

ACTION EFFECT DISPLAY METHOD AND APPARATUS, DEVICE, MEDIUM, AND PROGRAM PRODUCT

[0001] The present disclosure claims priority to Chinese Patent Application No.
5 202110949685.4, entitled "ACTION EFFECT DISPLAY METHOD AND APPARATUS,
DEVICE, AND MEDIUM" filed to the China Patent Office on August 18, 2021, which is
incorporated herein by reference in its entirety.

FIELD

[0002] Embodiments of the present disclosure relate to the field of interface interaction, in
10 particular to display of action effects.

BACKGROUND

[0003] In game applications or some virtual environment-based applications, a player is
usually able to control virtual objects to release skills or use props in the virtual environment, and
the release of skills is usually accompanied by skill effects shown on an interface.

15 [0004] In the conventional art, there may be a change in the attack speed of a skill released
by the player in the virtual environment, and when the skill is released and the attack speed is
changed, the process of the skill effects generally remains unchanged. Taking an increase in the
attack speed as an example, the change in the attack speed is reflected by an increase in an injury
value to an enemy caused by a single attack after the release of the skill.

20 [0005] However, due to the above manner of displaying the skill effect upon the change of
the attack speed, when the player controls the virtual object to move after performing an attack, the
skill effect is still played, resulting in mismatch between an action of the virtual object and playing
of the skill effect.

SUMMARY

25 [0006] An action effect display method and apparatus, a device, a medium, and a program
product are provided according to embodiments of the present disclosure, which can improve
playing match between an action and a skill effect. The technical solutions are described as follows.

[0007] In one aspect, an action effect display method is provided. The method includes:

displaying a first virtual object, the first virtual object is capable of executing a target action, the target action including an action effect;

receiving an action execution operation, the action execution operation being used for controlling the first virtual object to execute the target action, the target action corresponding to execution speed information;

dividing, in response to the action execution operation, the action effect of the target action into n effect segments, the effect segments being obtained by performing playing speed adjustment based on adjustment ratios corresponding to the execution speed information, adjustment ratios of at least two of the effect segments are different from each other during the playing speed adjustment, $n \geq 2$ and n being an integer; and

playing the n effect segments in sequence to obtain an action effect display result of the target action corresponding to the execution speed information.

[0008] In another aspect, an action effect display apparatus is provided. The apparatus includes: a display module, a receiving module, and a dividing module. The display module is configured to display a first virtual object, the first virtual object is capable of executing a target action, the target action includes a corresponding action effect. The receiving module is configured to receive an action execution operation, the action execution operation is used for controlling the first virtual object to execute the target action, the target action corresponds to execution speed information. The dividing module is configured to divide, in response to the action execution operation, the action effect of the target action into n effect segments, the effect segments are obtained by performing playing speed adjustment based on adjustment ratios corresponding to the execution speed information, adjustment ratios of at least two of the effect segments are different from each other during the playing speed adjustment, $n \geq 2$ and n being an integer. The display module is further configured to play the n effect segments in sequence to obtain an action effect display result of the target action corresponding to the execution speed information.

[0009] In yet another aspect, a computer device is provided. The computer device includes a processor and a memory, the memory stores at least one instruction, at least one program, a code set or an instruction set. The at least one instruction, the at least one program, the code set or the instruction set is loaded and executed by the processor to implement the action effect display method described in the above aspect.

[0010] In yet another aspect, a computer-readable storage medium is provided. The storage medium is configured to store a computer program, the computer program is executed to implement the action effect display method described in the above aspect.

[0011] In yet another aspect, a computer program product or computer program is provided.

5 The computer program product or computer program includes computer instructions stored in a computer-readable storage medium. A processor of a computer device reads the computer instructions from the computer-readable storage medium, and the processor executes the computer instructions to cause the computer device to implement the action effect display method described in the above aspect.

10 [0012] The technical solutions according to the embodiments of the present disclosure can realize at least the following beneficial effects. When the action effect is displayed in an accelerated manner based on the execution speed information, the action effect is divided into segments, and segmented acceleration processing is performed based on acceleration emphases corresponding to the different effect segments, so that at least two effect segments in the n effect segments adopt
15 different adjustment ratios during playing speed adjustment. The acceleration ratio of segments to be displayed in a emphasized manner is low, and the acceleration ratio of segments with a weak effect is high, that is, the part with the weak effect is omitted and the part with a strong effect is emphasized, achieving the purpose of emphasis on the display of the part with the strong effect while accelerating display of the action effect. When the target action is executed by the first virtual
20 object in an accelerated manner, the displayed action effect can be accelerated on the premise that a key point of the action effect is displayed in a emphasized manner, thereby improving the display accuracy and efficiency of playing the action effect relative to the target action.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIG. 1 is a schematic diagram of an interface of a skill effect according to the
25 conventional art.

[0014] FIG. 2 is a structural block diagram of a terminal according to an exemplary embodiment of the present disclosure.

[0015] FIG. 3 is a schematic diagram of an implementation environment according to an exemplary embodiment of the present disclosure.

30 [0016] FIG. 4 is a schematic diagram of an action effect display principle according to an exemplary embodiment of the present disclosure.

[0017] FIG. 5 is a flow chart of an action effect display method according to an exemplary embodiment of the present disclosure.

[0018] FIG. 6 is a flow chart of an action effect display method according to another exemplary embodiment of the present disclosure.

5 [0019] FIG. 7 is a flow chart of an action effect display method according to yet another exemplary embodiment of the present disclosure.

[0020] FIG. 8 is a schematic diagram of an attack speed adjustment process according to an exemplary embodiment of the present disclosure.

10 [0021] FIG. 9 is a structural block diagram of an action effect display apparatus according to an exemplary embodiment of the present disclosure.

[0022] FIG. 10 is a structural block diagram of an action effect display apparatus according to another exemplary embodiment of the present disclosure.

[0023] FIG. 11 is a structural block diagram of a terminal according to an exemplary embodiment of the present disclosure.

15 DESCRIPTION OF EMBODIMENTS

[0024] In order to make the objects, technical solutions and advantages of the present disclosure clearer, embodiments of the present disclosure will be further described in detail below in combination with the drawings.

20 [0025] FIG. 1 is a schematic diagram of an interface of a skill effect in the conventional art. As shown in FIG. 1, a virtual object 110 is displayed in a game interface 100, and the virtual object 110 releases a skill in a virtual environment at a double speed faster than an initial speed. After completely releasing the skill at the double speed, the virtual object starts to move in the virtual environment, while a skill effect is still played at the original speed, that is, when the virtual object starts to move in the virtual environment, the skill effect has not been finished playing, resulting in
25 mismatch between the movement of the virtual object and playing of the skill effect.

[0026] The terminal in the present disclosure may be a desktop computer, a laptop portable computer, a mobile phone, a tablet computer, an e-book reader, a moving picture experts group audio layer III (MP3) player, a moving picture experts group audio layer IV (MP4) player, etc. An application supporting a virtual environment, such as an application supporting a three-dimensional
30 virtual environment, is installed and run in the terminal. The application may be any one of a virtual reality application, a three-dimensional map program, a military simulation program, a third-person

shooting (TPS) game, a first-person shooting (FPS) game, a multiplayer online battle arena (MOBA) game. In some embodiments, the application may be a stand-alone application, such as a stand-alone three-dimensional game program, or a network online application.

5 **[0027]** FIG. 2 illustrates a structural block diagram of an electronic device according to an exemplary embodiment of the present disclosure. The electronic device 200 includes: an operating system 220 and an application 222.

[0028] The operating system 220 is basic software that provides the application 222 with a secure access to computer hardware.

10 **[0029]** The application 222 is an application supporting a virtual environment. In some embodiments, the application 222 is an application supporting a three-dimensional virtual environment. The application 222 may be any one of a virtual reality application, a three-dimensional map program, a military simulation program, a TPS game, a FPS game, an MOBA game, and a multiplayer gun-battle survival game. The application 222 may be a stand-alone application, such as a stand-alone three-dimensional game application, or may be a
15 network online application.

