is applied to a terminal running an application. The application allows a travelling virtual vehicle to be in a state of drifting. The application is configured to perform a following method including steps S301 to S313.

[0054] In step S301, an application is started.

[0055] Various applications are installed on a terminal. Start icons of the applications may be displayed on a desktop of the terminal.

[0056] A user may click or tap a start icon of an application. The terminal starts the application after the start icon is triggered. The application provides a virtual environment, and a virtual vehicle in the virtual environment. The application further allows the travelling virtual vehicle to be in a state of drifting.

[0057] In step S302, a user interface of the application is displayed. The user interface includes a driving image of a virtual vehicle traveling in a virtual world.

[0058] The terminal runs the application and displays the user interface of the application. The user interface includes the driving image of the virtual vehicle traveling in a virtual world. The driving image displays the virtual environment observed from a first-person perspective or a third-person perspective of the virtual vehicle. The first-person perspective is also referred to as a driver perspective or an in-vehicle perspective. The third-person perspective is also referred to as a behind-vehicle perspective or a distant perspective.

[0059] In a case that the virtual world is three-dimensional, the first-person perspective may be implemented via a first camera disposed at a position of a driver, and the third-person perspective may be implemented via a second camera disposed behind the virtual vehicle. Both the first-person perspective and the third-person perspective follow the virtual vehicle in movement. In this embodiment, the third-person perspective is taken as an example to illustrate the driving image, and the present disclosure is not limited thereto.

[0060] In some embodiments, widgets of various types overlay with the driving image in the user interface. The widget includes at least a direction button and a drifting widget. The direction button is configured to control directions of the virtual vehicle. The direction button includes at least one of a forward-direction button, a left-direction button, a backward-direction button, and a right-direction button. The drifting widget is configured to control the virtual vehicle to trigger and/or keep a state of drifting. When the direction button and the drifting widget are simultaneously pressed, the virtual vehicle is controlled to be in the state of drifting. When the direction button and the drifting widget are being continuously pressed, the virtual vehicle remains in the state of drifting.

[0061] In this embodiment, it is taken an example for illustration that the target-interacting widget includes the direction button and the drifting widget.

[0062] In some embodiments, the widget further includes at least one of: a ranking display widget, a speed information widget, a mini-map widget, a braking widget, a turbo widget, and a nitro-boosting widget. The ranking display widget is configured to display a race rank of a current virtual vehicle among all virtual vehicles. The speed information widget is configured to display at least one piece of time information, which may be personal best time, lap time, and total racing time of a current race. The mini-map widget is configured display a top view of a whole map of a race track in a preset scale (and a real-time position of the current virtual vehicle on the map of the race track). The braking widget is configured to control the virtual vehicle to decelerate. The turbo widget is configured to control the virtual vehicle to accelerate rapidly for a first period that is short. The first time period may be of a fixed length. The nitro-boosting widget is configured to

control the virtual vehicle to accelerate rapidly for a second period that is long. A length of the second time period may be dynamically determined according to an attribute value for nitro.

[0063] In some embodiments, the turbo widget and the nitro-boosting widget are both widgets for bonus items, and can be triggered for usage only when the travelling virtual vehicle obtains a bonus item by meeting a preset condition. Otherwise, the turbo widget and the nitro-boosting widget are displayed as an inactive state, which indicates being not usable. Illustratively, the nitro-boosting widget can be triggered for usage only when available nitro is accumulated to a threshold.

[0064] In step S303, an event indicating a start of an operation corresponding to a widget for interacting with a target is received, when a virtual vehicle in the virtual world is in a state of normal travelling.

[0065] The user controls the virtual vehicle to travel in the ground environment in the virtual world. During the travelling, the user may control the traveling direction of the virtual vehicle via the direction button.

[0066] As shown in Figure 4, when the virtual vehicle is traveling in the virtual world, the virtual vehicle is subject to traction F_1 for the normal traveling and friction f . The normal-traveling traction F_1 refers to traction pointing toward a front of the vehicle head. The friction f includes at least one of: friction due to the ground, and a wind drag. The normal-traveling traction F_1 is greater than or equal to the friction f .

[0067] When the virtual vehicle travels in the state of normal traveling, the user may further perform a drifting-triggering operation on the target-interacting widget. In some embodiments, the drifting-triggering operation includes a trigger operation performed on the drifting widget. Alternatively, the drifting-triggering operation includes a trigger operation performed on a steering widget and the drifting widget. Alternatively, the drifting-triggering operation includes a trigger operation performed on a peripheral for simulating driving.

[0068] In some embodiments, the drifting-triggering operation may be performed via a touch screen, or may be performed via an external input device, such as a mouse, a VR controller, or a peripheral for simulating driving. The peripheral for simulating driving includes at least one of: a steering wheel, a gear stick, a gas pedal, and a brake.

[0069] In some embodiments, the drifting-triggering operation may be a tap, multiple taps, a long press, a slide, or the like. A type of the drifting-triggering operation is not limited herein.

[0070] For example, the drifting-triggering operation is pressing the left-direction button and the drifting widget simultaneously, or pressing the right-direction button and the drifting widget simultaneously.

[0071] It is taken as an example that the drifting-triggering operation is pressing simultaneously a direction button and the drifting widget that are displayed on a touch screen. When the touch screen detects a touch operation of the user, an event indicating a start of a touch is generated in an operating system of the terminal. The touch-start event is the event indicating the start of the operation.

[0072] Illustratively, a touch event is triggered in the operating system of the terminal when the user attaches a finger on the screen, slides the finger on the screen, or detaches the finger from the screen. The touch event may be of following types.

[0073] A first type is touch-start event (an event indicating a start of a touch). Such event is triggered when a finger starts to touch the screen. Such event may be triggered even if one finger touches the screen while another finger is touching the screen.

[0074] A second type is touch-move event (an event indicating movement of a touch). Such event is continuously triggered when a finger slides on the touch screen. When such event occurs, a `preventDefault ()` event may be invoked to prevent rolling.

[0075] A third type is touch-end event (an event indicating an end of a touch). Such event is triggered when a finger is detached from the touch screen.

[0076] An application in the terminal may determine the forgoing touch start event, which is obtained at a program level, as the event indicating the start of the operation corresponding to the target-interacting widget.

