METHODS AND APPARATUSES FOR PROCESSING ATTENTION INFORMATION, STORAGE MEDIA AND ELECTRONIC DEVICES

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Chinese Patent Application No. 201810374723.6 filed on April 24, 2018, the disclosure of which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] The present disclosure relates to the field of information statistics technology, and in particular, to methods and apparatuses for processing attention information, and storage media and electronic devices thereof.

BACKGROUND

[0003] With the development of technology, major businesses use a variety of ways to promote their own services. A common way to promote services is to recommend information to users through multimedia platforms. This information may be in the form of images, audios, videos or the like. Advertisement is an example.

[0004] With the explosive growth of recommendation information, the recommendation of information lacks accuracy. If a user is always recommended information that he/she does not like, not only a waste of multimedia resources may be caused, but also a viscosity of the user to the multimedia resources may be decreased. Therefore, the attention of the user to the recommended information has an important reference value for subsequent accurate recommendations.

SUMMARY

[0005] To solve at least one of the above technical problems, embodiments of the

present disclosure provide methods and apparatuses for processing attention information, as well as storage media and an electronic device thereof.

[0006] The method for processing attention information includes:

[0007] obtaining feature information of at least one display object;

[0008] determining attention information between the at least one display object and the first content data based on the feature information of the at least one display object; and

[0009] performing a statistical analysis of the attention information on the first content data based on the attention information between the at least one display object and the first content data.

[0010] In the embodiments of the present disclosure, the method further includes:

[0011] determining, based on the statistical result of the attention information, second content data to be recommended; and

[0012] displaying the second content data.

[0013] In the embodiments of the present disclosure, obtaining feature information of at least one display object and determining attention information between the at least one display object and the first content data based on the feature information of the at least one display object includes:

[0014] obtaining line-of-sight direction information of the at least one display object; and determining the attention information between the at least one display object and the first content data based on the line-of-sight direction information of the at least one display object.

[0015] In the embodiments of the present disclosure, the attention information includes indication information for indicating whether the display object pays

attention to the first content data;

[0016] determining the attention information between the at least one display object and the first content data based on the line-of-sight direction information of the at least one display object includes:

[0017] determining, based on the line-of-sight direction information of the at least one display object, whether a line-of-sight of the at least one display object falls into a first display area, the first display area indicates an area for displaying the first content data on a display device.

[0018] for a display object whose line-of-sight falls into the first display area, the indication information corresponding to the display object is set to indicate that the display object pays attention to the first content data;

[0019] for a display object whose line-of-sight does not fall into the first display area, the indication information corresponding to the display object is set to indicate that the display object does not pay attention to the first content data.

[0020] In the embodiments of the present disclosure, the attention information further includes: a degree of attention that the display object pays to the first content data;

[0021] determining the attention information between the at least one display object and the first content data based on the line-of-sight direction information of the at least one display object further includes:

[0022] for a display object whose line-of-sight falls into the first display area, determining, based on the line-of-sight direction information of the display object, a target position where the line-of-sight of the display object is projected on the first display area, and determining the degree of attention that the display object pays to

the first content data based on a positional relationship of the target position with the first display area.

[0023] In the embodiments of the present disclosure, the attention information further includes: duration of attention that the display object pays to the first content data;

[0024] determining the attention information between the at least one display object and the first content data based on the line-of-sight direction information of the at least one display object further includes:

[0025] for a display object whose line-of-sight falls into the first display area, performing a statistical analysis of the duration for which the line-of-sight of the display object falls into the first display area and determining, based on the statistical result of the duration, the duration of attention that the display object pays to the first content data.

[0026] In the embodiments of the present disclosure, obtaining the line-of-sight information of the at least one display object includes:

[0027] obtaining eyeball angle information and head posture information of the at least one display object; and

[0028] determining the line-of-sight direction information of the at least one display object based on the eyeball angle information and the head posture information of the at least one display object.

[0029] In the embodiments of the present disclosure, obtaining eyeball angle information and head posture information of the at least one display object includes:

[0030] obtaining an image of the at least one display object;

[0031] obtaining the eyeball angle information of the at least one display object by

processing the image of the at least one display object with a first neural network; and

[0032] obtaining the head posture information of the at least one display object by processing the image of the at least one display object with a second neural network.

[0033] In the embodiments of the present disclosure, performing a statistical analysis of the attention information on the first content data based on the attention information between the at least one display object and the first content data includes:

[0034] performing a statistical analysis, based on the attention information between the at least one display object and the first content data, of at least one of the following attention information on the first content data: a number of people who pay attention to the first content data, a numbers of people corresponding to each of different degrees of attention, a number of people corresponding to each of different durations of attention.

[0035] In the embodiments of the present disclosure, obtaining the feature information of the at least one display object and determining the attention information between the at least one display object and the first content data based on the feature information of the at least one display object includes:

[0036] obtaining geographic location information of the at least one display object, and determining, based on the geographic location information of the at least one display object, the attention information between the at least one display object and the first content data.

[0037] In the embodiments of the present disclosure, the attention information includes: indication information for indicating whether the display object pays attention to the first content data;

[0038] determining the attention information between the at least one display object

and the first content data based on the line-of-sight direction information of the at least one display object includes:

[0039] determining, based on the geographic location information of the at least one display object, whether a position of the at least one display object falls into a first area range, the first area range is determined based on a position of a display device;

[0040] for a display object whose position falls into the first area range, the indication information corresponding to the display object is set to indicate that the display object pays attention to the first content data; and

[0041] for a display object whose position does not fall into the first area range, the indication information corresponding to the display object is set to indicate that the display object does not pay attention to the first content data.

[0042] In the embodiments of the present disclosure, the attention information further includes: duration of attention that the display object pays to the first content data;

[0043] determining, based on the geographic location information of the at least one display object, the attention information between the at least one display object and the first content data further includes:

[0044] for a display object whose position falls into the first area range, performing a statistical analysis of a duration for which the position of the display object falls into the first area range and determining, based on the statistical result of the duration, the duration of attention that the display object pays to the first content data.