[0030] FIG. 3 illustrates a structural block diagram of a computer system according to an exemplary embodiment of the present disclosure. The computer system 300 includes: a first device 320, a server 340, and a second device 360.

[0031] An application supporting a virtual environment is installed and run on the first
20 device 320. The application may be any one of a virtual reality application, a three-dimensional map program, a military simulation program, a TPS game, a FPS game, an MOBA game, and a multiplayer gun-battle survival game. The first device 320 is used by a first user, and the first user uses the first device 320 to control a first virtual object located in a virtual environment to perform an activity. The activity includes but not limited to at least one of adjusting a body posture, crawling,
25 walking, running, riding, jumping, driving, picking up, shooting, attacking, and throwing. For example, the first virtual object is a first virtual character, such as a simulated character or an animated character.

[0032] The first device 320 is connected to the server 340 via a wireless network or a wired network.

30 **[0033]** The server 340 includes at least one kind of one server, multiple servers, a cloud computing platform, and a virtualization center. The server 340 is used for providing a background service for an application supporting a three-dimensional virtual environment. In some

embodiments, the server 340 performs primary computing work, and the first device 320 and the second device 360 perform secondary computing work. Alternatively, the server 340 performs secondary computing work, and the first device 320 and the second device 360 perform primary computing work. Alternatively, the server 340, the first device 320 and the second device 360 use a distributed computing architecture to perform collaborative computing.

[0034] An application supporting a virtual environment is installed and run on the second device 360. The application may be any one of a virtual reality application, a three-dimensional map program, a military simulation program, an FPS game, an MOBA game, and a multiplayer gun-battle survival game. The second device 360 is used by a second user, and the second user uses the second device 360 to control a second virtual object located in the virtual environment to perform an activity. The activity includes but not limited to: at least one of adjusting a body posture, crawling, walking, running, riding, jumping, driving, picking up, shooting, attacking, and throwing. For example, the second virtual object is a second virtual character, such as a simulated character or an animated character.

[0035] In some embodiments, the first virtual character and the second virtual character are in the same virtual environment. In some embodiments, the first virtual character and the second virtual character may belong to the same team, the same organization, have a friend relationship or have a temporary communication right. In some embodiments, the first virtual character and the second virtual character may also belong to different teams, different organizations, or two hostile groups.

[0036] In some embodiments, the applications installed on the first device 320 and the second device 360 are the same, or the applications installed on the two devices are the same type of application on different control system platforms. The first device 320 may generally refer to one of multiple devices, and the second device 360 may generally refer to one of multiple devices. This embodiment is exemplified only by the first device 320 and the second device 360. The device types of the first device 320 and the second device 360 are the same or different from each other. The device types include at least one of a game host, a desktop computer, a smartphone, a tablet computer, an e-book reader, an MP3 player, an MP4 player, and a laptop portable computer. The following embodiment is exemplified with the device being a desktop computer.

[0037] A person skilled in the art will appreciate that the quantity of the device may be greater or smaller. For example, the quantity of the devices may be one, or tens or hundreds, or more. The quantity and types of the devices are not limited by the embodiments of the present disclosure.

[0038] It is to be noted that the server 340 may be implemented as a physical server or a cloud server at a cloud end, where cloud technology refers to a hosting technology for unifying a series of resources, such as hardware, software and networks, in a wide area network or a local area network so as to realize the calculation, storage, processing and sharing of data. The cloud technology is the general name of network technology, information technology, integration technology, management platform technology, application technology, etc. applied based on a cloud computing business model, and may form a resource pool and be used on demand, which is flexible and convenient. Cloud computing technology may become an important support. Background services of a technical network system require a large number of computing and storage resources, such as video websites, picture websites and more portal websites. With the high development and application of the Internet industry, each item may have its own identifier in the future, which is to be transmitted to a background system for logical processing. Data of different levels may be processed separately, and all kinds of industry data need a strong system backing support, which can only be realized by cloud computing.

[0039] In some embodiments, the method according to the embodiment of the present disclosure may be applied to a cloud game scenario, so that the calculation of data logic during a game is performed by a cloud server, while a terminal is responsible for the display of a game interface.

[0040] In some embodiments, the server 340 may also be implemented as a node in a blockchain system. Blockchain is a new application mode of computer technology, such as distributed data storage, point-to-point transmission, a consensus mechanism and an encryption algorithm. Blockchain, essentially a decentralized database, is a string of data blocks generated in association using cryptographic methods. Each data block includes information of a batch of network transactions, and is used for verifying (anti-counterfeiting) the validity of the information and generating the next block. Blockchain may include a blockchain underlying platform, a platform product services layer, and an application services layer.

[0041] In the embodiment of the present disclosure, with regard to a skill effect, each effect segment is separately accelerated in a segmented form, so as to ensure that an important part of the skill effect is retained and a negligible part of the skill effect is omitted while accelerating the playing of the skill effect. For example, FIG. 4 illustrates a schematic diagram of an action effect display principle according to an exemplary embodiment of the present disclosure. As shown in FIG. 4, the skill effect of a target skill 400 includes a total of twelve image frames. When the target

skill 400 needs to be released at twice the attack speed, the skill effect of the target skill is correspondingly accelerated.

5 [0042] The twelve image frames corresponding to the skill effect are divided to obtain two effect segments, that is, an effect segment 410 and an effect segment 420, each effect segment corresponds to six image frames. When the skill effect is played at a double speed, the two effect segments are compressed based on adjustment ratios respectively corresponding to the two effect segments. Two image frames are deleted from the first effect segment 410 and four image frames are deleted from the second effect segment 420, so that the playing time of the skill effect is shortened by half to correspond to the release duration of the skill.

10 [0043] In conjunction with the introduction of the above terms and the description of the implementation environment, the action effect display method according to an embodiment of the present disclosure is described. FIG. 5 illustrates a flow chart of an action effect display method according to an exemplary embodiment of the present disclosure. Taking the method being applied to a terminal as an example for description, as shown in FIG. 5, the method includes the following steps 501 to 504.

[0044] In step 501, a first virtual object is displayed, the first virtual object is capable of executing a target action.

20 [0045] The target action includes a corresponding action effect. The target action includes at least one of a target skill action, a target attack action, a target dance action, and a target movement action. In the embodiment of the present disclosure, the description will be given by taking the target action being implemented as the target skill action as an example.

[0046] Taking an action effect corresponding to the target skill action being a skill effect as an example, when the first virtual object releases a target skill, the target skill action is executed, and the target skill action has a corresponding skill effect.

25 [0047] In some embodiments, the target skill is configured for the first virtual object, and the target skill corresponds to a preparation phase and a cooling phase. The preparation phase refers to a phase that the target skill is being prepared and the first virtual object may not release the target skill within a certain period of time in the preparation process. The cooling phase refers to a phase in which the target skill is completely prepared and the first virtual object may release the target skill.

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[0048] In some embodiments, when the first virtual object is configured with the target skill and the target skill is in the cooling phase, the first virtual object is capable of releasing the target skill.

[0049] The first virtual object releases the target skill to a second virtual object in a hostile relationship in a virtual environment.

[0050] In the embodiment of the present disclosure, the description will be given by taking the first virtual object being a virtual object hosted by an application installed in the current terminal as an example, that is, a player controls the movement of the first virtual object in the virtual environment and the execution of actions via the application, for example, the player controls the first virtual object to release the target skill to the second virtual object in the virtual environment.

[0051] In step 502, an action execution operation is received, the action execution operation is used for controlling the first virtual object to execute the target action.

[0052] The target action corresponds to execution speed information. The execution speed information is used for indicating that the target action is executed by the first virtual object in an accelerated manner.

[0053] The execution speed information includes at least one of the following three cases.

[0054] In a first case, the execution speed information is determined according to props configured for the first virtual object.

[0055] For example, the target action corresponds to initial speed information, and an attack speed is increased on the basis of the initial speed information according to an acceleration prop configured for the first virtual object. For example, the first virtual object is configured with an acceleration ball, and the acceleration ball is used for improving the attack speed of the first virtual object by 20%, that is, the attack speed is increased for a specific skill release (for example, the target skill) or an ordinary attack of the first virtual object, or the attack speed is increased for all skills or ordinary attacks configured for the first virtual object.