[0077] In step S304, the virtual vehicle is controlled to be in a state of drifting in the virtual world, according to the event indicating the start of the operation.

[0078] The state of drifting refers to a movement state, in which there is a large angle between a head direction pointed of a vehicle and a travelling direction of the vehicle, and a body of the vehicle passes a bend sideways. The head direction refers to a direction pointing toward a right front of a head of the vehicle. The traveling direction refers to a direction corresponding to a velocity of the traveling virtual vehicle, that is, an actual moving direction of the virtual vehicle in the ground environment.

[0079] In step S305, an angle between a head direction and a traveling direction of the virtual vehicle is monitored.

[0080] In some embodiments, the terminal monitoring the angle between the head direction and the traveling direction of the virtual vehicle includes, but is not limited to, at least one of four manners as follows.

[0081] In a first manner, the angle between the head direction and the traveling direction of the virtual vehicle is monitored in real time, when the virtual vehicle is in the state of drifting.

[0082] In a second manner, the terminal monitors the angle between the head direction and the traveling direction of the virtual vehicle in real time, after receiving the operation-end event corresponding to the target-interacting widget. The operation-end event is triggered when the operation of the user starts to disappear on the target-interacting widget. For example, the operation-end event is generated when stopping a touch operation of pressing the direction button and the drifting widget simultaneously.

[0083] In a third manner, the terminal monitors the angle between the head direction and the traveling direction of the virtual vehicle at a predetermined time interval.

[0084] In a fourth manner, the terminal monitors the angle between the head direction and the traveling direction of the virtual vehicle upon receiving a steering operation.

[0085] In this embodiment, when the user stops touching the target-interacting widget (for example, the user detaches a finger from the direction button or the drifting widget), the operating system of the terminal generates the touch-end event corresponding to the target-interacting widget, and the application in the terminal determines the touch-end event as the operation-end event. After the operation-end event corresponding to the target-interacting widget is received, the terminal monitors the angle between the head direction and the traveling direction of the virtual vehicle.

[0086] In some embodiments, when monitoring the angle, the terminal receives a steering operation performed by the user, changes the head direction of the virtual vehicle according to the steering operation, and determines an angle between the changed head direction and the traveling direction. The steering operation may be an operation performed on the direction button, or an operation performed on a steering wheel.

[0087] For example, the steering operation may be pressing the left-direction button or pressing the right-direction button.

[0088] After determining the angle between the head direction and the traveling direction of the virtual vehicle, the terminal further determines a magnitude relationship between the angle and a first threshold and a magnitude relationship between the angle and a second threshold. The first

threshold is greater than the second threshold. Illustratively, the first threshold is 45 degrees, and the second threshold is 10 degrees.

[0089] The process goes to step S306 in a case that the angle is greater than or equal to the first threshold. The process goes to step S311 in a case that the angle is less than the first threshold and is greater than or equal to the second threshold. The process goes to step S313 in a case that the angle is less than the second threshold.

[0090] After the drifting-triggering operation is completed, the head direction or the traveling direction of the virtual vehicle is changed under multiple influences, such as a direction of traction, a steering operation, and friction. Besides, the user may perform multiple steering operations, and hence this step may be repeated for multiple times correspondingly.

[0091] In step S306, a dynamic keep-drifting traction is applied on the virtual vehicle along the head direction, in a case that the angle between the head direction and the traveling direction is greater than or equal to a first threshold, after the operation-end event corresponding to the target-interacting widget is received. The dynamic keep-drifting traction is configured to control the virtual vehicle to keep the state of drifting.

[0092] After the drifting-triggering operation triggered by the user on the target-interacting widget is finished, the terminal applies the dynamic keep-drifting traction on the virtual vehicle along the head direction, in case of determining that the angle between the head direction and the traveling direction of the virtual vehicle is greater than the first threshold. The dynamic keep-drifting traction is configured to control the virtual vehicle to keep the state of drifting.

[0093] In some embodiments, "keeping the state of drifting" may be referred to as a keep-drifting state.

[0094] As shown in Figure 5, the dynamic keep-drifting traction F_2 of the virtual vehicle points toward a right front of the vehicle head. The virtual vehicle in the state of drifting moves along the traveling direction with a velocity V . The virtual vehicle is also subject to friction f pointing oppositely to the velocity V . A component F_{21} that is of the dynamic keep-drifting traction F_2 and along the traveling direction is greater than or equal to the friction f , such that the virtual vehicle remains in the state of drifting. At the same time, another component F_{22} of the dynamic keep-drifting traction F_2 changes the head direction, and a steering operation performed by the user is necessary to control the head direction of the virtual vehicle. In an optional embodiment, in the normal travelling state, the friction f is in positive correlation with the velocity of the virtual vehicle.

[0095] In some embodiments, an additional returning force is further provided in the application. The returning force is configured to guide the virtual vehicle to align the head direction with the travelling direction automatically in drifting, in case of no control signal.

[0096] In some embodiments, a traction component that is of the dynamic keep-drifting traction and along the traveling direction is greater than or equal to friction.

[0097] In some embodiments, magnitude of the dynamic keep-drifting traction is in positive correlation with a velocity of the virtual vehicle. Alternatively, magnitude of the dynamic keep-drifting traction is in positive correlation with a velocity of the virtual vehicle within a preset range of the velocity, and is constant out of the preset range of the velocity.

[0098] In one embodiment, the friction to which the virtual vehicle is subjected is ground friction. The ground friction is in positive correlation with a velocity of the virtual vehicle within a preset range of the velocity, and a direction of the ground friction is opposite to the traveling direction. A traction component along the traveling direction, of the dynamic keep-drifting traction to which the virtual vehicle is subjected, is kept same as the ground friction. Alternatively, the friction component is slightly greater than the ground friction. Thereby, the virtual vehicle remains in the state of drifting.

[0099] In step S307, ground friction on the virtual vehicle is changed from a first friction value to a second friction value, in a case that the angle between the head direction and the traveling direction is greater than the first threshold, after the operation-end event corresponding to the target-interacting widget is received. The first friction value is greater than the second friction value.

[0100] In some embodiments, the first friction value is determined in real time based on the velocity of the virtual vehicle. The velocity of the virtual vehicle is in positive correlation with the ground friction, within a present range of the velocity.