[0045] In the embodiments of the present disclosure, performing a statistical analysis of the attention information on the first content data based on the attention information between the at least one display object and the first content data includes:

[0046] performing a statistical analysis, based on the attention information between the at least one display object and the first content data, of at least one of the following attention information on the first content data: a number of people who pay attention to the first content data, a number of people corresponding to each of different durations of attention.

[0047] In the embodiments of the present disclosure, obtaining the feature information of the at least one display object and determining the attention information between the at least one display object and the first content data based on the feature information of the at least one display object includes:

[0048] obtaining interaction information between the at least one display object and the first content data, and determining the attention information between the at least one display object and the first content data based on the interaction information between the at least one display object and the first content data.

[0049] In the embodiments of the present disclosure, performing a statistical analysis of the attention information on the first content data based on the attention information between the at least one display object and the first content data includes:

[0050] performing a statistical analysis of at least the following attention information on the first content data based on the attention information between the at least one display object and the first content data: numbers of people corresponding to different interaction frequencies.

[0051] An apparatus for processing attention information provided in the embodiments of the present disclosure including:

[0052] a displaying unit configured to display first content data;

[0053] an obtaining unit configured to obtain feature information of at least one

display object;

[0054] a determining unit configured to determine attention information between the at least one display object and the first content data based on the feature information of the at least one display object; and

[0055] a statistic unit configured to perform a statistical analysis of the attention information on the first content data based on the attention information between the display object and the first content data.

[0056] In the embodiments of the present disclosure, the apparatus further includes:

[0057] a recommendation unit configured to determine, based on the statistical result of the attention information, second content data to be recommended;

[0058] the displaying unit is further configured to display the second content data.

[0059] In the embodiments of the present disclosure, the obtaining unit is configured to obtain line-of-sight direction information of the at least one display object;

[0060] the determining unit is configured to determine the attention information between the at least one display object and the first content data based on the line-of-sight direction information of the at least one display object.

[0061] In the embodiments of the present disclosure, the attention information includes: indication information for indicating whether the display object pays attention to the first content data; the determining unit includes:

[0062] a first determining sub-unit configured to determine whether a line-of-sight of the at least one display object falls into a first display area based on the line-of-sight direction information of the at least one display object, the first display area is an area displaying the first content data on the display device; for a display object whose line-of-sight falls into the first display area, the indication information

corresponding to the display object is set to indicate that the display object pays attention to the first content data; for a display object whose line-of-sight does not fall into the first display area, the indication information corresponding to the display object is set to indicate that the display object does not pay attention to the first content data.

[0063] In the embodiments of the present disclosure, the attention information further includes: a degree of attention that the display object pays to the first content data; the determining unit further includes:

[0064] a second determining sub-unit configured to, for a display object whose line-of-sight falls into the first display area, determine, based on the line-of-sight direction information of the display object, a target position where the line-of-sight of the display object projected on the first display area, and determine the degree of attention that the display object pays to the first content data based on a positional relationship of the target position with the first display area.

[0065] In the embodiments of the present disclosure, the attention information further includes: duration of attention that the display object pays to the first content data; the determining unit further includes:

[0066] a third determining sub-unit configured to, for a display object whose line-of-sight falls into the first display area, performing a statistical analysis of the duration for which the line-of-sight of the display object falls into the first display area and determine, based on the statistical result of the duration, the duration of attention that the display object pays to the first content data.

[0067] In the embodiments of the present disclosure, the obtaining unit includes:

[0068] an obtaining sub-unit configured to obtain eyeball angle information and

head posture information of the at least one display object;

[0069] a determining unit configured to determine the line-of-sight direction information of the at least one display object based on the eyeball angle information and the head posture information of the at least one display object.

[0070] In the embodiments of the present disclosure, the obtaining sub-unit is configured to:

[0071] obtain an image of the at least one display object;

[0072] obtain the eyeball angle information of the at least one display object by processing the image of the at least one display object with a first neural network; and

[0073] obtain the head posture information of the at least one display object by processing the image of the at least one display object with a second neural network.

[0074] In the embodiments of the present disclosure, the statistic unit is configured to performing a statistical analysis , based on the attention information between the at least one display object and the first content data, of at least one of the following attention information on the first content data : a number of people who pay attention to the first content data, a number of people corresponding to each of different degrees of attention, a number of people corresponding to each of different durations of attention.

[0075] In the embodiments of the present disclosure, the obtaining unit is configured to obtain geographic location information of the at least one display object;

[0076] the determining unit is configured to determine, based on the geographic location information of the at least one display object, the attention information between the at least one display object and the first content data.

[0077] In the embodiments of the present disclosure, the attention information

includes: indication information for indicating whether the display object pays attention to the first content data; the determining unit includes:

[0078] a fourth determining sub-unit configured to determine, based on the geographic location information of the at least one display object, whether a position of the at least one display object falls into a first area range, the first area range is determined based on a position of a display device; for a display object whose position falls into the first area range, the indication information corresponding to the display object is set to indicate that the display object pays attention to the first content data; for a display object whose position does not fall into the first area range, the indication information corresponding to the display object is set to indicate that the display object does not pay attention to the first content data.

[0079] In the embodiments of the present disclosure, the attention information further includes: duration of attention that the display object pays to the first content data; the determining unit includes:

[0080] a fifth determining unit configured to, for a display object whose position falls into the first area range, performing a statistical analysis of a duration for which the position of the display object falls into the first area range and determine, based on the statistical result of the duration, the duration of attention that the display object pays to the first content data.

[0081] In the embodiments of the present disclosure, the statistic unit is configured to performing a statistical analysis, based on the attention information between the at least one display object and the first content data, of at least one of the following attention information on the first content data: a number of people who pay attention to the first content data, a number of people corresponding to each of different

durations of attention.

