

DEVICE AND METHOD FOR PROVIDING ANALYSIS INFORMATION ABOUT AN ONGOING SIMULATION SESSION

TECHNICAL FIELD

[0001] Various aspects of this disclosure relate to devices and methods for providing analysis information about an ongoing simulation session.

BACKGROUND

[0002] Simulation sessions of virtual environments may be carried out for various purposes, for example computer games but also for testing purposes, e.g. for control software of robotic devices like autonomous vehicles. Typically, there are important events in such simulation sessions like a player death in a game or an accident in a testing simulation and it is interesting for a user to analyze the circumstances that led to the event to learn from it. A form to provide such kind of analysis information to a user is a replay of the simulation which the user can watch and analyze after the simulation session. However, this does not allow the user to learn for the current session, i.e. the provided information has no impact on the current session.

[0003] Accordingly, more efficient approaches for providing a user with analysis information about an ongoing simulation session are desirable.

SUMMARY

[0004] Various embodiments concern a method for providing analysis information about an ongoing simulation session, the method including performing a simulation session simulating a behaviour of a plurality of objects in a virtual environment according to control information provided by a plurality of agents and displaying a replay of a part of the simulation session on a terminal device of a user, wherein the terminal device acts as one of the agents, while continuing the simulation session, wherein at least one of the period covered by the replay and speed of the replay is controlled by input of the one of the users.

[0005] According to one embodiment, the method includes enabling display of the replay in response to an event in the simulation session related to the agent as which the terminal device of the user acts.

[0006] According to one embodiment, the method includes displaying the replay or an option to display the replay for the user of the terminal device in response to the event.

[0007] According to one embodiment, the period covered by the replay within the simulation session is limited by the point of time within the simulation session at which the event took place.

[0008] According to one embodiment, continuing the simulation session includes continuing simulating the behaviour of the plurality of objects in continuation of the state of the virtual environment at the time of the event.

[0009] According to one embodiment, the method includes displaying the replay in a 2D or 3D representation of the virtual environment representing, for each point of time of the replay for which the replay is displayed, a state of the simulation session at the point of time.

[0010] According to one embodiment, the method includes displaying, along with the replay, the virtual environment according to the current state of the simulation session on the terminal device.

[0011] According to one embodiment, the virtual environment according to the current state of the simulation session is displayed in a 2D or a 3D representation.

[0012] According to one embodiment, the method includes displaying the virtual environment according to the current state of the simulation session in a subscreen of a screen displaying the replay according to a picture-in-picture function.

[0013] According to one embodiment, the method includes, after displaying the replay, displaying the virtual environment according to the current state of the simulation session on the terminal device.

[0014] According to one embodiment, the method includes, before and after displaying the replay, displaying the virtual environment according to the current state of the simulation session on the terminal device in a 2D or 3D representation as in the replay.

[0015] According to one embodiment, terminal devices of other users act as the agents of the plurality of agents other than the agent as which the terminal device of the user acts.

[0016] According to one embodiment, the control information is given by user input of the user and the other users.

[0017] According to one embodiment, the simulation session is a game session.

[0018] According to one embodiment, each agent of the plurality of agents corresponds to an avatar associated with a respective user and the control information is given by user input of the respective user.

[0019] According to one embodiment, the method includes enabling display of the replay in response to a death event of an avatar of the user in the game session, wherein the game has respawn.

[0020] According to one embodiment, the simulation session is continued until a game ending event.

[0021] According to one embodiment, the game ending event is an event of an agent winning the game session or a maximum duration of the game session being reached.

[0022] According to one embodiment, the method at least some of the agents are software applications for controlling a behaviour of a respective robotic device.

[0023] According to one embodiment, the simulation session is a simulation session for evaluating a control policy of at least one of the software applications.

[0024] According to one embodiment, the terminal device is a mobile phone or a tablet.

[0025] According to one embodiment, a terminal device is provided including a communication interface, a memory and a processing unit configured to perform the method of any one of the above embodiments.

[0026] According to one embodiment, a computer program element is provided including program instructions, which, when executed by one or more processors, cause the one or more processors to perform the method of any one of any one of the above embodiments.

[0027] According to one embodiment, a computer-readable medium is provided including program instructions, which, when executed by one or more processors, cause the one or more processors to perform the method of any one of any one of the above embodiments.

[0028] It should be noted that embodiments described in context of the method are analogously valid for the terminal device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] The invention will be better understood with reference to the detailed description when considered in conjunction with the non-limiting examples and the accompanying drawings, in which:

- FIG. 1 shows a data processing system.

- FIG. 2 illustrates a screen for the presentation of a replay.
- FIG. 3 shows a flow diagram illustrating a method for providing analysis information about an ongoing simulation session

DETAILED DESCRIPTION

[0030] The following detailed description refers to the accompanying drawings that show, by way of illustration, specific details and embodiments in which the disclosure may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the disclosure. Other embodiments may be utilized and structural, and logical changes may be made without departing from the scope of the disclosure. The various embodiments are not necessarily mutually exclusive, as some embodiments can be combined with one or more other embodiments to form new embodiments.