[0101] In some embodiments, the second friction value is a preset empirical value which is small. The application may reduce the ground friction on the virtual vehicle when keeping the virtual vehicle in the state of drifting. In such case, the ground friction can reduce the velocity of the virtual vehicle more slowly, and thereby it is easier to keep the virtual vehicle in the state of drifting.

[0102] In a case that there are multiple virtual vehicles in the virtual world, ground friction of each virtual vehicle may be independently configured, which depends on a current velocity and a traveling state of the virtual vehicle.

[0103] In step S308, an attribute value for nitro of the virtual vehicle is continuously increased during the state of drifting.

[0104] When the virtual vehicle is in the state of drifting, the application increased the attribute value for nitro for a nitro-boosting widget continuously, according to duration of the state of drifting. The duration is in positive correlation with the attribute value for nitro.

[0105] In step S309, a nitro-boosting widget of the virtual vehicle is activated into an available state, in a case that the attribute value for nitro reaches a trigger threshold.

[0106] The nitro-boosting widget corresponds to a trigger threshold thereof. In a case that the increased attribute value for nitro does not reach the trigger threshold, the nitro-boosting widget is in an unavailable state. A widget not activated is displayed on the user interface but cannot be triggered, or is not displayed on the user interface. In a case that the increased attribute value for nitro reaches the trigger threshold, the nitro-boosting widget is activated into an available state. The available state is displayed on the user interface and can be triggered.

[0107] In step S310, the virtual vehicle is controlled to accelerate, in a case that a signal triggering the nitro-boosting widget is received.

[0108] In some embodiments, the nitro-boosting widget is displayed on the touch screen. When the nitro-boosting widget is in the available state and the user presses the nitro-boosting widget, the terminal receives the signal triggering the nitro-boosting widget, and controls the virtual vehicle to accelerate according to the trigger signal.

[0109] The terminal may control the virtual vehicle to accelerate according to remaining available nitro indicated by the attribute value for nitro. That is, acceleration process needs to consume continuously the nitro indicated by the attribute value for nitro. In a case the nitro indicated by the attribute value for nitro runs out, the terminal controls the virtual vehicle to quit the state of acceleration.

[0110] In some embodiments, the terminal controls the virtual vehicle to quit the state of acceleration, further in a case that the virtual vehicle collides with another object during acceleration.

[0111] In step S311, the virtual vehicle is controlled to restore the state of normal traveling, in a case that the angle between the head direction and the traveling direction is less than the first threshold, during controlling the virtual vehicle to keep the state of drifting.

[0112] The terminal may switch the dynamic keep-drifting traction to the normal-traveling traction. The normal-traveling traction is configured to control the virtual vehicle in the state of normal traveling.

[0113] In step S312, the ground friction on the virtual vehicle is changed from the second friction value to the first friction value, in a case that the angle between the head direction and the traveling direction is less than the first threshold, during controlling the virtual vehicle to keep the state of drifting.

[0114] In such case, the application further changes the ground friction on the virtual vehicle from the second friction value to the first friction value.

[0115] In some embodiments, the first friction value is determined in real time based on the velocity of the virtual vehicle. The velocity of the virtual vehicle is in positive correlation with the ground friction, within a preset range of the velocity.

[0116] In some embodiments, the second friction value is a preset empirical value which is small.

[0117] In step S313, the virtual vehicle is controlled to switch from the state of drifting to the state of normal traveling after a target period, in a case that the angle between the head direction and the traveling direction is less than a second threshold, after the operation-end event corresponding to the target-interacting widget for interacting with a target is received.

[0118] When the operation-end event corresponding to the target-interacting widget is received, the virtual vehicle enters another state of drifting that is transient, in a case that the angle between the head direction and the traveling direction is small (for example, less than 10 degrees). The "state of drifting that is transient" may be called a cadence-drifting state. The cadence-drifting state is different from the keep-drifting state. The application controls the virtual vehicle to switch from the state of drifting to the state of normal traveling after a short target period.

[0119] In some embodiments, the application calculates a decay period, during which the virtual vehicle is turned from the state of drifting into the state of normal traveling, according to the velocity of the virtual vehicle and the ground friction. The application controls the virtual vehicle to be turned from the state of drifting to the state of normal traveling based on the decay period, in a case that the decay period is greater than a minimum drifting period. The application controls the virtual vehicle to be turned from the state of drifting to the state of normal traveling based on the minimum drifting period, in a case that the decay period is less than the minimum drifting period.

[0120] In some embodiments, after the operation-end event corresponding to the target-interacting widget f is received, the application further changes the ground friction on the virtual vehicle from the second friction value to the first friction value, in a case that the angle between the head direction and the traveling direction is less than the second threshold. Thereby, the virtual vehicle switches from the cadence-drifting state to the state of normal traveling.

[0121] In addition, the cadence-drifting state also belongs to the state of drifting. Therefore, the application further performs the step S308, that is, an attribute value for nitro of the virtual vehicle is continuously increased during the state of drifting (the cadence-drifting state). The cadence-drifting state may help the user increase attribute value for nitro by a small amount quickly. In a case that the attribute value for nitro increase through keep-drifting or ordinary drifting approximates the trigger threshold, the user may fill remaining nitro vacancy through the cadence-drifting state.

[0122] In summary, the method is provided in the forgoing embodiments. After the operation-end event corresponding to the target-interacting widget is received, the virtual vehicle is controlled to keep the state of drifting in a case that the angle between the head direction and the traveling direction is greater than or equal to the first threshold. Thereby, the user may merely control the angle between the head direction and the traveling direction, when controlling the virtual vehicle to keep the state of drifting. It is not necessary to press the direction button and the drifting widget simultaneously, and only the direction button needs to be pressed to the head direction. Operations are less difficult, facilitating human-machine interaction in scenarios not suitable for long-time bimanual operation.

[0123] In the method according to the foregoing embodiments, each time the steering operation of the user is received after the operation-end event corresponding to the target-interacting widget is received, it is further determined whether the angle between the head direction and the traveling direction of the virtual vehicle is greater than a threshold. In a case that the angle between the head direction and the traveling direction of the virtual vehicle is greater than the first threshold, the virtual vehicle remains in the state of drifting, and the attribute value for nitro of the nitro-boosting widget is increased according to the duration of the state of drifting (the keep-drift state) of the virtual vehicle. Such concise human-machine interaction enables the user to increase the available nitro quickly, and obtain more nitro-boosting widgets as bonuses.