[0082] In the embodiments of the present disclosure, the obtaining unit is configured to obtain interaction information between the at least one display object and the first content data;

[0083] the determining unit is configured to determine the attention information between the at least one display object and the first content data based on the interaction information between the at least one display object and the first content data.

[0084] In the embodiments of the present disclosure, the statistic unit is configured to performing a statistical analysis of at least the following attention information on the first content data based on the attention information between the at least one display object and the first content data: numbers of people corresponding to different interaction frequencies.

[0085] The embodiments of the present disclosure provide a storage medium storing executable instructions, wherein the instructions are executed by a processor to cause the processor to implement the above method for processing attention information.

[0086] The embodiments of the present disclosure provide an electronic device, including:

[0087] a memory configured to store executable instructions;

[0088] a processor configured to communicate with the memory to execute the executable instructions to implement the above method for processing attention information.

[0089] In the technical solutions according to embodiments of the present disclosure, first content data is displayed, feature information of at least one display object is

obtained, attention information between the at least one display object and the first content data is determined based on the feature information of the at least one display object, and a statistical analysis of the attention information on the first content data may be performed based on the attention information between the at least one display object and the first content data. Using such technical solutions according to embodiments of the present disclosure, a statistical analysis of the attention information on the first content data is achieved, and the statistical result may be used as the basis or influencing factor for subsequent multimedia resource allocation, so realizing an accurate recommendation which recommends desired information to a display object.

BRIEF DESCRIPTION OF THE DRAWINGS

[0090] FIG.1 illustrates a network structural diagram according to some embodiments of the present disclosure.

[0091] FIG. 2 illustrates a first schematic flowchart of a method for processing attention information according to some embodiments of the present disclosure.

[0092] FIG. 3 illustrates a second schematic flowchart of a method for processing attention information according to some embodiments of the present disclosure.

[0093] FIG. 4 illustrates a third schematic flowchart of a method for processing attention information according to some embodiments of the present disclosure.

[0094] FIG. 5 illustrates a fourth schematic flowchart of a method for processing attention information according to some embodiments of the present disclosure.

[0095] FIG. 6 illustrates a first structural composition of an apparatus for processing attention information according to some embodiments of the application.

[0096] FIG. 7 illustrates a second structural composition of an apparatus for processing attention information according to some embodiments of the application.

[0097] FIG.8 illustrates a schematic diagram of a structure of an electronic device according to some embodiments of the present disclosure.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0098] Various exemplary embodiments of the present disclosure will now be described in detail with reference to the accompanying drawings. It should be noted that the relative arrangements, numerical expressions, and numerical values of the components and steps set forth in these embodiments do not limit the scope of the present disclosure unless specifically stated otherwise.

[0099] Meanwhile, it should be understood that, for convenience of description, the dimensions of the various parts shown in the figures are not drawn according to actual proportional relationships.

[00100] The following description of at least one exemplary embodiment is practically merely illustrative, in no way limiting of the present disclosure and its application or use.

[00101] Techniques, methods, and apparatuses known to those of ordinary skill in the relevant art may not be discussed in detail, but the techniques, methods, and apparatuses should be considered as part of the description.

[00102] It should be noted that like references and letters denote like items in the following drawings, and therefore, once a certain item is defined in a drawing, no further discussion thereof is needed in the following drawings.

[00103] Embodiments of the present disclosure can be applied to electronic devices

such as computer systems/servers, and can operate with numerous other general purpose or special purpose computing system environments or configurations. Examples of well-known computing systems, environments and/or configurations suitable for use with electronic devices such as computer systems/servers include, but are not limited to, personal computer systems, server computer systems, thin clients, thick clients, hand-held or laptop devices, microprocessor-based systems, set-top boxes, programmable consumer electronics, network personal computers, minicomputer systems, mainframe computer systems, and distributed cloud computing technology environments including any of the above, and the like.

[00104] Electronic devices such as computer systems/servers may be described in the general context of computer system-executable instructions, such as program modules, executed by a computer system. In general, program modules may include routines, programs, target programs, components, logic, data structures, etc. that perform particular tasks or implement particular abstract data types. The computer system/server may be implemented in a distributed cloud computing environment in which tasks are performed by a remote processing device linked through a communication network. In a distributed cloud computing environment, the program modules may be located on a local or remote computing system storage medium including a storage device.

[00105] FIG. 1 is a schematic diagram of hardware entities of parties performing information interaction in the embodiments of the present disclosure, including servers 11……1n, and display devices 21-24 which perform information interaction with the servers through a wired or wireless network. The display devices may be implemented via a mobile phone, a desktop, a personal computer, an all-in-one

machine, a virtual reality (VR) device, an augmented reality (AR) device, etc. In an example, servers 11……1n may interact with a first type of terminal (for example, a terminal where the advertiser is located, or an object known as providing advertising material and content promotion) through network. After the first type of terminal submits a to-be-published advertisement, the to-be-published advertisement may be stored in a server cluster. The first type of terminal may be provided with an administrator for performing process such as reviewing the advertisement published by the first type of terminal. With respect to the first type of terminal, terminals where the display device 21-24 are located may be referred to as the second type of terminals (for example, terminals where ordinary display objects are located, or objects for advertising display or exposure). All applications or a certain application (such as a game application, a video application, a navigation application, etc.) installed on a display device can be added with advertisements to display more recommendation information to the display object.

[00106] The example of FIG. 1 above is only an example of a system architecture that implements the examples of the present disclosure, and the examples of the present disclosure are not limited to the system architecture described in FIG. 1 above, on the basis of which the various examples of the present disclosure are set forth.

[00107] FIG. 2 illustrates a first schematic flowchart of a method for processing attention information according to some embodiments of the present disclosure. As shown in FIG. 2. the method for processing attention information includes the following steps.

