

OBJECT CONTROL METHOD AND APPARATUS, STORAGE MEDIUM, AND ELECTRONIC APPARATUS

[0001] This application claims priority to Chinese Patent Application No. 201910130187X, entitled "OBJECT CONTROL METHOD AND APPARATUS, STORAGE MEDIUM, AND ELECTRONIC APPARATUS" filed with the China National Intellectual Property Administration on February 21, 2019, which is incorporated by reference in its entirety.

FIELD OF THE TECHNOLOGY

[0002] This disclosure relates to the field of computers, and particularly to an object control technology.

BACKGROUND OF THE DISCLOSURE

[0003] At present, in racing game applications, different racing tracks are generally designed in a game scene, so as to enrich the user experience of a player. Each racing track includes bends with different turning angles. In order to shorten the time in which a target object controlled by the player drives through a bend, the player generally controls the target object to perform a drift action through a control button set in a human-machine interaction interface.

[0004] In the process of the player controlling the target object to perform the drift action, the player usually needs to manually adjust a control operation on the control button according to game experience, to determine a drift angle of the target object in the drift process, so that the target object drifts according to the determined drift angle and then continues driving. In practical applications, if the player is unskilled in the control operation on the target object, drift errors are easily caused, which further affects a racing result.

[0005] In summary, the object control method provided in the related art requires the player to possess a relatively high level of operation, resulting in poor control accuracy in the process of controlling the drift of the target object.

[0006] For the foregoing problem, no effective solution has been proposed by now.

SUMMARY

[0007] There are provided an object control method and apparatus, a storage medium and an electronic apparatus according to embodiments of this disclosure, to at least solve the technical problem of poor control accuracy in a process of controlling an object to implement a target action.

[0008] According to an aspect of the embodiments of this disclosure, an object control method is provided. The method is applied to a terminal device. The method includes: obtaining an operation instruction generated by performing a long-press operation on a first virtual key and a second virtual key in a human-machine interaction interface displayed on a client, where the first virtual key is configured to adjust an advancing direction of a target object controlled by the client, and the second virtual key is configured to trigger the target object to perform a target action; in response to the operation instruction, controlling the target object to perform the target action in a current path, and detecting a target angle generated by the target object in the process of performing the target action, where the target angle is an angle between the advancing direction of the target object and a sliding direction of the target object; and adjusting a key state of each of the first virtual key and the second virtual key to an invalid state if it is detected that the long-press operation is currently performed on the first virtual key and the second virtual key and the target angle reaches a first angle threshold matching the current path, to control the target object to enter a state of passively performing the target action, where the invalid state indicates that key response logic of each of the first virtual key and the second virtual key is in a suspended state.

[0009] According to another aspect of the embodiments of this disclosure, an object control apparatus is further provided. The object control apparatus includes: a first obtaining unit, a first control unit and a first adjustment unit. The first obtaining unit is configured to obtain an operation instruction generated by performing a long-press operation on a first virtual key and a second virtual key in a human-machine interaction interface displayed on a client. The first virtual key is configured to adjust an advancing direction of a target object controlled by the client, and the second virtual key is configured to trigger the target object to perform a target action. The first control unit is configured to: in response to the operation instruction, control the target object to perform the target action in a current path, and detect a target angle generated by the target object in the process of performing the target action. The target angle is an angle between the advancing direction of the target object and a sliding direction of the target object. The first adjustment unit is configured to: if it is detected that the long-press operation is currently performed on the first virtual key and the second virtual key and the target angle reaches a first angle threshold matching the current path, adjust a key state of each of the first virtual key and the second virtual key to an

invalid state, to control the target object to enter a state of passively performing the target action. The invalid state indicates that key response logic of the first virtual key and the second virtual key is in a suspended state.

[0010] According to another aspect of the embodiments of this disclosure, a storage medium is further provided. The storage medium stores a computer program. The computer program, when executed, causes the foregoing object control method to be performed.

[0011] According to another aspect of the embodiments of this disclosure, an electronic apparatus is further provided. The electronic apparatus includes a memory, a processor, and a computer program that is stored in the memory and executable by the processor. The processor is configured to perform the foregoing object control method by executing the computer program.

[0012] According to another aspect of the embodiments of this disclosure, a computer program product is further provided. The computer program product includes instructions. The instructions, when executed by a computer, cause the computer to perform the foregoing object control method.

[0013] In the embodiments of this disclosure, according to the object control method provided in the embodiments, in running a client of a human-machine interaction application, after an operation instruction generated by performing a long-press operation on a first virtual key and a second virtual key in a human-machine interaction interface displayed on the client is obtained, the target object is controlled to perform a target action in a current path in response to the operation instruction, and a target angle generated by the target object in the process of performing the target action is detected. If it is detected that the long-press operation is currently performed on the first virtual key and the second virtual key, and the target angle reaches a first angle threshold matching the current path, a key state of each of the first virtual key and the second virtual key is adjusted to an invalid state. In other words, in the process that by the target object controlled by the client performs the target action in the current path, a relative relationship between the generated target angle and the first angle threshold is detected, to control the target object to automatically enter the state of passively performing the target action without relying on game experience of a player, so that the player does not need to manually adjust the control operation according to the game experience to determine the angle required for the target object to perform the target action, thereby reducing the operation difficulty of the player, improving the control accuracy when controlling the target object to perform the target action, and thus overcoming the problem in the related art of poor control accuracy caused by the fact that the player is unskilled in the control operation on the target object.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The accompanying drawings described herein are used to provide a further understanding of this disclosure, and form part of this disclosure. Exemplary embodiments of this disclosure and descriptions thereof are used to explain this disclosure, and do not constitute any inappropriate limitation to this disclosure. In the accompanying drawings:

[0015] FIG. 1 is a schematic diagram of a hardware environment of an optional object control method according to an embodiment of this disclosure;

[0016] FIG. 2 is a schematic diagram of a hardware environment of an optional object control method according to another embodiment of this disclosure;

[0017] FIG. 3 is a flowchart of an optional object control method according to an embodiment of this disclosure;

[0018] FIG. 4 is a schematic diagram of an optional object control method according to an embodiment of this disclosure;

[0019] FIG. 5 is a schematic diagram of an optional object control method according to another embodiment of this disclosure;

[0020] FIG. 6 is a flowchart of an optional object control method according to another embodiment of this disclosure;

[0021] FIG. 7 is a schematic diagram of an optional object control method according to another embodiment of this disclosure;

[0022] FIG. 8 is a schematic diagram of an optional object control method according to another embodiment of this disclosure;

[0023] FIG. 9 is a schematic diagram of a target classification model in an optional object control method according to an embodiment of this disclosure;

[0024] FIG. 10 is a schematic diagram of an initial classification model in an optional object control method according to another embodiment of this disclosure;

[0025] FIG. 11 is a schematic diagram of a configuration interface of an optional object control method according to an embodiment of this disclosure;

[0026] FIG. 12 is a schematic structural diagram of an optional object control apparatus according to an embodiment of this disclosure; and

[0027] FIG. 13 is a schematic structural diagram of an optional electronic apparatus according to an embodiment of this disclosure.