[0124] In the method according to the foregoing embodiments, after the operation-end event corresponding to the target-interacting widget is received, the virtual vehicle enters in the cadence-drifting state, and the attribute value for nitro of the nitro-boosting widget is increased

based on the duration of the state of drifting (the cadence-drifting state), in a case that the angle between the head direction and the traveling direction of the virtual vehicle is less than the second threshold. Fast man-machine interaction enables the user to accumulate available nitro by a small amount quickly, while the traveling direction of the virtual vehicle is not greatly changed. Thereby, when the attribute value for nitro increased through the keep-drifting or the ordinary drifting approximates the threshold, the user is able to obtain the bonus nitro-boosting widget more quickly through the cadence-drifting state.

[0125] In an embodiment, there are steps S601 to S607. In step S601, a user opens an application and starts an automobile racing game. In step S602, the user presses a button (a direction button and a drifting button) to control a vehicle to enter drifting. In step S603, the user releases the button and stops a drifting-triggering operation. In step S604, the application controls the racing automobile to keep a state of drifting. Keeping the state of drifting may be called as keep-drifting.

[0126] In step S605, the user may trigger following operations, in a case that the user chooses to align a vehicle head with a traveling direction.

[0127] A first operation is clicking or tapping the direction button, and steering the vehicle head towards a direction reverse to a drifting direction;

[0128] A second operation is reducing an angle between the head direction and the travelling direction of the vehicle continuously.

[0129] A third operation is quitting the state of drifting when that the angle is smaller than a threshold in degrees.

[0130] In step S606, the application controls the racing automobile to end the drifting, and the vehicle enters a state of normal traveling state when the vehicle head is successfully aligned with the traveling direction during the drifting.

[0131] In step S607, the user may trigger following operations, in a case that the user chooses not to align a vehicle head with a traveling direction.

[0132] A first operation is applying an automatic returning force on the vehicle head when the vehicle is in a keep-drifting state.

[0133] A second operation is clicking or tapping the direction button at appropriate time, and steering the vehicle head towards the same direction as the drifting direction.

[0134] A third operation is keeping the angle between the head direction and the movement direction of the vehicle basically unchanged.

[0135] A fourth operation is keeping the infinite keep-drifting state.

[0136] In some embodiments, a first text 71 "keep-drifting" may be displayed on and overlay with the user interface during the keep-drifting, as shown in Figure 7. Moreover, during the keep-drifting, a tire trace 72 due to the virtual vehicle drifting on the race track is obviously long, as shown in Figure 8.

[0137] Reference is made to Figure 5. In embodiments of the present disclosure, a large "keep-drifting" traction F_2 exists besides an inertial velocity V , when drifting of the racing automobile is maintained. Such traction and the friction f act jointly. In this case, a manner of calculating the force F or f changes dynamically, and a result thereof approximates that the racing automobile follows a uniform circular motion (definitely, the motion follows dynamic arcs in practice). In theory, the "keep-drifting" state of the racing automobile may be indefinitely maintained.

[0138] Illustratively, Figure 9 shows a calculation manner of the dynamic drifting traction F_2 and the friction f according to an embodiment of the present disclosure. The dynamic drifting traction F_2 changes with a real-time velocity of the racing automobile. A larger velocity of the racing automobile leads to a larger dynamic drift traction F_2 . After the velocity of the racing automobile reaches a certain threshold, an increase of the dynamic drifting traction F_2 stops. The traction f also changes with the real-time velocity of the racing automobile. Magnitude of the friction f is in direct proportion to a square of the real-time velocity of the racing automobile.

[0139] During the keep-drifting, the user needs to control the head direction of the virtual racing automobile in real time. For example, the angle between the head direction and the traveling direction is controlled within a range from 35 degrees to 45 degrees. A reason lies in that the angle between the head direction and the traveling direction should not be too small in real-time control of the user, and otherwise the racing automobile would quit the state of drifting. A key of the keep-drifting operation is that the angle between the head direction and the traveling direction should be under control of the user, such that the racing automobile is subject to a joint force approximating a centripetal force, and follows an approximate circular motion. In practice, a race track is not a standard arc, but a non-standard arc that changes in real time. Different arcs in the race track arcs require a player to control different angles of drafting, and hence the race track brings a lot of fun via designs.

[0140] In some embodiments, when a player wishes to end the keep-drifting, the player needs to steer the vehicle head such that the angle between the head direction and the traveling direction is 0. Thereby, the racing automobile is in the state of normal traveling, and the dynamic drifting traction F2 is switched to the normal-traveling traction F1. F1 is constant, and the friction f still increases with the velocity. A balance is finally achieved between the normal-traveling traction F1 and the friction f, and the racing automobile follows a uniform linear motion, which conforms to a power-design principle of vehicles in the real world.

[0141] In an optional embodiment, after the step S603, when the user releases the button, the virtual vehicle enters another state of drifting which is transient, also called the cadence-drifting state, instead of the keep-drifting state, in a case that the angle between the head direction and the traveling direction of the virtual vehicle is within 10 degrees. The racing automobile switches from the state of drifting to the state of normal traveling after keeping the state of drifting for a short time. In some embodiments, during the cadence drifting, a second text 74 "cadence-drifting" may further be displayed on and overlay with the user interface, as shown in Figure 10.

[0142] Hereinafter describe are apparatus embodiments of the present disclosure, which correspond to the foregoing method embodiments. A part not described in detail in the apparatus embodiments may refer to the corresponding description in the foregoing method embodiments.

[0143] Figure 11 is a schematic structural block diagram of an apparatus for virtual vehicle drifting in a virtual world according to an embodiment of the present disclosure. The apparatus may be implemented as an entire or a part of a terminal through software, hardware, or a combination of the two. The apparatus includes an interaction module 1120 and a control module 1140.

[0144] The interaction module 1120 is configured to receive an event indicating a start of an operation corresponding to a widget for interacting with a target, during travelling of a virtual vehicle in the virtual world. The widget for interacting with the target is a widget or a widget group, which is configured to trigger a state of drifting of the virtual vehicle.