[00108] At step 201, first content data is displayed.

[00109] In the embodiments of the present disclosure, the first content data may be

any type of recommendation information. The recommendation information may be, but is not limited to, a static image, a dynamic image, a short video, a long video, an interactive game, etc. In an example, the first content data may be an advertisement.

[00110] In the embodiments of the present disclosure, the display device may be a display screen, an all-in-one machine, a projector, a VR device, an AR device, etc.

[00111] At step 202, feature information of at least one display object is obtained, and attention information between the at least one display object and the first content data is determined based on the feature information of the at least one display object.

[00112] The display object may be a user, a robot, or other smart device.

[00113] In the embodiments of the present disclosure, the feature information includes at least one of the following: line-of-sight direction information of the display object, geographic location information of the display object, and interaction information between the display object and the first content data.

[00114] Taking the line-of-sight direction information of the display object as an example, the line-of-sight of the display object can indicate whether the display object pays attention to the first content data. If the display object pays attention to the first content data, a degree and duration of attention that the display object pays to the first content data object may be determined. Such attention information may be used to scale an exposure effect of the first content data to the display object.

[00115] In this example, the line-of-sight direction information of the display object can accurately indicate the attention information, thus the attention information determined by line-of-sight direction information of the display object is more complied to the actual intention of the display object. Taking the attention information as a reference for subsequent recommendation information can achieve more accurate

information recommendation.

[00116] Taking the geographic location information of the display object as an example, the geographic location information of the display object can indicate whether the position of the display object is near the display device. From another aspect, the geographic location information of the display object can also indicate whether the display object pays attention to the first content data. If the display object pays attention to the first content data, a degree and duration of attention that the display object pays to the first content data object may be determined. Such attention information determined by the geographic location information may be used to scale the exposure effect of the first content data to the display object.

[00117] In this example, the geographic location information of the display object can be obtained through a camera or a navigation and positioning system, so it is convenient and quick to implement, and the cost is low. Using the attention information determined by the geographic location information as a reference for subsequent recommendation information may meet recommendation demands of most display objects, thereby significantly improving the exposure effect of the recommendation information.

[00118] Taking the interaction information between the display object and the first content data as an example, the interaction such as a browsing operation, a downloading operation, a like giving operation, an attention paying operation, and a clicking operation) of the display object with the first content data can also indicate whether the display object pays attention to the first content data. If the display object pays attention to the first content data, a frequency of the interaction (times of interaction triggered per unit time) of the display object with the first content data

may be determined. The attention information determined by the interaction information may be used to scale the exposure effect of the first content data to the display object.

[00119] In this example, the interaction information of the display object can be obtained directly through the display device or a remote control device without additional device to assist, so it is convenient and quick to implement, and the cost is low. The interaction information can accurately indicate the attention information. Using such attention information as a reference for subsequent recommendation information can achieve more accurate recommendation of information, which is more complied with the demands of the display object, thereby significantly improving the exposure effect of the recommendation information.

[00120] In this example, different feature information can scale the attention information between the display object and the first content data from different dimensions. In an example, the attention information between the at least one display object of and the first content data may be determined based on one type of the feature information. In another example, the attention information between the at least one display object and the first content data may be determined based on two or three types of the feature information.

[00121] At step 203, statistical analysis is performed for attention information on the first content data based on the attention information between the at least one display object and the first content data.

[00122] For example, based on the attention information between the at least one display object and the first content data, a statistical analysis of at least one of the following attention information on the first content data is performed: a number of

people who pay attention to the first content data, a number of people corresponding to each of different degrees of attention, a number of people corresponding to each of different durations of attention , and a number of people corresponding to each of different interaction frequencies.

[00123] Optionally, the method further includes: determining, based on the statistical result of the attention information, second content data to be recommended; and displaying the second content data.

[00124] In an embodiment, the content data displayed on the display device is randomly recommended by a server or a cloud, or personalized recommended based on certain reference information. In an example, the server or the cloud may randomly recommend information to the display object without obtaining any reference information. In another example, if the server or the cloud obtains the reference information, the recommendation information is personalized for the display object according to the reference information. In the above examples, the reference information may be obtained by performing a statistical analysis of the attention information on the content data.

[00125] The reference information may be a number of people who pay attention to certain information, a number of people corresponding to each of different degrees of attention, a number of people corresponding to each of different durations of attention, and a number of people corresponding to each of different interaction frequencies, which is not limited to the present disclosure. Any two or more of the reference information can also be combined to implement the recommendation of the content data.

[00126] For example, three pieces of candidate information are provided, which are

information 1, information 2, and information 3. In a certain statistical period, a number of people who pay attention to information 1 is 30, a number of people who pay attention to information 2 is 20, and a number of people who pay attention to information 3 is 3. Then, information 1 is displayed as the content data on the display device.

[00127] For another example, three pieces of candidate information are provided, which are information 1, information 2, and information 3. In a certain statistical period, a number of people who pay attention to information 1 is 30, a number of people who pay attention to information 2 is 30, and a number of people who pay attention to information 3 is 30. A number of people having a high level of attention on information 1 is 4, a number of people having a high level of attention on information 2 is 17, and a number of people having a high level of attention on information 3 is 12. Then, information 2 is displayed as the content data on the display device.

[00128] For another example, three pieces of candidate information are provided, which are information 1, information 2, and information 3. In a certain statistical period, a number of people who pay attention to information 1 is 30, a number of people who pay attention to information 2 is 30, and a number of people who pay attention to information 3 is 30. A number of people having an attention duration more than 3 minutes on information 1 is 4, a number of people having an attention duration more than 3 minutes on information 2 is 17, and a number of people having an attention duration more than 3 minutes on information 3 is 12. Then, information 2 is displayed as the content data on the display device.