DESCRIPTION OF EMBODIMENTS

[0028] In order to make persons skilled in the art better understand the solutions of this disclosure, the following clearly and completely describes the technical solutions in the embodiments of this disclosure with reference to the accompanying drawings in the embodiments of this disclosure. Apparently, the described embodiments are only some of the embodiments of this disclosure rather than all of the embodiments. All other embodiments obtained by a person of ordinary skill in the art based on the embodiments of this disclosure without creative efforts shall fall within the protection scope of this disclosure.

[0029] It should be noted that, in this specification, claims, and accompanying drawings of this disclosure, the terms "first", "second", and so on are intended to distinguish similar objects but do not necessarily indicate a specific order or sequence. It is to be understood that the data termed in such a way is interchangeable in proper circumstances, so that the embodiments of this disclosure described herein can be implemented in orders other than the order illustrated or described herein. Moreover, the terms "include", "contain" and any other variants mean to cover the non-exclusive inclusion, for example, a process, method, system, product, or device that includes a list of steps or units is not necessarily limited to those expressly listed steps or units, but may include other steps or units not expressly listed or inherent to such a process, method, system, product, or device.

[0030] According to an aspect of the embodiments of this disclosure, an object control method is provided. Optionally, in an optional implementation, the object control method may be applied in, but is not limited to, a hardware environment shown in FIG. 1. It is assumed that a client (a client of a racing game application shown in FIG. 1) of a human-machine interaction application is installed in a user device 102. In the running of the client, an operation instruction generated by performing a long-press operation on a first virtual key (a direction key shown at the lower left corner of FIG. 1) and a second virtual key (an action control key shown at the lower right corner of FIG. 1) in a human-machine interaction interface displayed by the client is obtained, as shown in step S102.

[0031] The user device 102 includes a human-machine interaction screen 104, a processor 106, and a memory 108. The human-machine interaction screen 104 is configured to obtain a human-machine interaction operation. The processor 106 is configured to generate a corresponding operation instruction according to the human-machine interaction operation, and control a target

object to perform a corresponding action in response to the operation instruction. The target object is a virtual object controlled by a user through the client, such as a racing car in a racing game application. The memory 108 is configured to store the operation instruction and attribute information related to the target object.

[0032] Then, the user device 102 may perform step S104 of transmitting the operation instruction to a server 112 through a network 110. The server 112 includes a database 114 and a processing engine 116. As shown in step S106, the server 112 calls the processing engine 116, to determine, from the database 114, a first angle threshold matching a current path where the target object is located. Then, the server 112 performs step S108 of transmitting the determined first angle threshold to the user device 102 through the network 110, so that the user device 102 performs step S110 of controlling the target object to perform a target action in the current path using the obtained first angle threshold.

[0033] In addition, in an optional implementation, the object control method may be applied in, but is not limited to, a hardware environment shown in FIG. 2. It is still assumed that a client (a client of a racing game application shown in FIG. 2) of a human-machine interaction application is installed in a user device 102. In the running of the client, an operation instruction generated by performing a long-press operation on a first virtual key (a direction key shown at the lower left corner of FIG. 2) and a second virtual key (an action control key shown at the lower right corner of FIG. 2) in a human-machine interaction interface displayed by the client is obtained, as shown in step S202.

[0034] Subsequent operations performed after the operation instruction is obtained may be applied to, but are not limited to, an independent processing device with a relatively strong processing capability, without requiring data exchange with the server 112. For example, the independent processing device is still the user device 102, and the processor 106 in the user device 102 performs steps S204 to S208 in response to the operation instruction, including: controlling the target object to perform a target action in a current path, and detecting a target angle generated by the target object in the process of performing the target action; and if it is detected that the long-press operation is currently performed on the first virtual key and the second virtual key and the target angle reaches a first angle threshold matching the current path, adjusting a key state of each of the first virtual key and the second virtual key to an invalid state, to control the target object to enter a state of passively performing the target action. The first angle threshold may be, but is not limited to, pre-stored in the memory 108 of the user device 102. The foregoing is merely an example, which is not limited in this embodiment.

[0035] It should be noted that, according to the object control method provided in the embodiments, in running of a client of a human-machine interaction application, after an operation instruction generated by performing a long-press operation on a first virtual key and a second virtual key in a human-machine interaction interface displayed on the client is obtained, the target object controlled by the client is controlled to perform a target action in a current path in response to the operation instruction, and a target angle generated by the target object in the process of performing the target action is detected. If it is detected that the long-press operation is currently performed on the first virtual key and the second virtual key and the target angle reaches a first angle threshold matching the current path, a key state of each of the first virtual key and the second virtual key are adjusted to an invalid state. In other words, in the process that the target object controlled by the client performs the target action in the current path, a relative relationship between the generated target angle and the first angle threshold is detected, to control the target object to automatically enter the state of passively performing the target action without relying on game experience of a player, so that the player does not need to manually adjust the control operation according to the game experience to determine the angle required for the target object to perform the target action, thereby reducing the operation difficulty of the player, improving the control accuracy when performing the target action, and thus overcoming the problem in the related art of poor control accuracy caused by the fact that the player is unskilled in the control operation on the target object.

[0036] Optionally, in this embodiment, the user device may be, but is not limited to, a terminal device that supports running of an application client, such as a mobile phone, a tablet computer, a notebook computer, or a PC computer. The server and the user device may, but are not limited to, implement data exchange through a network. The network may include, but is not limited to, a wireless network or a wired network. The wireless network includes: Bluetooth, WIFI, and another network implementing wireless communication. The wired network may include, but is not limited to: a wide area network, a metropolitan area network, and a local area network. The foregoing is merely an example, which is not limited in this embodiment.

[0037] Optionally, in an optional implementation, the object control method includes the following steps S302 to S306, as shown in FIG. 3.

[0038] In S302, an operation instruction generated by performing a long-press operation on a first virtual key and a second virtual key in a human-machine interaction interface displayed on a client is obtained. The first virtual key is configured to adjust an advancing direction of a target

object controlled by the client. The second virtual key is configured to trigger the target object to perform a target action.

[0039] In S304, in response to the operation instruction, the target object is controlled to perform the target action in a current path, and a target angle generated by the target object in the process of performing the target action is detected. The target angle is an angle between the advancing direction of the target object and a sliding direction of the target object.