[0145] The control module 1140 is configured to control, according to the event indicating the start of the operation, the virtual vehicle to be in the state of drifting in the virtual world.

[0146] The control module 1140 is configured to control the virtual vehicle to keep the state of drifting, in a case that an angle between a direction pointed by a head of the virtual vehicle and a direction of the travelling is greater than or equal to a first threshold, after an event indicating an end of the operation corresponding to the widget is received.

[0147] In an optional embodiment, the control module 1140 is configured to apply a dynamic keep-drifting traction on the virtual vehicle along the direction pointed by the head of the virtual vehicle. The dynamic keep-drifting traction is configured to control the virtual vehicle to keep the state of drifting.

[0148] In an optional embodiment, magnitude of the dynamic keep-drifting traction is in positive correlation with a speed of the virtual vehicle within a preset range of the speed.

[0149] In an optional embodiment, the control module 1140 is further configured to change ground friction on the virtual vehicle from a first friction value to a second friction value, in a case that the angle between the direction pointed by the head of the virtual vehicle and the direction of the travelling is greater than the first threshold, after the event indicating the end of the operation corresponding to the widget is received. The first friction value is greater than the second friction value.

[0150] In an optional embodiment, the control module 1140 is further configured to increase an attribute value for nitro of the virtual vehicle continuously during the state of drifting, activate a nitro-boosting widget of the virtual vehicle into an available state in a case that the attribute value for nitro reaches a trigger threshold, and control the virtual vehicle to accelerate in a case that a signal triggering the nitro-boosting widget is received.

[0151] In an optional embodiment, the control module 1140 is further configured to control the virtual vehicle to restore a state of normal traveling, in a case that the angle between the direction pointed by the head of the virtual vehicle and the direction of the travelling is less than the first threshold, during controlling the virtual vehicle to keep the state of drifting.

[0152] In an optional embodiment, the control module 1140 is further configured to change the ground friction on the virtual vehicle from a second friction value to a first friction value, in a case that the angle between the direction pointed by the head of the virtual vehicle and the direction of the travelling is detected to be less than the first threshold, during controlling the virtual vehicle to keep the state of drifting. The first friction value is greater than the second friction value.

[0153] In an optional embodiment, the control module 1140 is further configured to switch the dynamic keep-drifting traction to traction for normal traveling. The traction for normal traveling is configured to control the virtual vehicle to be in the state of normal traveling. The dynamic keep-drifting traction is greater than the traction for normal traveling.

[0154] In an optional embodiment, the apparatus further includes a monitoring module 1160.

- [0155]** The interaction module 1120 is further configured to receive a steering operation.
- [0156]** The control module 1140 is further configured to change the direction pointed by the head of the virtual vehicle according to the steering operation.
- [0157]** The monitoring module 1160 is further configured to determine an angle between the changed direction pointed by the head of the virtual vehicle and the direction of the travelling.
- [0158]** In an optional embodiment, the control module 1140 is configured to control the virtual vehicle to switch from the state of drifting to the state of normal traveling after a target period, in a case that the direction pointed by the head of the virtual vehicle and the direction of the travelling is less than a second threshold, after the event indicating the end of the operation corresponding to the widget is received. The second threshold is less than the first threshold.
- [0159]** In an optional embodiment, the control module 1140 is configured to: calculate a decay period during which the virtual vehicle is turned from the state of drifting into the state of normal traveling, according to a velocity of the virtual vehicle and the ground friction; control the virtual vehicle to be turned from the state of drifting into the state of normal traveling based on the decay period, in a case that the decay period is greater than a minimum drifting duration; and control the virtual vehicle to be turned from the state of drifting into the normal traveling state based on the minimum drifting period, in a case that the decay period is less than the minimum drifting period.
- [0160]** In summary, the apparatus is provided in the forgoing embodiments. After the operation-end event corresponding to the target-interacting widget is received, the virtual vehicle is controlled to keep the state of drifting in a case that the angle between the head direction and the traveling direction is greater than or equal to the first threshold. Thereby, the user may merely control the angle between the head direction and the traveling direction, when controlling the virtual vehicle to keep the state of drifting. It is not necessary to press the direction button and the drifting widget simultaneously, and only the direction button needs to be pressed to the head direction. Operations are less difficult, facilitating human-machine interaction in scenarios not suitable for long-time bimanual operation.
- [0161]** Reference is made to Figure 12, which is a structural block diagram of a terminal 1200 according to an embodiment of the present disclosure. The terminal 1200 may be a smartphone, a tablet computer, a MP3 (Moving Picture Experts Group Audio Layer III) player, a MP4 (Moving Picture Experts Group Audio Layer IV) player, a notebook computer, or a desktop

computer. The terminal 1200 may also be called another name, such as user equipment, a portable terminal, a laptop terminal, or a desktop terminal.

[0162] Generally, the terminal 1200 includes a processor 1201 and a memory 1202.

[0163] The processor 1201 may include one or more processing cores, and may be, for example, a 4-core processor or an 8-core processor. The processor 1201 may be implemented in hardware, embodied in at least one of: a digital signal processor (DSP), a field-programmable gate array (FPGA), and a programmable logic array (PLA). The processor 1201 may alternatively include a main processor and a co-processor. The main processor is a processor that is configured to process data in an awaking state, and is also referred to as a central processing unit (CPU). The co-processor is a low-power processor configured to process data in an idle state. In some embodiments, the processor 1201 may be integrated with a graphics processing unit (GPU). The GPU is responsible for rendering and drawing content to be displayed on a display screen. In some embodiments, the processor 1201 may further include an artificial intelligence (AI) processor. The AI processor is configured to process a calculating operation related to machine learning.

[0164] The memory 1202 may include one or more computer-readable storage media. The computer-readable storage medium may be non-transient. The memory 1202 may further include a high-speed random access memory, and a non-volatile memory, such as one or more magnetic disk storage devices and a flash storage device. In some embodiments, the non-transitory computer-readable storage medium in the memory 1202 is configured to store at least one instruction. The at least one instruction is configured to be executed by the processor 1201 to implement the method for virtual vehicle drifting in the virtual world according to the method embodiments of the present disclosure.