[00129] For example, three pieces of candidate information are provided, which are

information 1, information 2, and information 3. In a certain statistical period, a number of interactions that have been carried out with information 1 is 10, a number of interactions that have been carried out with information 2 is 13, and a number of interactions that have been carried out with information 3 is 0. Then, information 2 is displayed as the content data on the display device.

[00130] FIG. 3 illustrates a second schematic flowchart of a method for processing attention information according to some embodiments of the present disclosure. As shown in FIG. 3, the method for processing attention includes the following steps.

[00131] At step 301, first content data is displayed.

[00132] In the embodiments of the present disclosure, the first content data may be any type of recommendation information. The recommendation information may be, but is not limited to, a static image, a dynamic image, a short video, a long video, an interactive game, etc. In an example, the first content data may be an advertisement.

[00133] In the embodiments of the present disclosure, the display device may be a display screen, an all-in-one machine, a projector, a VR device, an AR device, etc.

[00134] In an embodiment, the first content data displayed on the display device is randomly recommended by the server or the cloud, or personalized recommended based on certain reference information. In an example, the server or the cloud may randomly recommend information to the display object without obtaining any reference information. In another example, if the server or the cloud obtains the reference information, the recommendation information is personalized for the display object according to the reference information. In the above examples, the reference information may be obtained by performing a statistical analysis of the attention information on the first content data.

[00135] At step 302, line-of-sight direction information of at least one display object is obtained, and attention information between the at least one display object and the first content data is determined based on the line-of-sight direction information of the at least one display object.

[00136] In an embodiment, the line-of-sight direction information of the at least one display object may be obtained by the following steps:

[00137] obtaining eyeball angle information and head posture information of the at least one display object;

[00138] determining the line-of-sight direction information of the at least one display object based on the eyeball angle information and the head posture information of the at least one display object.

[00139] Further, obtaining the eyeball angle information and the head posture information of the at least one display object includes:

[00140] obtaining an image of the at least one display object;

[00141] obtaining the eyeball angle information of the at least one display object by processing the image of the at least one display object with a first neural network;

[00142] obtaining the head posture information of the at least one display object by processing the image of the at least one display object with a second neural network.

[00143] For example, a camera can collect target images (such as face images) of five display objects (display object 1 to display object 5) within a shooting range supported by the camera, which are P1, P2, P3, P4, P5. Each target image is input in to the first neural network and the second neural network. Taking P1 as an example, use the first neural network to obtain the eyeball angle prediction information eye1 of P1 and use the second neural network to obtain the head posture prediction

information head1 of P1. Then, based on the eyeball angle prediction information eye1 and the head posture prediction information head1, the line-of-sight direction information of the display object 1 can be determined. For P2 to P5, the line-of-sight direction information of the display object 2 to display object 5 can be obtained in similar way.

[00144] In the embodiments of the present disclosure, the attention information between the at least one display object and the first content data is determined based on the line-of-sight direction information of the at least one display object. The attention information includes at least one of the following:

[00145] 1) Indication information for indicating whether the display object pays attention to the first content data;

[00146] 2) Degree of attention that the display object pays to the first content data; and

[00147] 3) Duration of attention that the display object pays to the first content data.

[00148] In an embodiment, the attention information includes: indication information for indicating whether the display object pays attention to the first content data. Accordingly, determining the attention information between the at least one display object and the first content data based on the line-of-sight direction information of the at least one display object includes: determining, based on the line-of-sight direction information of the at least one display object, whether a line-of-sight of the at least one display object falls into a first display area, the first display area indicates an area for displaying the first content data on a display device; for a display object whose line-of-sight falls into the first display area, the indication information corresponding to the display object is set to indicate that the display object pays attention to the first

content data; for a display object whose line-of-sight does not fall into the first display area, the indication information corresponding to the display object is set to indicate that the display object does not pay attention to the first content data.

[00149] For example, the line-of-sight direction information of 5 display objects (display object 1 to display object 5) is obtained, which are S1, S2, S3, S4, and S5. It should be understood that the line-of-sight direction information has different representations based on different coordinate systems. In this example, S1, S3 fall into the first display area where the first content data is displayed, and S2, S4, and S5 do not fall into the first display area where the first content data is displayed, which indicates that the display object 1 and the display object 3 pay attention to the first content, and the display object 2, the display object 4, and the display object 5 do not pay attention to the first content data.

[00150] In an embodiment, the attention information includes: a degree of attention that the display object pays to the first content data. Determining the attention information between the at least one display object and the first content data based on the line-of-sight direction information of the at least one display object further includes: for a display object whose line-of-sight falls into the first display area, determining, based on the line-of-sight direction information of the display object, a target position where the line-of-sight of the display object projected on the first display area, and determining the degree of attention that the display object pays to the first content data based on the positional relationship of the target position with the first display area.

[00151] For example, the line-of-sight direction information of 5 display objects (display object 1 to display object 5) is obtained, which are respectively S1, S2, S3,

S4 and S5. In this example, S1, S3 fall into the first display area where the first content data is displayed, which indicates that the display object 1 and the display object 3 pay attention to the first content data. The degree of attention that display object 1 pays to the first content data can be scaled according to a target position T1 where S1 projected on the first display area. In an example, the closer the distance to the center O of the first display area, the higher the degree of attention. Therefore, the degree of attention F1 of the display object 1 pays to the first content data is inversely proportional to the distance between T1 and O. Similarly, the degree of attention F3 of the display object 3 pays to the first content data may be obtained. In an embodiment, the degree of attention can be quantified into several levels, for example, the distance of the target position to the center O within a first proximity range indicates a high level of attention, the distance to the center O within a second proximity range indicates an intermediate level of attention, and the distance to the center O within a third proximity range indicates a low level of attention.