[0056] In a second case, the execution speed information is speed information determined according to object information of the first virtual object in a virtual battle.

[0057] For example, the target action corresponds to the initial speed information, and the attack speed is increased on the basis of the initial speed information according to the level of the first virtual object in the virtual battle. For example, when the first virtual object is in an initial phase of the virtual battle, an attack speed corresponding to a specific skill release (for example, the target skill) or an ordinary attack is an initial attack speed, and each time the first virtual object is

improved by five levels, the attack speed corresponding to the specific skill release (for example, the target skill) or the ordinary attack of the first virtual object is increased, with an increase gradient of 20%.

5 [0058] In a third case, the execution speed information is speed information determined according to the purchase of attack speed attributes by the first virtual object.

[0059] For example, the target action corresponds to the initial speed information, and the first virtual object purchases an attack speed attribute in the virtual battle, for example, exchanging for an attack speed of 20% by executing a virtual prop, so that after the first virtual object purchases the attack speed attribute, the attack speed corresponding to a specific skill release (for example, the target skill) or an ordinary attack is 120% of the initial attack speed.

15 [0060] It is to be noted that the above-mentioned manner of determining the execution speed information is merely an example, which is not limited in the embodiments of the present disclosure. The manners of prop configuration, object information and the purchase of the attack speed attributes may be used in combination or independently, for example, the highest attack speed is adopted.

[0061] In step 503, in response to the action execution operation, the action effect of the target action is divided into n effect segments, the effect segment is a segment after adjusting playing speed based on an adjustment ratio corresponding to the execution speed information, $n \geq 2$ and n being an integer.

20 [0062] Adjustment ratios of at least two of the effect segments are different from each other during the playing speed adjustment.

[0063] That is, different effect segments are obtained by performing playing speed adjustment based on different ratios. That is, some effect segments have a high playing speed while some effect segments have a low playing speed on the premise that all effect segments are played in an accelerated manner.

25 [0064] In some embodiments, the action effect of the target action is firstly divided to obtain n candidate effect segments, adjustment ratios respectively corresponding to the n candidate effect segments are determined based on the execution speed information, and the playing speed adjustment is performed on the n candidate effect segments based on the adjustment ratios respectively corresponding to the n candidate effect segments to obtain the n effect segments.

30 [0065] Since the execution speed information may reflect the acceleration situation during execution of the target action, to which degree an original action effect needs to be adjusted may be

determined, so that the playing speed of the action effect may match the target action executed in the accelerated manner, thereby improving the adjustment accuracy of the playing speed.

[0066] In some embodiments, the playing speed adjustment is performed on the n candidate effect segments in at least one of the following two manners.

5 **[0067]** In a first manner, for an i^{th} candidate effect segment, an i^{th} adjustment ratio corresponding to the i^{th} candidate effect segment is acquired, $0 < i \leq n$; and the quantity of image frames of the i^{th} candidate effect segment is compressed based on the i^{th} adjustment ratio to obtain an i^{th} effect segment.

10 **[0068]** For example, the action effect of the target action includes a total of twelve image frames, the action effect is divided into two candidate effect segments, each effect segment includes six image frames; and a first effect segment is compressed to retain five image frames and a second effect segment is compressed to retain three image frames based on the adjustment ratio, so that the whole action effect is compressed to retain eight image frames.

15 **[0069]** By compressing the quantity of the image frames, the quantity of image frames included in the i^{th} effect segment is less than the quantity of image frames included in the i^{th} candidate effect segment, the playing duration of the i^{th} effect segment may be directly shortened due to the smaller quantity of image frames, thereby accurately adjusting the playing speed by controlling the quantity of image frames.

20 **[0070]** In a second manner, for the i^{th} candidate effect segment, the i^{th} adjustment ratio corresponding to the i^{th} candidate effect segment is acquired, $0 < i \leq n$; and a frame rate of the i^{th} candidate effect segment is adjusted based on the i^{th} adjustment ratio to obtain the i^{th} effect segment.

25 **[0071]** For example, the action effect of the target action includes a total of twelve image frames, and the initial playing speed of the action effect is twelve frames per second. The action effect is divided into two candidate effect segments, each effect segment includes six image frames. Based on the adjustment ratio, a frame rate of the first effect segment is controlled to be 18 frames per second, and a frame rate of the second effect segment is controlled to be 24 frames per second.

[0072] In some embodiments, the action effect of the target action is divided to obtain m candidate effect segments, $m > n$ and m being an integer. The m candidate effect segments are compressed to select n candidate effect segments therefrom for playing speed adjustment.

30 **[0073]** For example, the action effect of the target action is firstly divided to obtain six candidate effect segments, and a sixth candidate effect segment of the six candidate effect segments is deleted, to obtain five candidate effect segments, and speed adjustment is performed on the five

candidate effect segments subsequently to obtain five effect segments.

5 **[0074]** In some embodiments, in the displaying process of skill effects, effects displayed first are generally prominent effects, and effects displayed later are ending animations, so that in some embodiments, the adjustment ratios corresponding to the n effect segments are set positively correlated with an arrangement order of the n effect segments.

10 **[0075]** For example, the action effect of the target action includes a total of twelve image frames, and the action effect of the target action is divided into three candidate effect segments for speed adjustment, where the adjustment ratio of the first candidate effect segment is 10%, the adjustment ratio of the second candidate effect segment is 20%, and the adjustment ratio of the third candidate effect segment is 30%.

15 **[0076]** In some embodiments, the quantity of image frames to be deleted is determined by multiplying the adjustment ratio and the original quantity of image frames of a candidate effect segment and removing a remainder. Alternatively, the quantity of image frames to be deleted is determined by multiplying the adjustment ratio and the original quantity of image frames of a candidate effect segment and rounding a remainder.

20 **[0077]** In some embodiments, the quantity of effect segments for division is preset, or randomly determined, or determined based on a total duration of the effect action.

25 **[0078]** In step 504, the n effect segments are played in sequence to obtain an action effect display result of the target action corresponding to the execution speed information.

30 **[0079]** In some embodiments, after the n effect segments subjected to the playing speed adjustment are determined, the n effect segments are played in sequence to serve as the action effect of the target action corresponding to the execution speed information.

35 **[0080]** In some embodiments, based on the above different manners for speed adjustment, the effect segments are played in at least one of the following three manners.

40 **[0081]** In a first manner, when the speed adjustment is performed on the candidate effect segments by compressing the quantity of the image frames, the image frames in the n effect segments obtained by compressing the quantity of the image frames are displayed one by one, to obtain the action effect of the target action subjected to speed adjustment corresponding to the execution speed information.

45 **[0082]** In a second manner, when the speed adjustment is performed on the candidate effect segments by compressing the frame rate, the n effect segments are displayed frame by frame based on the frame rate corresponding to each effect segment. For example, if the frame rate of an effect

segment A is 12 frames per second, and the frame rate of an effect segment B is 24 frames per second, when the n effect segments are displayed in sequence, the effect segment A is played firstly at 12 frames per second, and the effect segment B is played at 24 frames per second, to obtain the action effect of the target action subjected to speed adjustment corresponding to the execution speed information.

[0083] In a third manner, when the speed adjustment is performed on the candidate effect segments by compressing the quantity of the image frames and the frame rate, during playing of the n effect segments, the image frames with the compressed quantity are displayed one by one based on the frame rate respectively corresponding to each effect segment.

[0084] It is to be noted that the above playing situations of the effect segments are merely schematic examples, which is not limited by the embodiments of the present disclosure.