[0031] Embodiments described in the context of one of the devices or methods are analogously valid for the other devices or methods. Similarly, embodiments described in the context of a device are analogously valid for a vehicle or a method, and vice-versa.

[0032] Features that are described in the context of an embodiment may correspondingly be applicable to the same or similar features in the other embodiments. Features that are described in the context of an embodiment may correspondingly be applicable to the other embodiments, even if not explicitly described in these other embodiments. Furthermore, additions and/or combinations and/or alternatives as described for a feature in the context of an embodiment may correspondingly be applicable to the same or similar feature in the other embodiments.

[0033] In the context of various embodiments, the articles “a”, “an” and “the” as used with regard to a feature or element include a reference to one or more of the features or elements.

[0034] As used herein, the term “and/or” includes any and all combinations of one or more of the associated listed items.

[0035] In the following, embodiments will be described in detail.

[0036] FIG. 1 shows a data processing device 100 such as a computer or a smartphone.

[0037] The data processing device 100 has a CPU (central processing unit) 101 and a random access memory (RAM) 102. The RAM 102 is used to load program code, for example from a hard disk 103, and the CPU 101 executes the program code.

[0038] In the present example, it is assumed that a user intends to use the data processing device 100 to run a simulation of a 3D environment.

[0039] To do so, the user executes a simulation program 104 on the CPU 101.

[0040] The simulation may depend on input from users of other devices 106 which may each execute their own instance of the simulation. The coordination is performed by a server 105 which is connected to the device 100, 106 by a communication network 107.

[0041] The simulation is for example a computer game where the users of the devices 100, 106 may move their avatars through a 3D landscape. For this, the users of the devices 100, 106 provide user input according to which their avatars move (and act).

[0042] There may be certain events in the simulation which, for a certain user, e.g. the user of the device 100, may be interesting to analyze. This may for example be event arising from a certain input (or chain of inputs) by the user in combination with a certain input (or chain of inputs) by another user. In a computer game, for example, this may be that the avatar's user loses a battle against the avatar of the other user. In other contexts, like when the simulation is used to test the control policy of a robotic device like a vehicle, the event may for example be an accident and it may be interesting for the user to analyze the circumstances

[0043] Typically, it is possible to watch a replay of a simulation session (such as a gaming session) after it has ended. However, this means that a user may not use the insights gained from the replay of an event in the further course of the simulation session, even if a long amount of time is remaining during which the simulation session continues after the event and the user or agent may still influence in the simulation session after the event (e.g. a player may respawn in a gaming session or a vehicle in a test simulation may still be controlled (and, e.g. its control strategy adapted) after it had an accident).

[0044] Therefore, according to various embodiments, for being able to adapt the game strategy or control strategy such that this adaptation has an effect within the simulation session the user or agent is presented with a replay while the simulation session is still running. Furthermore, to allow the user to derive information from the replay which may have an impact on the rest of the simulation session, the user may control at least one of the period covered by the replay and speed of the replay.

[0045] FIG. 2 illustrates a screen 200 for the presentation of a replay.

[0046] The screen shows a 2D representation of a simulated environment, e.g. a 3D environment in which the user may move an avatar 201 or a vehicle 202.

[0047] It is assumed that a certain event has happened after 8 minutes and 46 seconds after the start of the simulation session, e.g. a player death in a computer game or an accident in a simulation where a user tests a control policy for a vehicle (or generally a robot device).

[0048] Accordingly, a bar 203 is presented to the user which covers 0:00 to 8:46. The bar 203 is provided with a slider 204 which the user may slide (using a mouse or by touch) along the bar to set the replay to a certain time (after the start of the simulation session and before the event).

[0049] Further, the user is presented with a pause button 205, a slow-motion button 206 (e.g. for half speed), a play button 207 for normal speed and a fast forward button 208 (e.g. double speed) which allow the user to set the speed of the replay. Finer granularities may be possible. For example, there may be a slider to adjust replay speed. Additionally, a rewind button may be provided. This may replace the option to move the slider by user input or may be provided in addition to it.

[0050] The replay of the simulation session is presented to the user on the screen in accordance with the replay speed the user has set.

[0051] While the replay is presented to the user, the simulation session continues. The user may for example be presented with a sub-screen (according to a picture-in-picture function) 209 which shows the state of the simulation session, e.g. from an observer perspective. In particular, this sub-screen, or another type of indication like a text overlay may inform the user when the user may continue to participate in the simulation session (e.g. when the user's avatar has respawned).

[0052] The user (e.g. player) may be instantly be presented with a replay of the simulation (e.g. game) to analyze the situation which led to the event (e.g. when being eliminated) without waiting for the end of the simulation session (e.g. in a large map or a long game session).

[0053] To reduce stress for the server 105 basic data can be stored in the client device (i.e. device 101) while only key data is verified in the server.

[0054] In summary, according to various embodiments, a method is provided as illustrated in FIG. 3.

[0055] FIG. 3 shows a flow diagram 300 illustrating a method for providing analysis information about an ongoing simulation session.