[00152] In an embodiment, the attention information includes: duration of attention that the display object pays to the first content data. Determining the attention information between the at least one display object and the first content data based on the line-of-sight direction information of the at least one display object further includes: for a display object whose line-of-sight falls into the first display area, performing a statistical analysis of the duration for which the line-of-sight of the display object falls into the first display area and determining, based on the statistical result of the duration, the duration of attention that the display object pays to the first content data.

[00153] For example, the line-of-sight direction information of five display objects

(display object 1 to display object 5) are obtained, which are respectively S1, S2, S3, S4 and S5. In this example, S1, S3 fall into the first display area where the first content data is displayed, which indicates that the display object 1 and the display object 3 pay attention to the first content data. The duration of attention that the display object 1 pays to the first content data is a duration t1 that S1 falls into the first display area. Similarly, the duration of attention that the display object 3 pays to the first content data is a duration t3 that S3 falls into the first display area.

[00154] In the embodiments of the present disclosure, the attention information between the display object and the first content data may include one or more of the above information.

[00155] At step 303, a statistical analysis of the attention information on the first content data is performed based on the attention information between the at least one display object and the first content data.

[00156] Following step 302, different attention information can be used as information of different dimensions to provide important references for subsequent recommendation of information. Therefore, a statistical analysis of at least one of the following attention information on the first content data may be performed based on the attention information between the at least one display object and the first content data: a number of people who pay attention to the first content data, a number of people corresponding to each of different degrees of attention, a number of people corresponding to each of different durations of attention, and a number of people corresponding to each of different interaction frequencies.

[00157] In an example, in a statistical period (for example, 3 hours), a statistical analysis of the attention information on information 1 is performed, and at least one of

the following information is obtained: a number of people who pay attention to information 1 is 20; a number of people who pay attention to information 1 and have a high level of attention is 7, a number of people who pay attention to information 1 and have an intermediate level of attention is 6, a number of people who pay attention to information 1 and have a low level of attention is 7; a number of people who pay attention to information 1 and have a duration of attention within a first duration range is 2, a number of people who pay attention to information 1 and have a duration of attention within a second duration range is 5, a number of people who pay attention to information 1 and have a duration of attention within a third duration range is 13.

[00158] The statistical results of the different information above can be used to scale the attention that display objects pay to the first content data in different dimensions. One or more of the above information can be used as a reference to scale the effective exposure of the first content data (that is, the degree of being effectively viewed), which can provide an important reference for subsequent accurate recommendation of information.

[00159] In the embodiments of the present disclosure, the line-of-sight direction information of the display object can accurately indicate the attention information, so the attention information determined by the line-of-sight direction information of the display object is more complied with the true intention of the display object. Using such attention information as a reference for subsequent recommendation information can achieve more accurate recommendation of information, which is more complied with the demands of the display object,

[00160] FIG. 4 illustrates a third schematic flowchart of a method for processing attention information according to some embodiments of the present disclosure. As

shown in FIG. 4, the method for processing attention information includes the following steps.

[00161] At step 401, first content data is displayed.

[00162] In the embodiments of the present disclosure, the first content data may be any type of recommendation information. The recommendation information may be, but is not limited to, a static image, a dynamic image, a short video, a long video, an interactive game, etc. In an example, the first content data may be an advertisement.

[00163] In the embodiments of the present disclosure, the display device may be a display screen, an all-in-one machine, a projector, a VR device, an AR device, etc.

[00164] At step 402, geographic location information of at least one display object is obtained, and attention information between the at least one display object and the first content data is determined based on the geographic location information of the at least one display object.

[00165] In an embodiment, the geographic location information of the at least one display object may be obtained based on the following method:

[00166] obtaining an image of the at least one display object;

[00167] obtaining the geographic location information of the at least one display object by processing the image of the at least one display object by using a third neural network.

[00168] In another embodiment, the geographic location information of at least one display object may be obtained based on the following method:

[00169] obtaining, by a relay node (such as a wireless access node), GPS information of a terminal of each display object, to determine the geographic location information of the at least one display object.

[00170] In the embodiments of the present disclosure, the attention information between the at least one display object and the first content data is determined based on the geographic location information of the at least one display object. The attention information includes at least one of the following:

[00171] 1) Indication information for indicating whether the display object pays attention to the first content data;

[00172] 2) Duration of attention that the display object pays to the first content data.

[00173] In an embodiment, the attention information includes: indication information for indicating whether the display object pays attention to the first content data. Accordingly, determining, based on the geographic location information of the at least one display object, the attention information between the at least one display object and the first content data includes: determining, based on the geographic location information of the at least one display object, whether a position of the at least one display object falls into a first area range the first area range is determined based on a position of the display device (for example, the first area range is an area centered on the position of the display device with a preset length as the radius); for a display object whose position falls into the first area range, the indication information corresponding to the display object is set to indicate that the display object pays attention to the first content data; for a display object whose position does not fall into the first area range, the indication information corresponding to the display object is set to indicate that the display object does not pay attention to the first content data.

[00174] For example, the geographic location information of five display objects (display object 1 to display object 5) are obtained, which are D1, D2, D3, D4, and D5. It should be understood that the geographic location information has different

representations based on different coordinate systems. In this example, D1, D3 fall into the first area range where the first content data is located, and D2, D4, and D5 do not fall into the first area range, which indicates that the display object 1 and the display object 3 pay attention to the first content, and the display object 2, the display object 4, and the display object 5 do not pay attention to the first content data.

[00175] In an embodiment, the attention information includes: duration of attention that the display object pays to the first content data. Determining, based on the geographic location information of the display object, the attention information between the display object and the first content data further includes: for a display object whose position falls into the first area range, performing a statistical analysis of a duration for which the position of the display object falls into the first area range and determining, based on the statistical result of the duration, the duration of attention that the display object pays to the first content data.