[0085] In summary, with the action effect display method according to the embodiment of the present disclosure, when the action effect is displayed in an accelerated manner based on the execution speed information, the action effect is divided into segments, and segmented acceleration processing is performed based on acceleration emphases corresponding to the different effect segments, so that adjustment ratios of at least two effect segments in the n effect segments are different from each other during playing speed adjustment. The acceleration ratio of segments to be displayed in an emphasized manner is low, and the acceleration ratio of segments with a weak effect is high, that is, the part with the weak effect is omitted and the part with a strong effect is emphasized. When the target action is executed by the first virtual object in an accelerated manner, the displayed action effect can be accelerated on the premise that a key point of the action effect is displayed in an emphasized manner, so that the purpose of emphasis on the display of the part with the strong effect while accelerating display of the action effect is achieved, thereby improving the display accuracy and efficiency of the action effect relative to the target action.

[0086] In an embodiment, the candidate effect segments are subjected to speed adjustment by compressing the quantity of the image frames. FIG. 6 is a flow chart of an action effect display method according to another exemplary embodiment of the present disclosure. Taking the method being applied to a terminal as an example, as shown in FIG. 6, the method includes the following steps 601 to 607.

[0087] In step 601, a first virtual object is displayed, the first virtual object is capable of executing a target action.

[0088] The target action has a corresponding action effect. In the embodiment of the present

disclosure, the description will be given by taking the target action being implemented as a target skill action as an example.

5 **[0089]** Taking an action effect corresponding to the target skill action being a skill effect as an example, when the first virtual object releases a target skill, the target skill action is executed, and the target skill action corresponds to the skill effect.

[0090] In step 602, an action execution operation is received, the action execution operation is used for controlling the first virtual object to execute the target action.

[0091] The target action corresponds to execution speed information.

10 **[0092]** In step 603, the action effect of the target action is divided to obtain n candidate effect segments.

[0093] In some embodiments, the n candidate effect segments are obtained by directly dividing the action effect of the target action. Alternatively, firstly, the action effect of the target action is divided to obtain m candidate effect segments, where $m > n$ and m is an integer; and the m candidate effect segments are compressed to select n candidate effect segments therefrom for playing speed adjustment.

[0094] In some embodiments, the m candidate effect segments are compressed based on importance parameters of the m candidate effect segments. The importance parameter is determined based on a preset importance arrangement manner. For example, importance corresponding to each of the m candidate effect segments obtained by division is arranged in an order from high to low, and k candidate effect segments with the lowest importance are deleted to obtain the n candidate effect segments. Alternatively, the importance parameter is determined by recognition and analysis of an image frame. For example, a result obtained by identifying an action effect display ratio in the image frame is used as the importance parameter, and k candidate effect segments with the lowest importance parameter are deleted to obtain n candidate effect segments, k is a positive integer.

25 **[0095]** It is to be noted that the above-mentioned manner of dividing to obtain the n candidate effect segments is merely an example, and the manner of compressing the m candidate effect segments is not limited in the embodiments of the present disclosure.

[0096] It is to be noted that, in this embodiment, step 603 is performed after step 602. Step 603 may also be performed before step 602 or step 601, and the order of performing step 603 is not limited in this embodiment.

[0097] In step 604, in response to the action execution operation, adjustment ratios respectively corresponding to the n candidate effect segments are determined based on the

execution speed information.

[0098] In some embodiments, the adjustment ratios respectively corresponding to the n candidate effect segments are determined in at least one of the following three manners.

5 **[0099]** In a first manner, the adjustment ratios corresponding to the n candidate effect segments are set positively correlated with the arrangement order of the n candidate effect segments, that is, the further back a candidate effect segment is arranged, the higher the adjustment ratio corresponding to the candidate effect segment is. Taking shortening the playing duration as an example, the further back a candidate effect segment is arranged, the greater the extent to shorten the playing duration is.

10 **[0100]** In a second manner, the adjustment ratios corresponding to the n candidate effect segments are preset. In some embodiments, action effects of different actions have different effect emphasis phases, that is, some action effects emphasize an initial phase, while other action effects emphasize a middle phase, or some action effects emphasize an ending phase. Therefore, different adjustment ratios are set for candidate effect segments based on different action effects, and
15 compression is performed accordingly on the action effects based on the different adjustment ratios.

[0101] In a third manner, the adjustment ratios corresponding to the n candidate effect segments are determined randomly, that is, the n candidate effect segments are compressed in a randomly determined manner.

[0102] It is to be noted that the above-mentioned manner is merely an example, which is not
20 limited in this embodiment.

[0103] In step 605, for an i^{th} candidate effect segment, an i^{th} adjustment ratio corresponding to the i^{th} candidate effect segment is acquired, $0 < i \leq n$.

[0104] Among the n candidate effect segments, the i^{th} adjustment ratio of the i^{th} candidate effect segment is acquired, that is, when the value of i is 1 to n, the adjustment ratio of each
25 candidate effect segment is acquired and subsequent compression processing is performed continually.

[0105] In step 606, the quantity of image frames of the i^{th} candidate effect segment is compressed based on the i^{th} adjustment ratio to obtain an i^{th} effect segment.

[0106] In some embodiments, a first playing duration of the i^{th} candidate effect segment is
30 acquired, the first playing duration is adjusted based on the i^{th} adjustment ratio to obtain a second playing duration, and the quantity of the image frames of the i^{th} candidate effect segment is compressed based on the second playing duration to obtain the i^{th} effect segment.

5 [0107] For example, the first playing duration of the i^{th} candidate effect segment is 2 seconds, corresponding to twelve image frames, and the adjustment ratio of the i^{th} candidate effect segment is 25%, so that a playing duration obtained by adjusting based on the first playing duration and the adjustment ratio is 1.5 seconds, corresponding to nine image frames. That is, the image frames of the i^{th} candidate effect segment are compressed from twelve frames to nine frames.

[0108] Alternatively, the quantity of the image frames in the i^{th} candidate effect segment is adjusted by directly acquiring an adjustment ratio corresponding to the i^{th} adjustment ratio, so as to obtain the adjusted quantity of image frames.

10 [0109] Since different playing durations may intuitively correspond to different quantities of image frames under the same frame rate, how to compress the image frames may be accurately indicated based on the determined playing duration, thereby improving the compression effect.

[0110] In some embodiments, during compression of image frames in the candidate effect segments, the image frames to be compressed are selected in at least one of the following three manners.

15 [0111] In a first manner, priorities corresponding to the image frames in the i^{th} candidate effect segment are determined, and the quantity of the image frames is compressed based on the priority order of the image frames in the i^{th} candidate effect segment and the i^{th} adjustment ratio to obtain the i^{th} effect segment.

20 [0112] In some embodiments, the priorities of the image frames in the i^{th} candidate effect segment may be determined by ranking, or in a preset manner, or by image recognition.

[0113] For example, when the priorities of the image frames in the i^{th} candidate effect segment are determined by ranking, For example, the priorities of the image frames in the i^{th} candidate effect segment are set negatively correlated with the order of the image frames, that is, image frames with the lowest ranking in the i^{th} candidate effect segment are preferably deleted.

25 [0114] For example, when the image frames to be deleted in the i^{th} candidate effect segment are determined in the preset manner, taking the case where the priority of an odd frame in the i^{th} candidate effect segment is greater than that of an even frame, and the priority of the odd frames are negatively correlated with the arrangement order as an example, the image frames in the i^{th} candidate effect segment are deleted in sequence in the order of the first frame, the third frame, the
30 fifth frame, and so on.

[0115] For example, when the image frames to be deleted from the i^{th} candidate effect segment are determined by image recognition, for example, the image frames are subjected to

image recognition to recognize effect contents in the image frames, the proportion of the effect contents in the image frames is set positively correlated with the priorities of the image frames, and image frames with the minimum proportion of the effect contents in the image frames are preferably deleted.

5 **[0116]** Since the priority may reflect the importance of the corresponding image frame in the i^{th} candidate effect segment, and the importance may be used for the action effect or image frame deletion, how to delete the image frames during compression of the image frames may be accurately indicated based on the priority of the image frames, thereby improving the compression accuracy.

10 **[0117]** In a second manner, the image frames in the i^{th} candidate effect segment are deleted randomly, and the quantity of the image frames is compressed based on the i^{th} adjustment ratio, so as to obtain the i^{th} effect segment.

[0118] For example, when the image frames to be deleted from the i^{th} candidate effect segment are determined randomly, a random algorithm is adopted to select image frames from the
15 image frames of the i^{th} candidate effect segment for deletion.