[0056] In 301, a simulation session simulating a behaviour of a plurality of objects in a virtual environment according to control information provided by a plurality of agents is performed.

[0057] In 302, while continuing the simulation session, a replay of a part of the simulation session on a terminal device of a user, wherein the terminal device acts as one of the agents, is displayed, wherein at least one of the period covered by the replay and speed of the replay is controlled by input of the one of the users.

[0058] The method of FIG. 3 is for example carried out by a terminal device, e.g. corresponding to the data processing device 100 of FIG. 1. The terminal device may include a communication interface (e.g. configured to communicate with a server managing the simulation). The terminal device further includes a processing unit and a memory. The memory may be used by the processing unit to store, for example, program data for the simulation but also data allowing determining about past states of the virtual environment for the replay.

[0059] The simulation session is for example a game session and display of the replay is for example enabled (or triggered) in response to a death event of an avatar of the user in the game session. For example, the game has respawn (rebirth) but that is not necessary and also in a game session without respawn display of a replay may be interesting such that a user may instantly analyze the situation to use it in a later game session without having to pause between game sessions to watch and analyze a replay.

[0060] The methods described herein may be performed and the various processing or computation units and the devices and computing entities described herein may be implemented by one or more circuits. In an embodiment, a "circuit" may be understood as any kind of a logic implementing entity, which may be hardware, software, firmware, or any combination thereof. Thus, in an embodiment, a "circuit" may be a hard-wired logic circuit or a programmable logic circuit such as a programmable processor, e.g. a microprocessor. A "circuit" may also be software being implemented or executed by a processor, e.g. any kind of computer program, e.g. a computer program using a virtual machine code. Any other kind of implementation of the respective functions which are described herein may also be understood as a "circuit" in accordance with an alternative embodiment.

[0061] While the disclosure has been particularly shown and described with reference to specific embodiments, it should be understood by those skilled in the art that various changes in form and detail may be made therein without departing from the spirit and scope of the invention as defined by the appended claims. The scope of the invention is thus indicated by the appended claims and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced.

CLAIMS

1. A method for providing analysis information about an ongoing simulation session, comprising:
performing a simulation session simulating a behaviour of a plurality of objects in a virtual environment according to control information provided by a plurality of agents;
displaying a replay of a part of the simulation session on a terminal device of a user, wherein the terminal device acts as one of the agents, while continuing the simulation session, wherein at least one of the period covered by the replay and speed of the replay is controlled by input of the one of the users; and
displaying, along with the replay, the virtual environment according to the current state of the simulation session on the terminal device; and
displaying the virtual environment according to the current state of the simulation session in a subscreen of a screen displaying the replay according to a picture-in-picture function.
2. The method of claim 1, comprising enabling display of the replay in response to an event in the simulation session related to the agent as which the terminal device of the user acts.
3. The method of claim 2, comprising displaying the replay or an option to display the replay for the user of the terminal device in response to the event.
4. The method of claim 2 or 3, wherein the period covered by the replay within the simulation session is limited by the point of time within the simulation session at which the event took place.
5. The method of any one of claims 1 to 4, wherein continuing the simulation session comprises continuing simulating the behaviour of the plurality of objects in continuation of the state of the virtual environment at the time of the event.

6. The method of any one of claims 1 to 5, comprising displaying the replay in a 2D or 3D representation of the virtual environment representing, for each point of time of the replay for which the replay is displayed, a state of the simulation session at the point of time.
7. The method of claim 6, wherein the virtual environment according to the current state of the simulation session is displayed in a 2D or a 3D representation.
8. The method of any one of claims 1 to 7, comprising, after displaying the replay, displaying the virtual environment according to the current state of the simulation session on the terminal device, wherein the terminal device is a mobile phone or a tablet.
9. The method of any one of claims 1 to 8, comprising, before and after displaying the replay, displaying the virtual environment according to the current state of the simulation session on the terminal device in a 2D or 3D representation as in the replay.
10. The method of any one of claims 1 to 9, wherein terminal devices of other users act as the agents of the plurality of agents other than the agent as which the terminal device of the user acts.
11. The method of claim 10, wherein the control information is given by user input of the user and the other users.
12. The method of any one of claims 1 to 11, wherein the simulation session is a game session.

13. The method of claim 12, wherein each agent of the plurality of agents corresponds to an avatar associated with a respective user and the control information is given by user input of the respective user.
14. The method of claim 12 or 13, comprising enabling display of the replay in response to a death event of an avatar of the user in the game session.
15. The method of any one of claims 12 to 14, wherein the simulation session is continued until a game ending event, and wherein the game ending event is an event of an agent winning the game session or a maximum duration of the game session being reached.
16. The method of any one of claims 1 to 11, wherein at least some of the agents are software applications for controlling a behaviour of a respective robotic device, and wherein the simulation session is a simulation session for evaluating a control policy of at least one of the software applications.
17. A terminal device comprising a communication interface, a memory and a processing unit configured to perform the method of any one of claims 1 to 16.
18. A computer program element or computer-readable medium comprising program instructions, which, when executed by one or more processors, cause the one or more processors to perform the method of any one of claims 1 to 17.