[0040] In S306, if it is detected that the long-press operation is currently performed on the first virtual key and the second virtual key and the target angle reaches a first angle threshold matching the current path, a key state of each of the first virtual key and the second virtual key is adjusted to an invalid state, to control the target object to enter a state of passively performing the target action. The invalid state is used for indicating that key response logic of each of the first virtual key and the second virtual key is in a suspended state.

[0041] Optionally, in this embodiment, the object control method may be applied in, but is not limited to, a scenario in which an object controlled by a client of a human-machine interaction application is automatically controlled. For example, the human-machine interaction application may be, but is not limited to, a racing game application, and the target object may be a virtual object manipulated in the racing game application, such as a virtual role, virtual equipment, or a virtual vehicle. The target action may be, but is not limited to, a drift action in a racing game scene, and a corresponding target angle may be, but is not limited to, a drift angle.

[0042] In other words, in the case that the target object performs the drift action in the current path, with the solution provided in this embodiment, a target angle generated in the process of the target object performing the drift action can be obtained in real time, the target angle is compared with the first angle threshold matching the current path, and in a case that a comparison result indicates that the target angle reaches the first angle threshold, the key response logic of each of the first virtual key and the second virtual key in the human-machine interaction interface is adjusted to enter the suspended state (that is, the invalid state), so that the target object automatically enters a state of passively drifting. The foregoing is merely an example, which is not limited in this embodiment.

[0043] It should be noted that, in this embodiment, a relative relationship between the target angle generated by the target object and the first angle threshold is detected in the process that the target object controlled by the client performs the target action in the current path, to control the target object to automatically enter the state of passively performing the target action without relying on game experience of a player, so that the player does not need to manually adjust the

control operation according to the game experience to determine the angle required for the target object to perform the target action, thereby reducing the operation difficulty of the player so as to improve the control accuracy when performing the target action.

[0044] In addition, in this embodiment, the target action performed by the target object in the current path may be, but is not limited to, a drift action in a racing scene. It should be noted that, the drift action is required to be triggered and performed if it is detected that the long-press operation is performed on both the first virtual key and the second virtual key. The first virtual key may be, but is not limited to, a direction key configured to control the advancing direction of the target object, such as a "left direction key" and a "right direction key" shown in FIG. 4. The second virtual key may be, but is not limited to, a trigger control key configured to trigger the target object to perform the target action, such as a "drift start key" shown in FIG. 4.

[0045] Further, in this embodiment, if it is detected that the user performs an operation on a virtual key, a display state of the virtual key indicates that the virtual key is in an "operation state". As shown in FIG. 4, if it is detected that the user performs the long-press operation on the right direction key (that is, the first virtual key), the corresponding virtual key is displayed in a form of a "solid line". Further, if it is detected that the user performs the long-press operation on the drift start key (that is, the second virtual key), the corresponding virtual key is displayed in a form of a "filled mesh". If it is detected that the user performs no operation on a virtual key, a display state of the virtual key indicates that the virtual key is in a "no-operation state". As shown in FIG. 4, if it is detected that the long-press operation is not performed on the left direction key, the corresponding virtual key is displayed in a form of a "dashed line". Further, if it is detected that the long-press operation is not performed on the drift start key (that is, the second virtual key), the corresponding virtual key may be modified to be displayed in a form of "unfilled" (which is not shown in FIG. 3).

[0046] Optionally, in this embodiment, the key state of the virtual key may include, but is not limited to: a valid state and an invalid state. The invalid state is used for indicating that the key response logic of the virtual key is in a suspended state. That is, in a case that a press operation (such as the long-press operation) is performed on a virtual key in the invalid state, a back end of the client does not execute key response logic of the virtual key. The valid state is used for indicating that the key response logic of the virtual key is normal. That is, in a case that a press operation (such as the long-press operation) is performed on a virtual key in the valid state, the back end executes the key response logic of the virtual key.

[0047] Further, with reference to the foregoing description, after the key state of each of the first virtual key and the second virtual key is adjusted to the invalid state and the target object enters

the state of passively performing the target action, the method provided in this embodiment may include, but is not limited to: controlling, in the human-machine interaction interface, display states of the first virtual key and the second virtual key in the invalid state to be respectively consistent with display states of the first virtual key and the second virtual key in the case that the long-press operation is currently performed on the first virtual key and the second virtual key. That is, in the case that the target angle reaches the first angle threshold, the display states of the virtual keys are maintained, so that the user controls the target object to complete the target action in the current path without perception.

[0048] Optionally, in this embodiment, the first angle threshold (which may also be referred to as a sensitivity hereafter) may be determined by using, but is not limited to, a target classification model. The target classification model is obtained by performing machine training using sample data. The target classification model is configured to determine an angle threshold matching path information of a path. The angle threshold is an angle at which completing the target action in the path requires the minimum duration.

[0049] Further, in this embodiment, the first angle threshold determined by the target classification model may be optimized and configured. A configuration manner may include, but is not limited to: performing a configuration operation on an angle threshold configuration item in a configuration interface of the client. That is, for different user accounts that log in to the client, the angle threshold is flexibly configured by means of the angle threshold configuration item, to improve the flexibility of controlling the target object to perform the target action.

[0050] Optionally, in this embodiment, the back end of the client may, but is not limited to, directly detect a target angle of a controlled target object in real time, or may, but is not limited to, calculate the target angle of the target object after obtaining the advancing direction of the target object and the sliding direction of the target object.

[0051] For example, it is assumed that the target object is a virtual vehicle in a racing vehicle game application. In this case, the advancing direction of the target object may be a vehicle head direction of the virtual vehicle, and the sliding direction of the target object may be an actual sliding direction of a vehicle body of the virtual vehicle. Further, the vehicle head direction and the sliding direction of the vehicle body are used to determine a target angle generated by the virtual vehicle when performing a drift action.

[0052] Optionally, in this embodiment, after adjusting the key state of each of the first virtual key and the second virtual key to the invalid state, the method further includes: after the target object enters the state of passively performing the target action, determining a remaining

duration required for completing the target action by the target object according to a frictional resistance matching the current path; and controlling the target object to complete the target action in the remaining duration.

[0053] It should be noted that, in the process of generating the operation instruction by long-pressing both the first virtual key and the second virtual key to control the target object to perform the target action, a torsional force F is generated in a direction perpendicular to the advancing direction of the target object, as shown in FIG. 5. The torsional force F is used to control the target object to maintain a fast steering state, so that the target angle is continuously increased, so as to perform the target action (such as a drift action, which is also referred to as a "tail whipping action") in the current path. Further, in the case that the target angle reaches the first angle threshold, after the key state of each of the first virtual key and the second virtual key is adjusted to the invalid state, the torsional force F disappears accordingly, and the target object enters the state of passively performing the target action (that is, passively drifting). Under the effect of the frictional resistance of the current path, the target object completes the target action in the process of passively performing the target action, that is, the target object is caused to get out of the drift action and enter a normal driving state.