[0119] In a third manner, the similarity between the image frames in the i^{th} candidate effect segment is determined, an image frame is randomly reserved from image frames with a similarity greater than a similarity threshold, and the remaining image frames are deleted. For example, 3 frames need to be deleted from the i^{th} candidate effect segment, where the similarity between the
20 2nd frame, the 3rd frame and the 4th frame is greater than the similarity threshold, then the 3rd frame and the 4th frame are firstly deleted, and one frame is continually selected and deleted from other image frames with a similarity greater than the similarity threshold.

[0120] It is to be noted that the above-mentioned manner of deleting the image frames is merely an illustrative example, which is not limited in this embodiment.

25 **[0121]** In step 607, the n effect segments in sequence are played to obtain an action effect display result of the target action corresponding to the execution speed information.

[0122] In some embodiments, after the n effect segments subjected to the playing speed adjustment are determined, the n effect segments are played in sequence to serve as the action effect of the target action corresponding to the execution speed information.

30 **[0123]** In summary, with the action effect display method according to the embodiment of the present disclosure, when the action effect is displayed in an accelerated manner based on the execution speed information, the action effect is divided into segments, and segmented acceleration

processing is performed based on acceleration emphases corresponding to the different effect segments. The acceleration ratio of segments to be displayed in an emphasized manner is low, while the acceleration ratio of segments with a weak effect is high, that is, the part with the weak effect is omitted and the part with a strong effect is emphasized. Thus, the purpose of emphasis on the display of the part with the strong effect while accelerating display of the action effect is achieved, thereby improving the display accuracy and efficiency of the action effect.

[0124] In the method according to this embodiment, the image frames of the i^{th} candidate effect segment are compressed based on the priorities of the image frames in the i^{th} candidate effect segment, so that the accuracy of image frame deletion is improved and the effect presentation of the i^{th} effect segment is improved.

[0125] In an embodiment, the action effect is divided in various manners. FIG. 7 is a flow chart of an action effect display method according to an exemplary embodiment of the present disclosure. Taking the method being applied to a terminal as an example, as shown in FIG. 7, the method includes the following steps 701 to 710.

[0126] In step 701, a first virtual object is displayed, the first virtual object is capable of executing a target action.

[0127] The target action includes a corresponding action effect. In the embodiment of the present disclosure, the description will be given by taking the target action being implemented as a target skill action as an example.

[0128] Taking an action effect corresponding to the target skill action being a skill effect as an example, when the first virtual object releases a target skill, the target skill action is executed, and the target skill action includes the skill effect.

[0129] In step 702, an action execution operation is received, the action execution operation is used for controlling the first virtual object to execute the target action.

[0130] The target action corresponds to execution speed information.

[0131] In step 703, the action effect of the target action is divided with an equal length to obtain n candidate effect segments.

[0132] For example, after the division quantity of the candidate effect segments of the action effect is determined, the action effect of the target action is divided with an equal length based on the division quantity to obtain the n candidate effect segments. With the method of dividing with an equal length, the action effect can be divided into segments quickly and conveniently, thereby reducing the calculation amount for division.

[0133] In some embodiments, the division quantity of the candidate effect segments may be preset, for example, when the quantity of candidate effect segments is preset as 2, the action effect of the target action is divided into two candidate effect segments with an equal length.

[0134] Alternatively, the division quantity of the candidate effect segments may be determined randomly. In some embodiments, the division quantity of the candidate effect segments is determined within a preset quantity range, for example, within the quantity range of 1 to 4, the quantity of the candidate effect segments is randomly determined as 2, so the action effect of the target action is divided into two candidate effect segments with an equal length.

[0135] Alternatively, the division quantity of the candidate effect segments is determined based on an initial duration of the action effect, that is, the initial duration of the action effect before speed adjustment is determined, and the division quantity of the candidate effect segments is determined based on the initial duration. For example, the initial duration has a corresponding relationship with the division quantity. For example, when the initial duration is 1 to 2 seconds, the corresponding division quantity is 2; and when the initial duration is 2 to 3 seconds, the corresponding division quantity is 3.

[0136] In step 704, time point parameters corresponding to the target action are acquired.

[0137] In some embodiments, the time point parameters are preset parameters corresponding to the target action.

[0138] In step 705, the action effect is divided based on the time point parameters to obtain the n candidate effect segments.

[0139] For example, the time point parameters are inputted for the action effect of the target action, so that the action effect is divided at time points corresponding to the time point parameters to obtain the n candidate effect segments, that is, the quantity of the candidate effect segments corresponds to the quantity of the preset time point parameters. For example, the quantity of the candidate effect segments equals to the quantity of the time point parameters plus one.

[0140] The time points corresponding to division of the candidate effect segments are indicated by the preset time point parameters, for example, a part between two adjacent time points may be taken as a candidate effect segment. In this way, the action effect can be divided quickly, thereby improving the division efficiency.

[0141] In step 706, image frames corresponding to the action effect of the target action are acquired.

[0142] Each image frame of the action effect is acquired for subsequent similarity analysis.

[0143] In step 707, the action effect is divided based on a similarity relationship between the image frames corresponding to the action effect, to obtain the n candidate effect segments.

[0144] In some embodiments, a similarity between adjacent image frames in the image frames corresponding to the action effect is acquired, and consecutive image frames with a similarity satisfying a similarity threshold are grouped into the same candidate effect segment to obtain the n candidate effect segments.

[0145] Similar image frames may be determined from the image frames of an animation effect through the similarity analysis. Since similar image frames most likely correspond to the same sub-effect in the action effect, when the candidate effect segments are divided in this way, the possibility that image frames corresponding to the same sub-effect are grouped into one candidate effect segment can be improved, thereby improving the division accuracy.

[0146] In step 708, in response to the action execution operation, adjustment ratios respectively corresponding to the n candidate effect segments are determined based on the execution speed information.

[0147] In some embodiments, the adjustment ratios respectively corresponding to the n candidate effect segments are determined by at least one of an arrangement order, a preset manner, and a randomly determined manner.

[0148] In step 709, playing speed adjustment is performed on the n candidate effect segments based on the adjustment ratios respectively corresponding to the n candidate effect segments to obtain the n effect segments.

[0149] In some embodiments, a first playing duration of an i^{th} candidate effect segment is acquired, the first playing duration is adjusted based on the i^{th} adjustment ratio to obtain a second playing duration, and the quantity of image frames of the i^{th} candidate effect segment is compressed based on the second playing duration to obtain an i^{th} effect segment.

[0150] In step 710, the n effect segments are displayed in sequence to obtain an action effect display result of the target action corresponding to the execution speed information.

[0151] In some embodiments, after the n effect segments subjected to the playing speed adjustment are determined, the n effect segments are played in sequence to serve as the action effect of the target action corresponding to the execution speed information.

[0152] In summary, with the action effect display method according to the embodiment of the present disclosure, when the action effect is displayed in an accelerated manner based on the execution speed information, the action effect is divided into segments, and segmented acceleration

processing is performed based on acceleration emphases corresponding to the different effect segments. The acceleration ratio of segments to be displayed in a emphasized manner is low, while the acceleration ratio of segments with a weak effect is high, that is, the part with the weak effect is omitted and the part with a strong effect is emphasized. Thus, the purpose of emphasis on the display of the part with the strong effect while accelerating display of the action effect is achieved, thereby improving the display accuracy and efficiency of the action effect.

[0153] In the method according to this embodiment, the image frames of the i^{th} candidate effect segment are compressed based on the priorities of the image frames in the i^{th} candidate effect segment, so that the accuracy of image frame deletion is improved and the effect presentation of the i^{th} effect segment is improved.

[0154] For example, taking the attack speed of a skill being increased and a display speed of the skill effect being increased simultaneously as an example, FIG. 8 illustrates a schematic diagram of an attack speed adjustment process according to an exemplary embodiment of the present disclosure.