[00176] For example, the geographic location information of five display objects (display object 1 to display object 5) are obtained, which are respectively D1, D2, D3, D4 and D5. In this example, D1, D3 fall into the first area range where the first content data is located, which indicates that the display object 1 and the display object 3 pay attention to the first content data. The duration of attention for the display object 1 pays to the first content data is a duration t1' of D1 falls into the first display area. Similarly, the duration of attention for the display object 3 pays to the first content data is a duration t3'of D3 falls into the first display area.

[00177] In the embodiments of the present disclosure, the attention information between the display object and the first content data may include one or more of the above information.

[00178] At step 403, a statistical analysis of the attention information on the first content data is performed based on the attention information between the at least one display object and the first content data.

[00179] Following step 402, different attention information can be used as information of different dimensions to provide important references for subsequent information recommendation. Therefore, a statistical analysis of at least one of the following attention information on the first content data may be performed based on the attention information between the at least one display object and the first content data: a number of people who pay attention to the first content data, a number of people corresponding to each of different durations of attention.

[00180] In an example, in a statistical period (for example, 3 hours), a statistical analysis of the attention information on information 1 is performed, and at least one of the following information is obtained: a number of people who pay attention to information 1 is 20; a number of people who pay attention to information 1 and have a duration of attention within a first duration range is 2, a number of people who pay attention to information 1 and have a duration of attention within a second duration range is 5, a number of people who pay attention to information 1 and have a duration of attention within a third duration range is 13.

[00181] The statistical results of the different information above can be used to scale the attention that display objects pay to the first content data in different dimensions. One or more of the above information can be used as a reference to scale the effective exposure of the first content data (that is, the degree of being effectively viewed), which can provide an important reference for subsequent accurate recommendation of information.

[00182] In the embodiments of the present disclosure, the geographic location information of the display object can be obtained through a camera or a navigation and positioning system, so it is convenient and quick to implement, and the cost is low. Using the attention information determined by the geographic location information as a reference for subsequent recommendation information may meet recommendation demands of most display objects, thereby significantly improving the exposure effect of the recommendation information.

[00183] FIG. 5 illustrates a third schematic flowchart of a method for processing attention information according to some embodiments of the present disclosure. As shown in FIG. 5, the method for processing attention information includes the following steps.

[00184] At step 501, first content data is displayed.

[00185] In the embodiments of the present disclosure, the first content data may be any type of recommendation information. The recommendation information may be, but is not limited to, a static image, a dynamic image, a short video, a long video, an interactive game, etc. In an example, the first content data may be an advertisement.

[00186] In the embodiments of the present disclosure, the display device may be a display screen, an all-in-one machine, a projector, a VR device, an AR device, etc.

[00187] At step 502, interaction information between at least one display object and the first content data is obtained, and attention information between the at least one display object and the first content data is determined based on the interaction information between the at least one display object and the first content data.

[00188] The interaction such as a browsing operation, a downloading operation, a like giving operation, an attention paying operation, and a clicking operation of the

display object with the first content data can indicate whether the display object pays attention to the first content data. If the display object pays attention to the first content data, a frequency of the interaction (times of interaction triggered per unit time) of the display object with the first content data may be determined.

[00189] In an embodiment, the attention information includes: interaction information between the display object and the first content data.

[00190] For example, five display objects (display object 1 to display object 5) have interacted with the first content data. In a statistical period, the number of times that object 1 performs an operation on the first content data is N1, the number of times that object 2 performs an operation on the first content data is N2, the number of times that object 3 performs an operation on the first content data is N3, the number of times that object 4 performs an operation on the first content data is N4, and the number of times that object 5 performs an operation on the first content data is N5. Thus, N1 to N5 can indicate the interaction information between the five display objects and the first content data. In some examples, the interaction information can also be scaled according to a duration of operation that each display object performs on the first content data.

[00191] At step 503, a statistical analysis of the attention information on the first content data is performed based on the attention information between the at least one display object and the first content data.

[00192] Following step 502, different attention information can be used as information of different dimensions to provide important references for subsequent information recommendation. Therefore, a statistical analysis of at least the following attention information on the first content data may be performed based on the

interaction information between the at least one display object and the first content data: a number of people corresponding to each of different interaction frequencies.

[00193] In an example, in a statistical period (for example, 3 hours), a statistical analysis of the attention information on information 1 is performed, and the following information is obtained: a number of people who interact with information 1 within a first frequency range is 6, and a number of people who interact with information 1 within a second frequency range is 25.

[00194] In the embodiments of the present disclosure, the interaction information of the display object can be obtained directly through the display device or a remote control device without additional device to assist, so it is convenient and quick to implement, and the cost is low. The interaction information can accurately indicate the attention information. Using such attention information as a reference for subsequent recommendation information can achieve more accurate recommendation of information, which is more complied with the demands of the display object, thereby significantly improving the exposure effect of the recommendation information.

[00195] FIG. 6 illustrates a first structural composition of an apparatus for processing attention information according to some embodiments of the application. As shown in FIG. 6, the apparatus for processing attention information includes:

[00196] a displaying unit 601 configured to display first content data;

[00197] an obtaining unit 602 configured to obtain feature information of at least one display object;

[00198] a determining unit 603 configured to determine attention information between the at least one display object and the first content data based on the feature information of the at least one display object; and

[00199] a statistic unit 604 configured to perform a statistical analysis of the attention information on the first content data based on the attention information between the at least one display object and the first content data.

[00200] Those skilled in the art should understand that the implementation functions of each unit in the apparatus for processing attention information shown in FIG. 6 can be understood with reference to the relevant description of the aforementioned method for process attention information. The function of each unit in the apparatus for processing attention information shown in FIG. 6 can be realized by a program running on the processor, or can be realized by a specific logic circuit.

[00201] FIG. 7 illustrates a second structural composition of an apparatus for processing attention information according to some embodiments of the application. As shown in FIG. 7, the apparatus for processing attention information includes:

[00202] a displaying unit 601 configured to display first content data;

[00203] an obtaining unit 602 configured to obtain feature information of at least one display object;

[00204] a determining unit 603 configured to determine attention information between the at least one display object and the first content data based on the feature information of the at least one display object; and

[00205] a statistic unit 604 configured to perform a statistical analysis of the attention information on the first content data based on the attention information between the at least one display object and the first content data.