[0054] The following description is given with reference to steps S602 to S608 shown in FIG. 6. Assuming that a client of a racing game application is still used as an example for description, the target object is a virtual vehicle participating in racing and controlled by the client, and the target action is a drift action. The first virtual key is a direction key, and the second virtual key is a drift start key.

[0055] In step S602, the client obtains an operation instruction generated by long-pressing both the direction key (assuming that the right direction key is long-pressed) and the drift start key. In response to the operation instruction, the client performs step S604 of controlling the corresponding virtual vehicle to start the drift action in the current path. In the process of performing the drift action, a target angle of the virtual vehicle is continuously increased. In step S606, the client detects whether the generated target angle reaches a first angle threshold α . If the client detects that the target angle has not reached the first angle threshold α , the client returns to step S604, so that the virtual vehicle continues steering drift by means of a steering force. If the client detects that the target angle reaches the first angle threshold α , the client performs step S608 of controlling the virtual vehicle to enter a state of passively drifting.

[0056] A target angle β generated by the virtual vehicle in the process of performing the drift action is shown in FIG. 7, which is an angle between the advancing direction (that is, the

vehicle head direction) of the virtual vehicle and the sliding direction (that is, a vector direction of an actual speed of the vehicle body) of the virtual vehicle. The foregoing is merely an example, which is not limited in this embodiment.

[0057] According to the embodiments provided in this disclosure, in the process that the target object controlled by the client performs the target action in the current path, a relative relationship between the target angle generated by the target object and the first angle threshold is detected, to control the target object to automatically enter the state of passively performing the target action without relying on game experience of a player, so that the player does not need to manually adjust the control operation according to the game experience to determine the angle required for the target object to perform the target action, thereby reducing the operation difficulty of the player, improving the control accuracy when performing the target action, and thus overcoming the problem in the related art of poor control accuracy caused by the fact that the player is unskilled in the control operation on the target object.

[0058] In an optional solution, after adjusting the key state of each of the first virtual key and the second virtual key to the invalid state, the method further includes the following step S1.

[0059] In S1, in the human-machine interaction interface, display states of the first virtual key and the second virtual key in the invalid state are controlled to be respectively consistent with display states of the first virtual key and the second virtual key in the case that the long-press operation is performed on the first virtual key and the second virtual key.

[0060] It should be noted that, in this embodiment, the display state of the virtual key may be, but is not limited to, presented through UI representation of the virtual key in the human-machine interaction interface. In a case that an operation is currently performed on the virtual key, a display state of the virtual key is an "operation state". In a case that no operation is performed on the virtual key, a display state of the virtual key is a "no-operation state".

[0061] The following description is given with reference to an interface shown in FIG. 8. As shown in FIG. 8, it is assumed that a client of a racing game application is still used as an example for description. The first virtual key may be, but is not limited to, direction keys shown at the lower left corner of FIG. 8, including a "left direction key" and a "right direction key". The second virtual key may be, but is not limited to, a "drift start key" shown at the lower right corner of FIG. 8. If it is detected that a left thumb and a right thumb perform the long-press operation on the "right direction key" and the "drift start key" respectively, a display state of the "right direction key" is an "operation state", and the "right direction key" is displayed in a form of a "solid line" shown in FIG. 8. Further, a display state of the "left direction key" on which no user operation is detected is a

"no-operation state", and the "left direction key" is displayed in a form of a "dashed line" shown in FIG. 8. A display state of the "drift start key" is the "operation state", and the "drift start key" is displayed in a form of a "filled mesh" shown in FIG. 8.

[0062] Further, as shown in FIG. 8(a), a target angle β generated by the virtual vehicle in the process of performing the drift action is detected. With the interaction between the torsional force F and the frictional resistance f generated in the process of performing the drift action, the target angle β is continuously increased. If it is detected that the target angle β generated by the virtual vehicle in the process of performing the drift action reaches the first angle threshold α , the key state of each of the "right direction key" and the "drift start key" is adjusted to the invalid state, so that the virtual vehicle enters the state of passively drifting. In this case, the human-machine interaction interface is shown in FIG. 8(b), in which the display states of the "right direction key" and the "drift start key" are still displayed as the "operation state" corresponding to the long-press operation, that is, the "right direction key" is displayed in the form of the "solid line", and the "drift start key" is displayed in the form of the "filled mesh". In other words, in the case that the key state of each of the "right direction key" and the "drift start key" is adjusted to the invalid state, the display states of the "right direction key" and the "drift start key" remain unchanged.

[0063] According to the embodiments provided in this disclosure, in the case that the target angle reaches the first angle threshold, the display states of the first virtual key and the second virtual key in the invalid state are controlled to be respectively consistent with the display states of the virtual keys in the case that the long-press operation is performed on the virtual keys, so that the user controls the target object to complete the target action in the current path without perception. In this way, the user can automatically complete the target action in the current path according to the first angle threshold without perception, reducing the operation difficulty of the user operation and avoiding the error caused due to the unskilled operation.

[0064] In an optional solution, before obtaining the operation instruction generated by performing the long-press operation on the first virtual key and the second virtual key in the human-machine interaction interface displayed on the client, the method further includes the following steps S1 and S2.

[0065] In S1, path information of the current path is inputted into a target classification model. The target classification model is a model obtained by performing machine training using sample data and is configured to determine an angle threshold matching path information of a path. The angle threshold is an angle at which completing the target action in the path requires the minimum duration.

[0066] In S2, the first angle threshold matching the current path is determined according to an output result of the target classification model.

[0067] It should be noted that, in this embodiment, the target classification model may be configured to, but is not limited to, classify driving difficulty of the current path according to the path information of the current path, determine the first angle threshold matching the current path according to a classification result, and output the first angle threshold as an output result. The first angle threshold may be used for, but is not limited to, indicating the sensitivity of the player controlling the target object to pass through the current path.

[0068] The target classification model may be shown in FIG. 9. Classifying the driving difficulty of the current path according to the path information of the current path may be, but is not limited to, implemented by the following processes. Path features (path features 1 to k as shown in FIG. 9) of the current path are extracted through a target classification model 900. The path features may include, but are not limited to: a bend angle, a bend length, a frictional resistance, and the like. The path features are stored into a database 902. Then, deep learning is performed on the path features of the current path stored in the database 902 through an embedding function 904-2 and a neural network layer 904-4 in a deep network 904, and a classification level to which the driving difficulty of the current path belongs is determined by a classifier 906. Further, an angle threshold adapted to the classification level is obtained as a first angle threshold matching the current path, to obtain an output result 908. The first angle threshold is an angle at which performing the target action in the path corresponding to the classification level requires the minimum duration.