[0155] As shown in FIG. 8, in this process, time point parameters 810 are firstly inputted for an action effect, and the time point parameters 810 are implemented as $t_1, t_2, \dots, t_n$. Thus, the skill effect is divided into effect segments 820 based on the time point parameters 810, and effect playing durations corresponding to the effect segments 820 are $T_1, T_2, \dots, T_n$.

[0156] An influence coefficient 830 corresponding to each effect segment 820, i.e., an effect influence coefficient 830 corresponding to a change in the attack speed is inputted, corresponding to $k_1, k_2, \dots, k_n$. The degree to which the playing speed of each effect segment is affected by the attack speed is adjusted based on the influence coefficients. In order to make the playing speed of front effect segments be less affected by the attack speed and the playing speed of rear effect segments be more affected by the attack speed, generally, $k_1 < k_2 < k_3 < \dots < k_n$.

[0157] A player may increase an attack speed of a hero by X times by using equipment 840 or adopting other ways, so that the current influenced attack speed is $(1+X)$ times the initial attack speed. The minimum value of X is 0, that is, the attack speed of the hero is increased by 0 without any attack speed bonus. In some embodiments, the attack speed bonus has an upper limit, for example, when the maximum value of X is 2, the attack speed of the hero is at most 3 times the initial attack speed.

[0158] By substituting the attack speed increase parameter X into a formula 850, the increased playing speed of the i^{th} effect segment is $V_i = 1 + k_i \times X$, where 1 in the formula is the

initial attack speed of the hero, that is, in the initial state, the hero is not subjected to any bonus of equipment or skill effects, and the attack speed is twice the initial attack speed. The attack speed increased by X times is influenced by the coefficient k, so as to adjust the degree to which the different effect segments are influenced by the attack speed.

5 **[0159]** The playing duration of each effect segment is updated to a newly obtained effect

$$\text{playing duration } T = \sum_{i=1}^n \frac{T_i}{1 + k_i X} .$$

[0160] FIG. 9 is a structural block diagram of an action effect display apparatus according to an exemplary embodiment of the present disclosure. As shown in FIG. 9, the apparatus includes: a display module 910, a receiving module 920, and a dividing module 930. The display module 910 is configured to display a first virtual object, the first virtual object is capable of executing a target action, the target action includes a corresponding action effect. The receiving module 920 is configured to receive an action execution operation, the action execution operation is used for controlling the first virtual object to execute the target action, the target action corresponds to execution speed information, the execution speed information is used for indicating that the target action is executed by the first virtual object in an accelerated manner. The dividing module 930 is configured to divide, in response to the action execution operation, the action effect of the target action into n effect segments, the effect segments are obtained by performing playing speed adjustment based on adjustment ratios corresponding to the execution speed information, adjustment ratios of at least two of the effect segments are different from each other during the playing speed adjustment, $n \geq 2$ and n being an integer. The display module 910 is further configured to play the n effect segments in sequence to obtain an action effect display result of the target action corresponding to the execution speed information.

[0161] In an embodiment, the dividing module 930 is further configured to divide the action effect of the target action to obtain n candidate effect segments.

25 **[0162]** As shown in FIG. 10, the apparatus further includes: a determining module 940 and an adjustment module 950. The determining module 940 is configured to determine, in response to the action execution operation, adjustment ratios respectively corresponding to the n candidate effect segments based on the execution speed information. The adjustment module 950 is configured to perform the playing speed adjustment on the n candidate effect segments based on the adjustment ratios respectively corresponding to the n candidate effect segments to obtain the n effect segments.

- [0163] In an embodiment, the adjustment module 950 is further configured to acquire, for an i^{th} candidate effect segment, an i^{th} adjustment ratio corresponding to the i^{th} candidate effect segment, $0 < i \leq n$; and compress the quantity of image frames of the i^{th} candidate effect segment based on the i^{th} adjustment ratio to obtain an i^{th} effect segment.
- 5 [0164] In an embodiment, the adjustment module 950 is further configured to acquire a first playing duration of the i^{th} candidate effect segment; adjust the first playing duration based on the i^{th} adjustment ratio to obtain a second playing duration; and compress the quantity of the image frames of the i^{th} candidate effect segment based on the second playing duration to obtain the i^{th} effect segment.
- 10 [0165] In an embodiment, the determining module 940 is further configured to determine priorities corresponding to the image frames in the i^{th} candidate effect segment; and the adjustment module 950 is further configured to compress the quantity of the image frames based on a priority order of the image frames in the i^{th} candidate effect segment and the i^{th} adjustment ratio to obtain the i^{th} effect segment.
- 15 [0166] In an embodiment, the adjustment ratios corresponding to the n effect segments set are positively correlated with an arrangement order of the n effect segments.
- [0167] In an embodiment, the dividing module 930 is further configured to divide the action effect of the target action with an equal length to obtain the n candidate effect segments.
- [0168] In an embodiment, the dividing module 930 is further configured to acquire a time point parameter corresponding to the target action; and divide the action effect based on the time point parameter to obtain the n candidate effect segments.
- 20 [0169] In an embodiment, the dividing module 930 is further configured to acquire image frames corresponding to the action effect of the target action; and divide the action effect based on a similarity relationship between the image frames corresponding to the action effect to obtain the n candidate effect segments.
- 25 [0170] In an embodiment, the dividing module 930 is further configured to acquire a similarity between two adjacent image frames of the image frames corresponding to the action effect; and group consecutive image frames with a similarity satisfying a similarity threshold into the same candidate effect segment to obtain the n candidate effect segments.
- 30 [0171] In summary, with the action effect display apparatus according to the embodiment of the present disclosure, when the action effect is displayed in an accelerated manner based on the execution speed information, the action effect is divided into segments, and segmented acceleration

processing is performed based on acceleration emphases corresponding to the different effect segments, so that adjustment ratios of at least two effect segments in the n effect segments are different from each other during playing speed adjustment. The acceleration ratio of segments to be displayed in a emphasized manner is low, and the acceleration ratio of segments with a weak effect is high, that is, the part with the weak effect is omitted and the part with a strong effect is emphasized. When the target action is executed by the first virtual object in an accelerated manner, the displayed action effect can be accelerated on the premise that a key point of the action effect is displayed in a emphasized manner, so that the purpose of emphasis on the display of the part with the strong effect while accelerating display of the action effect is achieved, thereby improving the display accuracy and efficiency of the action effect relative to the target action.

[0172] It is to be noted that the action effect display apparatus according to the above-mentioned embodiment is merely exemplified by the division of the above-mentioned various functional modules, and in practice, the above-mentioned function may be completed by different functional modules according to needs, that is, the internal structure of the apparatus is divided into different functional modules to complete all or part of the functions described above. In addition, the action effect display apparatus according to the above embodiment belongs to the same concept as the embodiment of the action effect display method, and the specific implementation process thereof is described in detail in the method embodiment, which thus will not be repeated herein.

[0173] FIG. 11 illustrates a structural block diagram of a terminal 1100 according to an exemplary embodiment of the present disclosure. The terminal 1100 may be: a smartphone, a tablet computer, a moving picture experts group audio layer III (MP3) player, a moving picture experts group audio layer IV (MP4) player, a laptop, or a desktop. The terminal 1100 may also be referred to as user equipment, a portable terminal, a laptop terminal, a desktop terminal, and other names.

[0174] Generally, the terminal 1100 includes: a processor 1101 and a memory 1102.

[0175] The processor 1101 may include one or more processing cores, for example, a 4-core processor or an 8-core processor. The processor 1101 may be implemented in hardware in the form of at least one of digital signal processing (DSP), a field-programmable gate array (FPGA) and a programmable logic array (PLA). The processor 1101 may further include a main processor and a co-processor. The main processor is a processor for processing data in a wake-up state, also referred to as a central processing unit (CPU). The co-processor is a low-power processor for processing data in a standby state. In some embodiments, the processor 1101 may be integrated with a graphics processing unit (GPU), and the GPU is responsible for rendering and drawing of contents needing

to be displayed by a display screen. In some embodiments, the processor 1101 may further include an artificial intelligence (AI) processor, and the AI processor is configured to process computing operations related to machine learning.