[0165] In some optional embodiments, the terminal 1200 may include: a peripheral device interface 1203 and at least one peripheral device. The processor 1201, the memory 1202, and the peripheral device interface 1203 may be connected via a bus or a signal cable. Each peripheral device may be connected to the peripheral device interface 1203 via a bus, a signal cable, or a circuit board. In a specific embodiment, the peripheral device includes at least one of: a radio frequency circuit 1204, a touch screen 1205, a camera component 1206, an audio circuit 1207, a positioning component 1208, and a power supply 1209.

[0166] The peripheral device interface 1203 may be configured to connect the at least one peripheral device related to input/output (I/O) to the processor 1201 and the memory 1202. In some embodiments, the processor 1201, the memory 1202, and the peripheral device interface 1203 are integrated on a same chip or a same circuit board. In other embodiments, any one or two of the

processor 1201, the memory 1202, and the peripheral device interface 1203 may be implemented on a separate chip or a separate circuit board. This embodiment is not limited thereto.

[0167] The radio frequency circuit 1204 is configured to receive and transmit a radio frequency (RF) signal, also called an electromagnetic signal. The RF circuit 1204 communicates with a communication network and another communication device through the electromagnetic signal. The RF circuit 1204 converts an electric signal into an electromagnetic signal for transmission, or converts a received electromagnetic signal into an electric signal. In some embodiments, the RF circuit 1204 includes: an antenna system, an RF transceiver, one or more amplifiers, a tuner, an oscillator, a digital signal processor, a codec chip set, a subscriber identity module card, and the like. The RF circuit 1204 may communicate with another terminal through at least one wireless communication protocol. The wireless communication protocol includes, but is not limited to, a metropolitan area network, a generation of a mobile communication network (2G, 3G, 4G, or 5G), a wireless local area network, and/or a wireless fidelity (WiFi) network. In some embodiments, the RF circuit 1204 may include a circuit related to near field communication (NFC). The present disclosure is not limited thereto.

[0168] The display screen 1205 is configured to display a user interface (UI). The UI may include a graphic, a text, an icon, a video, and any combination of the above. When the display screen 1205 is a touch screen, the display screen 1205 is further capable collect a touch signal on or above a surface of the display screen 1205. The touch signal may be inputted into the processor 1201 as a control signal for processing. In such case, the display screen 1205 may be further configured to provide a virtual button and/or a virtual keyboard, also called a soft button and/or a soft keyboard. In some embodiments, a quantity of the display screen 1205 may be one, and the display screen 1205 is disposed on a front panel of the terminal 1200. In other embodiments, there may be two display screens 1205, which are disposed on different surfaces, respectively, of the terminal 1200, or are designed in a foldable form. In other embodiments, the display screen 1205 may be a flexible display screen, disposed on a curved surface or a folded surface of the terminal 1200. The display screen 1205 may even be configured to have a non-rectangular irregular shape, that is, a specially shaped screen. The display screen 1205 may be manufactured as, for example, a liquid crystal display (LCD), or an organic light-emitting diode (OLED).

[0169] The camera component 1206 is configured to collect an image or a video. In some embodiments, the camera component 1206 includes a front-facing camera and a rear-facing camera. Generally, the front-facing camera is disposed on a front panel of the terminal, and the rear-facing camera is disposed on a back surface of the terminal. In some embodiments, there are at least two

rear-facing cameras, each of which is any of a main camera, a depth-of-field camera, a wide-angle camera, and a telephoto camera, so as to implement a background-blurring function through fusion between the main camera and the depth-of-field camera, panoramic shooting and virtual-reality (VR) shooting functions through fusion between the main camera and wide-angle camera, or another fusion-shooting function. In some embodiments, the camera component 1206 may further include a flash light. The flash light may be a mono-color-temperature flash light or a dual-color-temperature flash light. The dual-color-temperature flash light refers to a combination of a warm-color flash light and a cold-color flash light, and may be configured to perform light compensation under different color temperatures.

[0170] The audio circuit 1207 may include a microphone and a loudspeaker. The microphone is configured to collect sound waves of a user and an environment, convert the sound waves into electrical signals, and input the electrical signals into the processor 1201 for processing or into the RF circuit 1204 for speech communication. Multiple microphones may be disposed at different portions of the terminal 1200 for stereo collection or noise reduction. The microphone may alternatively be a microphone array or an omnidirectional collection microphone. The loudspeaker is configured to convert electrical signals from the processor 1201 or the RF circuit 1204 into sound waves. The loudspeaker may be a conventional thin-film loudspeaker or a piezoelectric ceramic loudspeaker. When the loudspeaker is the piezoelectric ceramic loudspeaker, electrical signals can be converted into not only sound waves audible to human, but also inaudible sound waves for ranging or the like. In some embodiments, the audio circuit 1207 may further include an earphone jack.

[0171] The positioning component 1208 is configured to determine a current geographic location of the terminal 1200 for navigation or a location-based service (LBS). The positioning component 1208 may be a positioning component based on the global positioning system (GPS) of the United States, the COMPASS System of China, the GLONASS System of Russia, or the GALILEO System of the European Union.

[0172] The power supply 1209 is configured to supply power to a component in the terminal 1200. The power supply 1209 may be an alternating current, a direct current, a primary battery, or a rechargeable battery. When the power supply 1209 includes the rechargeable battery, the rechargeable battery may be a wired rechargeable battery or a wireless rechargeable battery. The rechargeable battery may be further configured to support fast-charge technology.

[0173] In some embodiments, the terminal 1200 may also include one or more sensors 1210. The one or more sensors 1210 include, but are not limited to, an acceleration sensor 1211, a

gyroscope sensor 1212, a pressure sensor 1213, a fingerprint sensor 1214, an optical sensor 1215, and a proximity sensor 1216.

[0174] The acceleration sensor 1211 may detect magnitude of acceleration on three coordinate axes of a coordinate system established with the terminal 1200. For example, the acceleration sensor 1211 may be configured to detect components of gravity acceleration along the three coordinate axes. The processor 1201 may control the touch screen 1205 to display the user interface in a landscape view or a portrait view, according to a gravity acceleration signal collected by the acceleration sensor 1211. The acceleration sensor 1211 may be further configured to collect motion data of a game or a user.