[0069] Optionally, in this embodiment, before inputting the path information of the current path into the target classification model, the method further includes: obtaining the sample data generated when performing the target action in N sample paths, where the sample data includes an angle used for performing the target action in an i^{th} sample path and a duration required for completing the target action in the i^{th} sample path, and i is an integer greater than or equal to 1 and less than or equal to N; and inputting the sample data into a pre-constructed initial classification model, and adjusting a parameter of the initial classification model according to an output result of the initial classification model and perform training to obtain the target classification model.

[0070] The following description is given with reference to the example shown in FIG. 10. An initial classification model is pre-constructed. It is assumed that the sample data generated when performing the target action in N sample paths is obtained. The sample data may include, but is not limited to: an angle used for performing the target action in each sample path and a duration required for completing the target action in the sample path. The angle may include, but is not

limited to, a minimum angle and a maximum angle [$\text{angle}_{\min}$, $\text{angle}_{\max}$] used for performing the target action in the sample path and required corresponding durations. Further, path features of the sample path, such as a bend angle, a bend length, and a frictional resistance, are obtained.

[0071] Further, deep learning is performed on the path features and the sample data of the N sample paths. Taking a sample path 1 as an example, path features (path features 1 to k shown in FIG. 10) of the sample path 1 and corresponding sample data 1 are obtained and stored into a database 1002, and the path features 1 to k and the sample data 1 are inputted into a deep network 1004. Deep learning is performed on the path features and the sample data 1 of the sample path 1 through an embedding function 1004-2 and a neural network layer 1004-4 in the deep network 1004, and an output result 1008 is obtained through a classifier 1006. A parameter in the deep network 1004 in the initial classification model is adjusted and optimized using feedback of the output result 1008 to be trained, to obtain a target classification model with a convergent result. The target classification model is used to determine an optimal angle threshold used for performing the target action in each path.

[0072] According to the embodiments provided in this disclosure, the path information of the current path is inputted into the target classification model, by which an optimal angle threshold used for performing the target action in the current path can be determined, shortening the duration required for the target object to perform the target action in the current path, and improving the accuracy of controlling the target object to perform the target action.

[0073] In an optional solution, after determining the first angle threshold matching the current path according to the output result of the target classification model, the method further includes the following steps S1 and S2.

[0074] In S1, a configuration instruction generated by performing a configuration operation on an angle threshold configuration item in a configuration interface of the client is obtained.

[0075] In S2, in response to the configuration instruction, the first angle threshold is adjusted, to obtain the adjusted first angle threshold.

[0076] The following description is given with reference to FIG. 11. Still taking the method of determining the first angle threshold provided in the foregoing embodiment as an example, after determining the first angle threshold based on the target classification model, the method may include, but is not limited to: displaying a configuration interface in on the human-machine interaction interface. The configuration interface may include an angle threshold configuration item, for example, an "angle threshold" shown in FIG. 11. Further, a configuration instruction generated

by performing a configuration operation on a parameter value α of the angle threshold configuration item is obtained, to perform configuration and optimization on the first angle threshold determined by the target classification model.

[0077] According to the embodiments provided in this disclosure, after the first angle threshold matching the current path is determined according to the output result of the target classification model, a configuration instruction generated by performing a configuration operation on an angle threshold configuration item in a configuration interface is obtained. The first angle threshold is further optimized and adjusted according to the configuration instruction, so that the adjusted first angle threshold is adapted to an operating habit of the player, and thus different first angle threshold can be flexibly used by different players, thereby improving the flexibility of the object control.

[0078] In an optional solution, after adjusting the key state of each of the first virtual key and the second virtual key to the invalid state, the method further includes the following step 1) or 2) or 3).

[0079] In 1), if it is detected that the long-press operation is currently performed on the first virtual key and no press operation is currently performed on the second virtual key, the key state of the first virtual key is controlled to maintain the invalid state.

[0080] In 2), if it is detected that no press operation is currently performed on the first virtual key and the long-press operation is currently performed on the second virtual key, the key state of the second virtual key is controlled to return to a valid state. The valid state is used for indicating that the key response logic of the second virtual key returns to normal.

[0081] In 3), if it is detected that no press operation is currently performed on the first virtual key and the second virtual key, the key state of each of the first virtual key and the second virtual key is controlled to return to a valid state. The valid state is used for indicating that the key response logic of each of the first virtual key and the second virtual key returns to normal.

[0082] It should be noted that, in this embodiment, after adjusting the key state of each of the first virtual key and the second virtual key to the invalid state, in order to restore the key response logic of each of the first virtual key and the second virtual key, the method may include, but is not limited to: releasing pressing on the two keys, i.e., no longer performing the press operation on the first virtual key and the second virtual key.

[0083] In addition, if it is detected that the user still performs the long-press operation on the first virtual key but releases the pressing on the second virtual key (that is, the user no longer

performs the press operation on the second virtual key), the key state of the first virtual key is controlled to maintain the invalid state, so that the user can complete the target action in a relatively short time without perception. If it is detected that the user releases the pressing on the first virtual key (that is, the user no longer performs the press operation on the first virtual key) but still performs the long-press operation on the second virtual key, the key response logic of the second virtual key is restored, so that the second virtual key can be restarted quickly in response to the user operation, which shortens a start duration required for performing the target action next time.

[0084] According to the embodiments provided in this disclosure, after adjusting the key state of each of the first virtual key and the second virtual key to the invalid state, the virtual keys are controlled to execute different operation logic according to different operation manners (for example, pressing or lifting) of the user on the virtual keys, expanding key operation functions.

[0085] It should be noted that, for ease of description, the foregoing method embodiments are stated as a series of action combinations. However, a person skilled in the art should understand that this disclosure is not limited to the described sequence of the actions. This is because that some steps may be performed in another sequence or performed simultaneously according to this disclosure. In addition, a person skilled in the art should also understand that the embodiments described in this specification are preferred embodiments, and the involved actions and modules are not necessarily required by this disclosure.

[0086] According to another aspect of the embodiments of this disclosure, an object control apparatus for implementing the object control method is further provided. As shown in FIG. 12, the apparatus includes a first obtaining unit 1202, a first control unit 1204 and a first adjustment unit 1206.

[0087] 1) The first obtaining unit 1202 is configured to obtain an operation instruction generated by performing a long-press operation on a first virtual key and a second virtual key in a human-machine interaction interface displayed on a client. The first virtual key is configured to adjust an advancing direction of a target object controlled by the client. The second virtual key is configured to trigger the target object to perform a target action.