5 [0176] The memory 1102 may include one or more computer-readable storage medium which may be non-transient. The memory 1102 may further include a high-speed random access memory, and a non-volatile memory, for example, one or more disk storage devices and flash storage devices. In some embodiments, the non-transitory computer-readable storage medium in the memory 1102 is used for storing a computer program which is executed by the processor 1101 to implement the action effect display method according to the method embodiment in the present
10 disclosure.

[0177] In some embodiments, the terminal 1100 may further include: a peripheral interface 1103 and at least one peripheral. The processor 1101, the memory 1102, and the peripheral interface 1103 may be connected by a bus or a signal line. Each peripheral may be connected to the peripheral interface 1103 via a bus, a signal line, or a circuit board. Specifically, the peripherals
15 include: at least one of a radio frequency circuit 1104, a display screen 1105, a camera 1106, an audio circuit 1107, a positioning component 1108, and a power supply 1109.

[0178] The peripheral interface 1103 may be used for connecting the at least one peripheral related to input/output (I/O) to the processor 1101 and the memory 1102. In some embodiments, the processor 1101, the memory 1102, and the peripheral interface 1103 are integrated on the same chip
20 or circuit board. In some other embodiments, any one or two of the processor 1101, the memory 1102, and the peripheral interface 1103 may be implemented on a separate chip or circuit board, which is not limited in this embodiment.

[0179] The radio frequency circuit 1104 is used for receiving and transmitting a radio frequency (RF) signal, also referred to as an electromagnetic signal. The radio frequency circuit
25 1104 communicates with a communication network and other communication devices via the electromagnetic signal. The radio frequency circuit 1104 converts an electrical signal into an electromagnetic signal for transmission, or converts a received electromagnetic signal into an electrical signal. In some embodiments, the radio frequency circuit 1104 includes: an antenna system, an RF transceiver, one or more amplifiers, a tuner, an oscillator, a digital signal processor, a
30 codec chipset, a subscriber identity module card, etc. The radio frequency circuit 1104 may communicate with other terminals via at least one wireless communication protocol. The wireless communication protocols include, but are not limited to: world wide web, metropolitan area networks, Intranet, generations of mobile communication networks (2G, 3G, 4G and 5G), wireless

local area networks and/or wireless fidelity (WiFi) networks. In some embodiments, the radio frequency circuit 1104 may further include a circuit related to near field communication (NFC), which is not limited in the present disclosure.

[0180] The display screen 1105 is used for displaying a user interface (UI). The UI may include a graph, text, an icon, a video, and any combination thereof. When the display screen 1105 is a touch display screen, the display screen 1105 also has the capacity to collect a touch signal at or above a surface of the display screen 1105. The touch signal may be inputted to the processor 1101 as a control signal for processing. In this case, the display screen 1105 may also be used to provide virtual buttons and/or virtual keyboards, also referred to as soft buttons and/or soft keyboards. In some embodiments, there may be one display screen 1105 disposed on a front panel of the terminal 1100. In other embodiments, there may be at least two display screens 1105 respectively disposed on different surfaces of the terminal 1100 or in a folded design. In yet other embodiments, the display screen 1105 may be a flexible display screen disposed on a curved or folded surface of the terminal 1100. The display screen 1105 may even be further set in a non-rectangular irregular pattern, that is, a special-shaped screen. The display screen 1105 may be made of materials such as a liquid crystal display (LCD) and an organic light-emitting diode (OLED).

[0181] The camera component 1106 is used for capturing images or videos. In some embodiments, the camera component 1106 includes a front-facing camera and a rear-facing camera. Generally, the front-facing camera is disposed on the 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, which are respectively any of a main camera, a depth-of-field camera, a wide-angle camera, and a telephoto camera, to achieve background blur through fusion of the main camera and the depth-of-field camera, panoramic photographing and virtual reality (VR) photographing through fusion of the main camera and the wide-angle camera, or other fused photographing functions. In some embodiments, the camera component 1106 may further include a flash. The flash may be a monochrome temperature flash, or a double color temperature flash. The double color temperature flash refers to a combination of a warm light flash and a cold light flash, and may be used for light compensation at different color temperatures.

[0182] The audio circuit 1107 may include a microphone and a speaker. The microphone is used for acquiring sound waves of a user and an environment, and converting the sound waves into an electrical signal which is input to the processor 1101 for processing, or input to the radio frequency circuit 1104 to implement voice communication. For stereo acquisition or noise reduction purposes, there may be multiple microphones respectively disposed at different locations of the

terminal 1100. The microphone may further be an array microphone or an omni-directional acquisition type microphone. The speaker is used for converting the electrical signal from the processor 1101 or the radio frequency circuit 1104 into sound waves. The speaker may be a conventional film speaker, or a piezoelectric ceramic speaker. When the speaker is a piezoelectric ceramic speaker, the speaker may not only convert the electric signal into sound waves audible to a human being, but also convert the electric signal into sound waves inaudible to a human being, for ranging and other purposes. In some embodiments, the audio circuit 1107 may also include a headphone jack.

[0183] The positioning component 1108 is used for positioning a current geographic position of the terminal 1100 to enable navigation or location based service (LBS). The positioning component 1108 may be a positioning component based on the global positioning system (GPS) of the United States, the BeiDou system of China, and the Galileo system of Russia.

[0184] The power supply 1109 is used for supplying power to components in the terminal 1100. The power supply 1109 may be AC power supply, DC power supply, a disposable battery or a rechargeable battery. When the power supply 1109 includes a rechargeable battery, the rechargeable battery may be a wired rechargeable battery or a wireless rechargeable battery. The wired rechargeable battery is a battery charged through a wired circuit, and the wireless rechargeable battery is a battery charged through a wireless coil. The rechargeable battery may also be used for a fast charging technology.

[0185] In some embodiments, the terminal 1100 further includes one or more sensors 1110. The one or more sensors 1110 include, but are not limited to: an acceleration sensor 1111, a gyroscope sensor 1112, a pressure sensor 1113, a fingerprint sensor 1114, an optical sensor 1115, and a proximity sensor 1116.

[0186] The acceleration sensor 1111 may detect an acceleration on three coordinate axes of the coordinate system established with the terminal 1100. For example, the acceleration sensor 1111 may be configured to detect components of a gravitational acceleration on the three coordinate axes. The processor 1101 may control the touch display screen 1105 to display the user interface in a horizontal view or a vertical view according to a gravity acceleration signal collected by the acceleration sensor 1111. The acceleration sensor 1111 may also be configured to collect motion data of a game or a user.

[0187] The gyroscope sensor 1112 may detect a body direction and a rotation angle of the terminal 1100. The gyroscope sensor 1112 may cooperate with the acceleration sensor 1111 to acquire a 3D action by the user on the terminal 1100. Based on the data collected by the gyroscope

sensor 1112, the processor 1101 may achieve the following functions: motion sensing (such as changing the UI according to a tilting operation of the user), image stabilization during photographing, game control, and inertial navigation.

[0188] The pressure sensor 1113 may be disposed on a side bezel of the terminal 1100 and/or a lower layer of the touch display screen 1105. When the pressure sensor 1113 is disposed on the side bezel of the terminal 1100, a grip signal of the user to the terminal 1100 may be detected, and the processor 1101 performs left-right hand recognition or quick operation according to the grip signal collected by the pressure sensor 1113. When the pressure sensor 1113 is disposed on the lower layer of the touch display screen 1105, the processor 1101 operates according to the pressure of the user on the touch display screen 1105 to control an operability control on the UI. The operability control includes at least one of a button control, a scroll-bar control, an icon control, and a menu control.

[0189] The fingerprint sensor 1114 is used for acquiring a fingerprint of a user, and the processor 1101 identifies an identity of the user based on the fingerprint acquired by the fingerprint sensor 1114, or the fingerprint sensor 1114 identifies the identity of the user based on the acquired fingerprint. When the identity of the user is identified as a trusted identity, the processor 1101 authorizes the user to perform related sensitive operations which include: unlocking a screen, checking encrypted information, downloading software, payment and changing a setting, etc. The fingerprint sensor 1114 may be disposed on the front, back or side of the terminal 1100. When a physical button or a vendor logo is disposed on the terminal 1100, the fingerprint sensor 1114 may be integrated with the physical button or the vendor logo.