[0175] The gyroscope sensor 1212 may detect a body direction and a rotation angle of the terminal 1200. The gyroscope sensor 1212 may cooperate with the acceleration sensor 1211 to collect a 3D action performed by the user on the terminal 1200. The processor 1201 may implement following functions according to data collected by the gyroscope sensor 1212: motion sensing (for example, the UI is changed according to a tilt operation of the user), image stabilization during shooting, game control, and inertial navigation.

[0176] The pressure sensor 1213 may be disposed on a side frame of the terminal 1200 and/or a lower layer of the touch screen 1205. When the pressure sensor 1213 is disposed on the side frame of the terminal 1200, a gripping signal of the user on the terminal 1200 may be detected. The processor 1201 performs left-or-right hand recognition or a quick operation according to the gripping signal collected by the pressure sensor 1213. When the pressure sensor 1213 is disposed on a bottom layer of the touch screen 1205, the processor 1201 controls an operable widget on the UI, according to a pressure operation performed by the user on the touch screen 1205. The operable widget includes at least one of: a button widget, a scroll bar widget, an icon widget, and a menu widget.

[0177] The fingerprint sensor 1214 is configured to collect a fingerprint of the user. The processor 1201 identifies an identity of the user according to the fingerprint collected by the fingerprint sensor 1214, or the fingerprint sensor 1214 identifies an identity of the user according to the collected fingerprint. When the identity of the user is identified as a trusted identity, the processor 1201 authorizes the user to perform a related sensitive operation. The sensitive operation includes unlocking a screen, viewing encrypted information, downloading software, payment, changing settings, or the like. The fingerprint sensor 1214 may be disposed on a front side, a back side, or a lateral side of the terminal 1200. In a case that a physical button or a vendor

logo is disposed on the terminal 1200, the fingerprint 1214 may be integrated with the physical button or the vendor logo.

[0178] The optical sensor 1215 is configured to collect an intensity of ambient light. In an embodiment, the processor 1201 may control luminance of the touch screen 1205 according to the intensity of ambient light collected by the optical sensor 1215. In a specific embodiment, the luminance of the touch screen 1205 is increased in case of high intensity of the ambient light, and the luminance of the touch screen 1205 is reduced in case of low intensity of the ambient light. In another embodiment, the processor 1201 may further adjust a camera parameter of the camera component 1206 dynamically according to the intensity of ambient light collected by the optical sensor 1215.

[0179] The proximity sensor 1216, also called a distance sensor, is generally disposed on the front panel of the terminal 1200. The proximity sensor 1216 is configured to collect a distance between the user and a front surface of the terminal 1200. In an embodiment, when the proximity sensor 1216 detects that the distance between the user and the front surface of the terminal 1200 is decreasing, the processor 1201 controls the touch screen 1205 to switch from a screen-on state to a screen-off state. When the proximity sensor 1216 detects that the distance between the user and the front surface of the terminal 1200 is increasing, the processor 1201 controls the touch screen 1205 to switch from the screen-off state to the screen-on state.

[0180] A person skilled in the art may understand that the structure shown in Figure 12 constitutes no limitation on the terminal 1200, and the terminal may include more or fewer components than those shown in the figure, or some components may be combined, or a different component deployment may be used.

[0181] In an embodiment, a terminal including a processor and a memory is provided. The memory stores a computer program. The computer program, when executed by the processor, configures the processor to perform steps of a method for virtual vehicle drifting in a virtual world. Such steps of the method for virtual vehicle drifting in the virtual world may refer to steps of the method for virtual vehicle drifting in the virtual world according to the foregoing embodiments.

[0182] In an embodiment, a computer-readable storage medium storing a computer program is provided. The computer program, when executed by a processor, configured the processor to perform steps of a method for virtual vehicle drifting in a virtual world. Such steps of the method for virtual vehicle drifting in the virtual world may refer to steps of the method for virtual vehicle drifting in the virtual world according to the foregoing embodiments.

[0183] In an embodiment, a computer program product is provided. The computer-readable storage medium is a non-volatile computer-readable storage medium. The computer-readable storage medium stores the computer program. The stored computer program, when executed by a processing component, may implement the method for virtual vehicle drifting in the virtual world according to the foregoing embodiments of the present disclosure.

[0184] "Multiple" mentioned in the description refers to a quantity of two or more. "And/or" describes an association relationship among associated objects, and may represent three candidate relationships. For example, "A and/or B" may represent following three cases: only A exists, both A and B exist, and only B exists. The character "/" generally indicates an alternative relationship between a former object and a latter object that are associated.

[0185] Sequence numbers of the foregoing embodiments of the present disclosure are merely for description purpose, and do not indicate preference among the embodiments.

[0186] A person of ordinary skill in the art may understand that all or some of the steps of the embodiments may be implemented by hardware, or may be implemented by a program instructing related hardware. The program may be stored in a computer-readable storage medium. Such storage medium may include: a read-only memory, a magnetic disk, or an optical disc.

[0187] The foregoing descriptions are merely embodiments of the present disclosure, but are not intended to limit the present disclosure. Any modification, equivalent replacement, or improvement made within the spirit and principle of the present disclosure shall fall within the protection scope of the present disclosure.

CLAIMS

What is claimed is:

1. A method for virtual vehicle drifting in a virtual world, performed by a terminal, wherein the method comprises:

receiving an event indicating a start of an operation corresponding to a widget for interacting with a target, during travelling of a virtual vehicle in the virtual world;

controlling, according to the event indicating the start of the operation, the virtual vehicle to be in a state of drifting in the virtual world; and

controlling the virtual vehicle to keep the state of drifting, in a case that an angle between a direction pointed by a head of the virtual vehicle and a direction of the travelling is greater than or equal to a first threshold, after an event indicating an end of the operation corresponding to the widget is received.

2. The method according to claim 1, wherein controlling the virtual vehicle to keep the state of drifting comprises:

applying a dynamic keep-drifting traction on the virtual vehicle along the direction pointed by the head of the virtual vehicle, wherein the dynamic keep-drifting traction is configured to control the virtual vehicle to keep the state of drifting.

3. The method according to claim 2, wherein magnitude of the dynamic keep-drifting traction is in positive correlation with a speed of the virtual vehicle within a preset range of the speed.