[0088] 2) The first control unit 1204 is configured to: in response to the operation instruction, control the target object to perform the target action in a current path, and detect a target angle generated by the target object in the process of performing the target action. The target angle is an angle between the advancing direction of the target object and a sliding direction of the target object.

[0089] 3) The first adjustment unit 1206 is configured to: if it is detected that the long-press operation is currently performed on the first virtual key and the second virtual key and the target angle reaches a first angle threshold matching the current path, adjust a key state of each of the first virtual key and the second virtual key to an invalid state to control the target object to enter a state of passively performing the target action. The invalid state indicates that key response logic of each of the first virtual key and the second virtual key is in a suspended state.

[0090] In an optional solution, the apparatus further includes a display unit.

[0091] 1) The display unit is configured to: after the key state of each of the first virtual key and the second virtual key is adjusted to the invalid state, control, in the human-machine interaction interface, display states of the first virtual key and the second virtual key in the invalid state to be respectively consistent with display states of the first virtual key and the second virtual key in the case that the long-press operation is performed on the first virtual key and the second virtual key.

[0092] According to the embodiments provided in this disclosure, in the case that the target angle reaches the first angle threshold, the display states of the first virtual key and the second virtual key in the invalid state are controlled to be respectively consistent with display states of key identifiers of the virtual keys in the case that the long-press operation is performed on the virtual keys, so that the user controls the target object to complete the target action in the current path without perception. In this way, the user can automatically complete the target action in the current path according to the first angle threshold without perception, reducing the operation difficulty of the user operation and avoiding the error caused due to the unskilled operation.

[0093] In an optional solution, the apparatus further includes an input unit and a determining unit.

[0094] 1) The input unit is configured to: before the operation instruction generated by performing the long-press operation on the first virtual key and the second virtual key in the human-machine interaction interface displayed on the client is obtained, input path information of the current path into a target classification model. The target classification model is a model obtained by performing machine training using sample data and is configured to determine an angle threshold matching path information of a path. The angle threshold is an angle at which completing the target action in the path requires the minimum duration.

[0095] 2) The determining unit is configured to determine the first angle threshold matching the current path according to an output result of the target classification model.

[0096] Optionally, in this embodiment, the apparatus further includes: a second obtaining unit and a training unit.

[0097] 1) The second obtaining unit is configured to: before the path information of the current path is inputted into the target classification model, obtain the sample data generated when performing the target action in N sample paths. The sample data includes an angle used for performing the target action in an i^{th} sample path and a duration required for completing the target action in the i^{th} sample path, where i is an integer greater than or equal to 1 and less than or equal to N.

[0098] 2) The training unit is configured to input the sample data into a pre-constructed initial classification model, and adjust a parameter of the initial classification model according to an output result of the initial classification model and perform training to obtain the target classification model.

[0099] According to the embodiments provided in this disclosure, the path information of the current path is inputted into the target classification model, by which an optimal angle threshold used for performing the target action in the current path can be determined, shortening the duration required for the target object to perform the target action in the current path, and improving the accuracy of controlling the target object to perform the target action.

[0100] In an optional solution, the apparatus further includes: a third obtaining unit and a second adjustment unit.

[0101] 1) The third obtaining unit is configured to: after the first angle threshold matching the current path is determined according to the output result of the target classification model, obtain a configuration instruction generated by performing a configuration operation on an angle threshold configuration item in a configuration interface of the client.

[0102] 2) The second adjustment unit is configured to adjust the first angle threshold in response to the configuration instruction, to obtain the adjusted first angle threshold.

[0103] According to the embodiments provided in this disclosure, after the first angle threshold matching the current path is determined according to the output result of the target classification model, a configuration instruction generated by performing a configuration operation on an angle threshold configuration item in a configuration interface is obtained. The first angle threshold is further optimized and adjusted according to the configuration instruction, so that the adjusted first angle threshold is adapted to an operating habit of the player, and thus different first

angle thresholds can be flexibly used by different players, thereby improving the flexibility of the object control.

[0104] In an optional solution, the apparatus further includes: a second control unit or a third control unit or a fourth control unit.

[0105] 1) The second control unit is configured to: after the key state of each of the first virtual key and the second virtual key is adjusted to the invalid state, control the key state of the first virtual key to maintain the invalid state if it is detected that the long-press operation is currently performed on the first virtual key and no press operation is currently performed on the second virtual key.

[0106] 2) The third control unit is configured to control the key state of the second virtual key to return to a valid state if it is detected that no press operation is currently performed on the first virtual key and the long-press operation is currently performed on the second virtual key. The valid state indicates that the key response logic of the second virtual key returns to normal.

[0107] 3) The fourth control unit is configured to control the key state of each of the first virtual key and the second virtual key to return to a valid state if it is detected that no press operation is currently performed on the first virtual key and the second virtual key. The valid state indicates that the key response logic of each of the first virtual key and the second virtual key returns to normal.

[0108] According to the embodiments provided in this disclosure, after the key state of each of the first virtual key and the second virtual key is adjusted to the invalid state, the virtual keys are controlled to execute different operation logic according to different operation manners (for example, pressing or lifting) of the user on the virtual keys, expanding key operation functions.

[0109] According to another aspect of the embodiments of this disclosure, an electronic apparatus for implementing the object control method is further provided. As shown in FIG. 13, the electronic apparatus includes a memory 1302 and a processor 1304. The memory 1302 stores a computer program. The processor 1304 is configured to perform steps in any one of the above method embodiments by executing the computer program.

[0110] Optionally, in this embodiment, the electronic apparatus may be located in at least one of multiple network devices in a computer network.

[0111] Optionally, in this embodiment, the processor may be configured to perform the following steps through the computer program:

[0112] S1, obtaining an operation instruction generated by performing a long-press operation on a first virtual key and a second virtual key in a human-machine interaction interface displayed on a client, where the first virtual key is configured to adjust an advancing direction of a target object controlled by the client, and the second virtual key is configured to trigger the target object to perform a target action;

[0113] S2, in response to the operation instruction, controlling the target object to perform the target action in a current path, and detecting a target angle generated by the target object in the process of performing the target action, where the target angle is an angle between the advancing direction of the target object and a sliding direction of the target object; and

[0114] S3, adjusting a key state of each of the first virtual key and the second virtual key to an invalid state if it is detected that the long-press operation is currently performed on the first virtual key and the second virtual key and the target angle reaches a first angle threshold matching the current path, to control the target object to enter a state of passively performing the target action, where the invalid state indicates that key response logic of each of the first virtual key and the second virtual key is in a suspended state.