[0190] The optical sensor 1115 is used for collecting ambient light intensity.

[0191] The proximity sensor 1116, also referred to as a distance sensor, is typically disposed on the front panel of the terminal 1100. The proximity sensor 1116 is used for collecting a distance between the user and the front of the terminal 1100. In one embodiment, when the proximity sensor 1116 detects that the distance between the user and the front of the terminal 1100 gradually decreases, the processor 1101 controls the touch display screen 1105 to switch from a screen-on state to a screen-off state. When the proximity sensor 1116 detects that the distance between the user and the front of the terminal 1100 gradually increases, the processor 1101 controls the touch display screen 1105 to switch from the screen-off state to the screen-on state.

[0192] A person skilled in the art may appreciate that the configuration shown in FIG. 11 is not to be construed as limiting the terminal 1100 and may include more or fewer components than

illustrated, or some components may be combined, or a different arrangement of components may be employed.

5 **[0193]** In some embodiments, the computer-readable storage medium may include: a read only memory (ROM), a random access memory (RAM), a solid state drive (SSD), or a compact disc, etc. The random access memory may include a resistance random access memory (ReRAM) and a dynamic random access memory (DRAM). The serial numbers of the above-mentioned embodiments of the present disclosure are merely for the purpose of description and do not indicate the superiority or inferiority of the embodiments.

10 **[0194]** A computer program product including instructions is further provided according to an embodiment of the present disclosure, which, when run on a computer, cause the computer to execute the method according to the above-mentioned embodiment.

15 **[0195]** A person of ordinary skill in the art may appreciate that all or part of the steps of implementing the above embodiments may be completed by hardware, or may be completed by instructing relevant hardware through a program. The program may be stored in a computer-readable storage medium which may be a read only memory, a magnetic disk or a compact disk, etc.

20 **[0196]** The above are merely optional embodiments of the present disclosure and are not intended to limit the present disclosure. Any modification, equivalent replacement, improvement, etc. made within the spirit and principle of the present disclosure shall fall within the scope of protection of the present disclosure.

CLAIMS

1. An action effect display method, performed by an electronic device, the method comprising:
displaying a first virtual object, the first virtual object is capable of executing a target action,
5 the target action comprising an action effect;

receiving an action execution operation, the action execution operation being used for
controlling the first virtual object to execute the target action, the target action corresponding to
execution speed information, the execution speed information being used for indicating that the
target action is executed by the first virtual object in an accelerated manner;

10 dividing, in response to the action execution operation, the action effect of the target action
into n effect segments, the effect segments being obtained by performing playing speed adjustment
based on adjustment ratios corresponding to the execution speed information, adjustment ratios of at
least two of the effect segments are different from each other during the playing speed adjustment, n
 ≥ 2 and n being an integer; and

15 playing the n effect segments in sequence to obtain an action effect display result of the target
action corresponding to the execution speed information.

2. The method according to claim 1, wherein the dividing, in response to the action execution
operation, the action effect of the target action into n effect segments comprises:

dividing the action effect of the target action to obtain n candidate effect segments;

20 determining, in response to the action execution operation, adjustment ratios respectively
corresponding to the n candidate effect segments based on the execution speed information; and

performing the playing speed adjustment on the n candidate effect segments based on the
adjustment ratios respectively corresponding to the n candidate effect segments to obtain the n
effect segments.

25 3. The method according to claim 2, wherein the performing the playing speed adjustment on
the n candidate effect segments based on the adjustment ratios respectively corresponding to the n
candidate effect segments to obtain the n effect segments comprises:

acquiring, for an i^{th} candidate effect segment, an i^{th} adjustment ratio corresponding to the i^{th}
candidate effect segment, $0 < i \leq n$; and

30 compressing the quantity of image frames of the i^{th} candidate effect segment based on the i^{th}

adjustment ratio to obtain an i^{th} effect segment.

4. The method according to claim 3, wherein the compressing the quantity of image frames of the i^{th} candidate effect segment based on the i^{th} adjustment ratio to obtain an i^{th} effect segment comprises:

5 acquiring a first playing duration of the i^{th} candidate effect segment;
 adjusting the first playing duration based on the i^{th} adjustment ratio to obtain a second playing duration; and

 compressing the quantity of the image frames of the i^{th} candidate effect segment based on the second playing duration to obtain the i^{th} effect segment.

10 5. The method according to claim 3, wherein the compressing the quantity of image frames of the i^{th} candidate effect segment based on the i^{th} adjustment ratio to obtain an i^{th} effect segment comprises:

 determining priorities of the image frames in the i^{th} candidate effect segment; and

 compressing the quantity of the image frames based on an order of the priorities of the image
15 frames in the i^{th} candidate effect segment and the i^{th} adjustment ratio to obtain the i^{th} effect segment.

6. The method according to any one of claims 1 to 5, wherein the adjustment ratios corresponding to the n effect segments are set positively correlated with an arrangement order of the n effect segments.

7. The method according to any one of claims 2 to 5, wherein the dividing the action effect of
20 the target action to obtain n candidate effect segments comprises:

 dividing the action effect of the target action with an equal length to obtain the n candidate effect segments.

8. The method according to any one of claims 2 to 5, wherein the dividing the action effect of the target action to obtain n candidate effect segments comprises:

25 acquiring a time point parameter corresponding to the target action; and

 dividing the action effect based on the time point parameter to obtain the n candidate effect segments.

9. The method according to any one of claims 2 to 5, wherein the dividing the action effect of the target action to obtain n candidate effect segments comprises:

30 acquiring image frames corresponding to the action effect of the target action; and

dividing the action effect based on a similarity relationship between the image frames corresponding to the action effect to obtain the n candidate effect segments.

10. The method according to claim 9, wherein the dividing the action effect based on a similarity relationship between the image frames corresponding to the action effect to obtain the n candidate effect segments comprises:

acquiring a similarity between adjacent image frames of the image frames corresponding to the action effect; and

grouping consecutive image frames with a similarity satisfying a similarity threshold into a same candidate effect segment to obtain the n candidate effect segments.

11. An action effect display apparatus, comprising:

a display module, configured to display a first virtual object, the first virtual object is capable of executing a target action, the target action comprising an action effect;

a receiving module, configured to receive an action execution operation, the action execution operation being used for controlling the first virtual object to execute the target action, the target action corresponding to execution speed information, the execution speed information being used for indicating that the target action is executed by the first virtual object in an accelerated manner; and

a dividing module, configured to divide, in response to the action execution operation, the action effect of the target action into n effect segments, the effect segments being obtained by performing playing speed adjustment based on adjustment ratios corresponding to the execution speed information, adjustment ratios of at least two of the effect segments are different from each other during the playing speed adjustment, $n \geq 2$ and n being an integer, wherein

the display module is further configured to play the n effect segments in sequence to obtain an action effect display result of the target action corresponding to the execution speed information.

12. The apparatus according to claim 11, wherein the dividing module is further configured to divide the action effect of the target action to obtain n candidate effect segments; and

the apparatus further comprises:

a determining module, configured to determine, in response to the action execution operation, adjustment ratios respectively corresponding to the n candidate effect segments based on the execution speed information; and

an adjustment module, configured to perform the playing speed adjustment on the n candidate

effect segments based on the adjustment ratios respectively corresponding to the n candidate effect segments to obtain the n effect segments.

13. A computer device, comprising a processor and a memory, the memory storing at least one instruction, at least one program, a code set or an instruction set, wherein

5 the at least one instruction, the at least one program, the code set or the instruction set is loaded and executed by the processor to implement the action effect display method according to any one of claims 1 to 10.

14. A computer-readable storage medium, configured to store a computer program, the computer program being executed to implement the action effect display method according to any
10 one of claims 1 to 10.

15. A computer program product comprising instructions which, when run on a computer, cause the computer to perform the action effect display method according to any one of claims 1 to 10.