4. The method according to claim 2, further comprising:

changing ground friction on the virtual vehicle from a first friction value to a second friction value, in a case that the angle between the direction pointed by the head of the virtual vehicle and the direction of the travelling is greater than the first threshold, after the event indicating the end of the operation corresponding to the widget is received;

wherein the first friction value is greater than the second friction value.

5. The method according to claim 1, further comprising:

increasing an attribute value for nitro of the virtual vehicle continuously, during the state of drifting;

activating a nitro-boosting widget of the virtual vehicle into an available state, in a case that

the attribute value for nitro reaches a trigger threshold; and

controlling the virtual vehicle to accelerate, in a case that a signal triggering the nitro-boosting widget is received.

6. The method according to any one of claims 1 to 5, further comprising:

controlling the virtual vehicle to restore a state of normal traveling, in a case that the angle between the direction pointed by the head of the virtual vehicle and the direction of the travelling is less than the first threshold, during controlling the virtual vehicle to keep the state of drifting.

7. The method according to claim 6, wherein controlling the virtual vehicle to restore the state of normal traveling comprises:

switching the dynamic keep-drifting traction to traction for normal traveling;

wherein the traction for normal traveling is configured to control the virtual vehicle to be in the state of normal traveling; and

wherein the dynamic keep-drifting traction is greater than the traction for normal traveling.

8. The method according to claim 6, further comprising:

changing the ground friction on the virtual vehicle from a second friction value to a first friction value, in a case that the angle between the direction pointed by the head of the virtual vehicle and the direction of the travelling is detected to be less than the first threshold, during controlling the virtual vehicle to keep the state of drifting;

wherein the second friction value characterizes friction when the virtual vehicle keeping the state of drifting;

wherein the first friction value is greater than the second friction value.

9. The method according to any one of claims 1 to 5, further comprising:

receiving a steering operation;

changing the direction pointed by the head of the virtual vehicle according to the steering operation; and

determining an angle between the changed direction pointed by the head of the virtual vehicle and the direction of the travelling.

10. The method according to any one of claims 1 to 5, further comprising:

controlling the virtual vehicle to switch from the state of drifting to the state of normal

traveling after a target period, in a case that the direction pointed by the head of the virtual vehicle and the direction of the travelling is less than a second threshold, after the event indicating the end of the operation corresponding to the widget is received;

wherein the second threshold is less than the first threshold.

11. The method according to claim 10, wherein controlling the virtual vehicle to switch from the state of drifting to the state of normal traveling after the target period comprises:

calculating a decay period during which the virtual vehicle is turned from the state of drifting into the state of normal traveling, according to a velocity of the virtual vehicle and the ground friction;

controlling the virtual vehicle to be turned from the state of drifting into the state of normal traveling based on the decay period, in a case that the decay period is greater than a minimum drifting duration; and

controlling the virtual vehicle to be turned from the state of drifting into the normal traveling state based on the minimum drifting period, in a case that the decay period is less than the minimum drifting period.

12. An apparatus for virtual vehicle drifting in a virtual world, comprising:

an interaction module, configured to receive an event indicating a start of an operation corresponding to a widget for interacting with a target, during travelling of a virtual vehicle in the virtual world; and

a control module, configured to control, according to the event indicating the start of the operation, the virtual vehicle to be in the state of drifting in the virtual world;

wherein the control module is further configured to control the virtual vehicle to keep the state of drifting, in a case that an angle between a direction pointed by a head of the virtual vehicle and a direction of the travelling is greater than or equal to a first threshold, after an event indicating an end of the operation corresponding to the widget is received.

13. The apparatus according to claim 12, wherein the control module is configured to:

apply a dynamic keep-drifting traction on the virtual vehicle along the direction pointed by the head of the virtual vehicle, in a case that the angle between the direction pointed by the head of the virtual vehicle and the direction of the travelling is greater than or equal to the first threshold, after the event indicating the end of the operation corresponding to the widget is received;

wherein the dynamic keep-drifting traction is configured to control the virtual vehicle to keep

the state of drifting.

14. The apparatus according to claim 12, wherein the control module is further configured to:
change ground friction on the virtual vehicle from a first friction value to a second friction value, in a case that the angle between the direction pointed by the head of the virtual vehicle and the direction of the travelling is greater than the first threshold, after the event indicating the end of the operation corresponding to the widget is received;

wherein the first friction value is greater than the second friction value.

15. The apparatus according to claim 12, wherein the control module is further configured to:
increase an attribute value for nitro of the virtual vehicle continuously during the state of drifting;

activate a nitro-boosting widget of the virtual vehicle into an available state in a case that the attribute value for nitro reaches a trigger threshold; and

control the virtual vehicle to accelerate in a case that a signal triggering the nitro-boosting widget is received.

16. The apparatus according to any one of claims 12 to 15, wherein the control module is further configured to:

control the virtual vehicle to restore a state of normal traveling, in a case that the angle between the direction pointed by the head of the virtual vehicle and the direction of the travelling is less than the first threshold, during controlling the virtual vehicle to keep the state of drifting.

17. The apparatus according to claim 16, wherein the control module is further configured to:
switch the dynamic keep-drifting traction to traction for normal traveling, wherein:
the traction for normal traveling is configured to control the virtual vehicle to be in the state of normal traveling; and

the dynamic keep-drifting traction is greater than the traction for normal traveling.

18. The apparatus according to claim 16, wherein the control module is further configured to:
change the ground friction on the virtual vehicle from a second friction value to a first friction value, in a case that the angle between the direction pointed by the head of the virtual vehicle and the direction of the travelling is less than the first threshold, during controlling the virtual vehicle to keep the state of drifting;

wherein the second friction value characterizes friction when the virtual vehicle keeping the

state of drifting;

wherein the first friction value is greater than the second friction value.

19. A terminal, comprising:

a processor, and

a memory,

wherein the memory stores computer-readable instructions, and the computer-readable instructions when executed by the processor configure the processor to perform the method according to any one of claims 1 to 11.

20. A non-volatile computer-readable storage medium, storing computer-readable instructions, wherein:

the computer-readable instructions when executed by one or more processors configure the one or more processors to perform the method according to any one of claims 1 to 11.