[0115] Optionally, a person of ordinary skill in the art may understand that, the structure shown in FIG. 13 is only illustrative. The electronic apparatus may be a terminal device such as a smartphone (such as an Android mobile phone or an iOS mobile phone), a tablet computer, a palmtop computer, a mobile Internet device (MID), or a PAD. FIG. 13 does not limit the structure of the electronic apparatus. For example, the electronic apparatus may further include more or fewer components (such as a network interface) than those shown in FIG. 13, or may have a configuration different from that shown in FIG. 13.

[0116] The memory 1302 may be configured to store a software program and a module, for example, a program instruction/module corresponding to the object control method and apparatus in the embodiments of this disclosure. The processor 1304 performs various functional applications and data processing by running the software program and the module stored in the memory 1302, that is, implements the object control method. The memory 1302 may include a high-speed random memory, and may further include a non-volatile memory, for example, one or more magnetic storage apparatuses, a flash memory, or another nonvolatile solid-state memory. In some embodiments, the memory 1302 may further include memories remotely disposed relative to the processor 1304, and the remote memories may be connected to a terminal through a network. Examples of the network include, but are not limited to, the Internet, an intranet, a local area network, a mobile communication network, and a combination thereof. The memory 1302 may be

specifically used for, but is not limited to, storing information such as the operation instruction, the first angle threshold, and the target angle. As an example, as shown in FIG. 13, the memory 1302 may include, but is not limited to, an extraction unit 1102, a determining unit 1104, a generation unit 1106, and a processing unit 1108 in the object control apparatus. In addition, the memory 1302 may further include, but is not limited to, other module units in the object control apparatus, which is not elaborated herein.

[0117] Optionally, a transmission apparatus 1306 is configured to receive or transmit data through a network. Specific examples of the network may include a wired network and a wireless network. In an example, the transmission apparatus 1306 includes a network interface controller (NIC). The NIC may be connected to another network device and a router by using a network cable, to communicate with the Internet or a local area network. In an example, the transmission apparatus 1306 is a radio frequency (RF) module, which communicates with the Internet in a wireless manner.

[0118] In addition, the electronic apparatus further includes: a display 1308 and a connection bus 1310. The display 1308 is configured to display the human-machine interaction interface and a picture in which the target object performs the target action in the current path. The connection bus 1310 is configured to connect various module components in the electronic apparatus.

[0119] According to another aspect of the embodiments of this disclosure, a storage medium is further provided. The storage medium stores a computer program. The computer program, when executed, causes steps in any one of the foregoing method embodiments to be performed.

[0120] Optionally, in this embodiment, the storage medium may be configured to store a computer program for performing the following steps:

[0121] S1, obtaining an operation instruction generated by performing a long-press operation on a first virtual key and a second virtual key in a human-machine interaction interface displayed on a client, where the first virtual key is configured to adjust an advancing direction of a target object controlled by the client, and the second virtual key is configured to trigger the target object to perform a target action;

[0122] S2, in response to the operation instruction, controlling the target object to perform the target action in a current path, and detecting a target angle generated by the target object in the process of performing the target action, where the target angle is an angle between the advancing direction of the target object and a sliding direction of the target object; and

[0123] S3, adjusting a key state of each of the first virtual key and the second virtual key to an invalid state if it is detected that the long-press operation is currently performed on the first virtual key and the second virtual key and the target angle reaches a first angle threshold matching the current path, to control the target object to enter a state of passively performing the target action, where the invalid state indicates that key response logic of each of the first virtual key and the second virtual key is in a suspended state.

[0124] Optionally, in this embodiment, a person of ordinary skill in the art may understand that all or some of the steps of the methods in the foregoing embodiments may be implemented by a program instructing relevant hardware of the terminal device. The program may be stored in a computer-readable storage medium. The storage medium may include a flash disk, a read-only memory (ROM), a random access memory (RAM), a magnetic disk, an optical disc, or the like.

[0125] The sequence numbers of the foregoing embodiments of this disclosure are merely for description purpose but do not imply the preference among the embodiments.

[0126] If the integrated unit in the foregoing embodiments is implemented in a form of a software functional unit and is sold or used as an independent product, the integrated unit may be stored in the foregoing computer-readable storage medium. Based on such an understanding, the technical solutions of this disclosure essentially, or the part contributing to the conventional technology, or all or a part of the technical solution may be implemented in a form of a software product. The computer software product is stored in a storage medium and includes several instructions for causing one or more computer devices (which may be a personal computer, a server, a network device or the like) to perform all or some of steps of the methods in the embodiments of this disclosure.

[0127] In the foregoing embodiments of this disclosure, descriptions of the embodiments have different emphases. As for parts that are not described in detail in an embodiment, reference can be made to the related descriptions in other embodiments.

[0128] In the several embodiments provided in this disclosure, it is to be understood that, the disclosed client can be implemented in another manner. The apparatus embodiments described above are merely exemplary. For example, the division of the units is merely the division of logic functions, and other division manners may be used during actual implementation. For example, multiple units or components may be combined, or may be integrated into another system, or some features may be omitted or not performed. In addition, the coupling, or direct coupling, or communication connection that is presented or discussed may be the indirect coupling or

communication connection through some interfaces, units, or modules, and may be in electrical or other forms.

[0129] The units described as separate components may be or may not be physically separated, and the components displayed as units may be or may not be physical units, and may be located in one position, or may be distributed on multiple network units. Some or all of the units may be selected according to actual needs to achieve the objectives of the solutions in the embodiments.

[0130] In addition, functional units in the embodiments of this disclosure may be integrated into one processing unit, or each of the units can exist alone physically, or two or more units are integrated into one unit. The integrated unit may be implemented in the form of hardware, or may be implemented in a form of a software functional unit.

[0131] The foregoing merely shows exemplary implementations of this disclosure. It should be noted that, a person of ordinary skill in the art can further make several improvements and modifications without departing from the principle of this disclosure, and the improvements and modifications shall fall within the protection scope of this disclosure.

CLAIMS

What is claimed is:

1. An object control method, applied to a terminal device, the method comprising:

obtaining an operation instruction generated by performing a long-press operation on a first virtual key and a second virtual key in a human-machine interaction interface displayed on a client, the first virtual key being configured to adjust an advancing direction of a target object controlled by the client, the second virtual key being configured to trigger the target object to perform a target action;

in response to the operation instruction, controlling the target object to perform the target action in a current path, and detecting a target angle generated by the target object in the process of performing the target action, the target angle being an angle between the advancing direction of the target object and a sliding direction of the target object; and

adjusting a key state of each of the first virtual key and the second virtual key to an invalid state if it is detected that the long-press operation is currently performed on the first virtual key and the second virtual key and the target angle reaches a first angle threshold matching the current path, to control the target object to enter a state of passively performing the target action, the invalid state indicating that key response logic of each of the first virtual key and the second virtual key is in a suspended state.

2. The method according to claim 1, wherein after adjusting the key state of each of the first virtual key and the second virtual key to the invalid state, the method further comprises:

controlling, in the human-machine interaction interface, display states of the first virtual key and the second virtual key in the invalid state to be respectively consistent with display states of the first virtual key and the second virtual key in the case that the long-press operation is performed on the first virtual key and the second virtual key.

3. The method according to claim 1, wherein before the obtaining an operation instruction generated by performing a long-press operation on a first virtual key and a second virtual key in a human-machine interaction interface displayed on a client, the method further comprises:

inputting path information of the current path into a target classification model, the target classification model being a model obtained by performing machine training using sample data and being configured to determine an angle threshold matching path information of a path, the angle threshold being an angle at which completing the target action in the path requires the minimum

duration; and

determining the first angle threshold matching the current path according to an output result of the target classification model.

4. The method according to claim 3, wherein before the inputting path information of the current path into a target classification model, the method further comprises:

obtaining the sample data generated when performing the target action in N sample paths, the sample data comprising an angle used for performing the target action in an i^{th} sample path and a duration required for completing the target action in the i^{th} sample path, i being an integer greater than or equal to 1 and less than or equal to N; and

inputting the sample data into a pre-constructed initial classification model, and adjusting a parameter of the initial classification model according to an output result of the initial classification model and performing training to obtain the target classification model.

5. The method according to claim 3, wherein after the determining the first angle threshold matching the current path according to an output result of the target classification model, the method further comprises:

obtaining a configuration instruction generated by performing a configuration operation on an angle threshold configuration item in a configuration interface of the client; and

adjusting the first angle threshold in response to the configuration instruction, to obtain the adjusted first angle threshold.

6. The method according to claim 1, wherein after the adjusting a key state of each of the first virtual key and the second virtual key to an invalid state, the method further comprises:

after the target object enters the state of passively performing the target action, determining, according to a frictional resistance matching the current path, a remaining duration required for completing the target action by the target object; and

controlling the target object to complete the target action in the remaining duration.

7. The method according to any one of claims 1 to 6, wherein after the adjusting a key state of each of the first virtual key and the second virtual key to an invalid state, the method further comprises:

controlling the key state of the first virtual key to maintain the invalid state if it is detected that the long-press operation is currently performed on the first virtual key and no press operation is currently performed on the second virtual key; or

controlling the key state of the second virtual key to return to a valid state if it is detected that no press operation is currently performed on the first virtual key and the long-press operation is currently performed on the second virtual key, the valid state indicating that the key response logic of the second virtual key returns to normal; or

controlling the key state of each of the first virtual key and the second virtual key to return to a valid state if it is detected that no press operation is currently performed on the first virtual key and the second virtual key, the valid state indicating that the key response logic of each of the first virtual key and the second virtual key returns to normal.

8. An object control apparatus, comprising:

a first obtaining unit, configured to obtain an operation instruction generated by performing a long-press operation on a first virtual key and a second virtual key in a human-machine interaction interface displayed on a client, the first virtual key being configured to adjust an advancing direction of a target object controlled by the client, the second virtual key being configured to trigger the target object to perform a target action;

a first control unit, configured to: in response to the operation instruction, control the target object to perform the target action in a current path, and detect a target angle generated by the target object in the process of performing the target action, the target angle being an angle between the advancing direction of the target object and a sliding direction of the target object; and

a first adjustment unit, configured to: if it is detected that the long-press operation is currently performed on the first virtual key and the second virtual key and the target angle reaches a first angle threshold matching the current path, adjust a key state of each of the first virtual key and the second virtual key to an invalid state to control the target object to enter a state of passively performing the target action, the invalid state indicating that key response logic of each of the first virtual key and the second virtual key is in a suspended state.

9. The apparatus according to claim 8, further comprising:

a display unit, configured to: after the key state of each of the first virtual key and the second virtual key is adjusted to the invalid state, control, in the human-machine interaction interface, display states of the first virtual key and the second virtual key in the invalid state to be respectively consistent with display states of the first virtual key and the second virtual key in the case that the long-press operation is performed on the first virtual key and the second virtual key.

10. The apparatus according to claim 8, further comprising:

an input unit, configured to: before the operation instruction generated by performing the

long-press operation on the first virtual key and the second virtual key in the human-machine interaction interface displayed on the client is obtained, input path information of the current path into a target classification model, the target classification model being obtained by performing machine training using sample data and being configured to determine an angle threshold matching path information of a path, the angle threshold being an angle at which completing the target action in the path requires the minimum duration; and

a determining unit, configured to determine the first angle threshold matching the current path according to an output result of the target classification model.

11. The apparatus according to claim 10, further comprising:

a second obtaining unit, configured to: before the path information of the current path is inputted into the target classification model, obtain the sample data generated when performing the target action in N sample paths, the sample data comprising an angle used for performing the target action in an i^{th} sample path and a duration required for completing the target action in the i^{th} sample path, i being an integer greater than or equal to 1 and less than or equal to N; and

a training unit, configured to input the sample data into a pre-constructed initial classification model, and adjust a parameter of the initial classification model according to an output result of the initial classification model and perform training to obtain the target classification model.

12. The apparatus according to claim 10, further comprising:

a third obtaining unit, configured to: after the first angle threshold matching the current path is determined according to the output result of the target classification model, obtain a configuration instruction generated by performing a configuration operation on an angle threshold configuration item in a configuration interface of the client; and

a second adjustment unit, configured to adjust the first angle threshold in response to the configuration instruction, to obtain the adjusted first angle threshold.

13. The apparatus according to any one of claims 8 to 12, further comprising:

a second control unit, configured to: after the key state of each of the first virtual key and the second virtual key is adjusted to the invalid state, control the key state of the first virtual key to maintain the invalid state if it is detected that the long-press operation is currently performed on the first virtual key and no press operation is currently performed on the second virtual key; or

a third control unit, configured to control the key state of the second virtual key to return to a valid state if it is detected that no press operation is currently performed on the first virtual key and

the long-press operation is currently performed on the second virtual key, the valid state indicating that the key response logic of the second virtual key returns to normal; or

a fourth control unit, configured to control the key state of each of the first virtual key and the second virtual key to return to a valid state if it is detected that no press operation is currently performed on the first virtual key and the second virtual key, the valid state indicating that the key response logic of each of the first virtual key and the second virtual key returns to normal.

14. A storage medium, having a program stored therein, the program, when executed, causing the method according to any one of claims 1 to 7 to be performed.

15. An electronic apparatus, comprising a memory and a processor, the memory storing a computer program, the processor being configured to perform the method according to any one of claims 1 to 7 by executing the computer program.

16. A computer program product, comprising instructions that, when executed by a computer, causing the computer to perform the method according to any one of claims 1 to 7.