[00206] In an embodiment, the apparatus further includes:

[00207] a recommendation unit 605 configured to determine, based on the statistical result of the attention information, second content data to be recommended;

[00208] the displaying unit 601 is further configured to display the second content data.

[00209] In an embodiment, the obtaining unit 602 is configured to obtain line-of-sight direction information of the at least one display object;

[00210] the determining unit 603 is configured to determine attention information between the at least one display object and the first content data based on the line-of-sight direction information of the at least one display object.

[00211] In an embodiment, the attention information includes: indication information for indicating whether the display object pays attention to the first content data; the determining unit 603 includes:

[00212] a first determining sub-unit 6031 configured to determine, based on the line-of-sight direction information of the at least one display object, whether a line-of-sight of the at least one display object falls into a first display area, the first display area indicates an area for displaying the first content data on a display device; for a display object whose line-of-sight falls into the first display area, the indication information corresponding to the display object is set to indicate that the display object pays attention to the first content data; for a display object whose line-of-sight does not fall into the first display area, the indication information corresponding to the display object is set to indicate that the display object does not pay attention to the first content data.

[00213] In an embodiment, the attention information further includes: the degree of attention that the display object pays to the first content data; the determining unit 603 further includes:

[00214] a second determining sub-unit 6032 configured to, for a display object whose

line-of-sight falls into the first display area, determine, based on the line-of-sight direction information of the display object, a target position of the line-of-sight of the display object projected on the first display area, and determine the degree of attention that the display object pays to the first content data based on a positional relationship of the target position with the first display area.

[00215] In an embodiment, the attention information further includes: duration of attention that the display object pays to the first content data; the determining unit 603 further includes:

[00216] a third determining sub-unit 6033 configured to, for a display object whose line-of-sight falls into the first display area, perform a statistical analysis of the duration for which the line-of-sight of the display object falls into the first display area and determine, based on the statistical result of the duration, the duration of attention that the display object pays to the first content data.

[00217] In an embodiment, the obtaining unit 602 includes:

[00218] an obtaining sub-unit 6021 configured to obtain eyeball angle information and head posture information of the at least one display object; and

[00219] a determining sub-unit 6022 configured to determine the line-of-sight direction information of the at least one display object based on the eyeball angle information and the head posture information of the at least one display object.

[00220] In an embodiment, the obtaining sub-unit 6021 is configured to:

[00221] obtain an image of the at least one display object;

[00222] obtain the eyeball angle information of the at least one display object by processing the image of the at least one display object with a first neural network; and

[00223] obtain the head posture information of the at least one display object by

processing the image of the at least one display object with a second neural network;

[00224] In an embodiment, the statistic unit 604 is configured to perform a statistical analysis, based on the attention information between the at least one display object and the first content data, of at least one of the following attention information on the first content data: a number of people who pay attention to the first content data, a number of people corresponding to each of different degrees of attention, a number of people corresponding to each of different durations of attention.

[00225] In an embodiment, the obtaining unit 602 is configured to obtain geographic location information of the at least one display object;

[00226] the determining unit 603 is configured to determine, based on the geographic location information of the at least one display object, the attention information between the at least one display object and the first content data.

[00227] In an embodiment, the attention information includes: indication information for indicating whether the display object pays attention to the first content data; the determining unit 603 includes:

[00228] a fourth determining sub-unit 6034 configured to determine, based on the geographic location information of the at least one display object, whether a position of the at least one display object falls into a first area range, the first area range is determined based on a position of the display device; for a display object whose position falls into the first area range, the indication information corresponding to the display object is set to indicate that the display object pays attention to the first content data; for a display object whose position does not fall into the first area range, the indication information corresponding to the display object is set to indicate that the display object does not pay attention to the first content data.

[00229] In an embodiment, the attention information further includes: duration of attention that the display object pays to the first content data; the determining unit 603 includes:

[00230] a fifth determining sub-unit 6035 configured to, for a display object whose position falls into the first area range, perform a statistical analysis of a duration for which the position of the display object falls into the first area range and determine, based on the statistical result of the duration, the duration of attention that the display object pays to the first content data.

[00231] In an embodiment, the statistic unit 604 is configured to performing a statistical analysis, based on the attention information between the at least one display object and the first content data, of at least one of the following attention information on the first content data: a number of people who pay attention to the first content data, a number of people corresponding to each of different durations of attention.

[00232] In an embodiment, the obtaining unit 602 is configured to obtain interaction information between the at least one display object and the first content data.

[00233] The determining unit 603 is configured to determine the attention information between the at least one display object and the first content data based on the interaction information between the at least one display object and the first content data.

[00234] In an embodiment, the statistic unit 604 is configured to performing a statistical analysis of the following attention information on the first content data based on the attention information between the at least one display object and the first content data: numbers of people corresponding to different interaction frequencies.

[00235] Those skilled in the art should understand that the implementation functions

of each unit in the apparatus for processing attention information shown in FIG. 7 can be understood with reference to the relevant description of the aforementioned method for process attention information. The function of each unit in the apparatus for processing attention information shown in FIG. 7 can be realized by a program running on the processor, or can be realized by a specific logic circuit.

[00236] Embodiments of the present disclosure further provide an electronic device, for example, a mobile terminal, a personal computer (PC), a tablet computer, a server, and the like. FIG.8 illustrates a schematic diagram of a structure of an embodiment of electronic device according to some embodiments of the present disclosure. Referring to FIG. 8, which illustrates a schematic diagram of a structure of an electronic device 1500 suitable for implementing a display device or a server according to an embodiment of the present disclosure: as shown in FIG. 8, the electronic device 1500 includes one or more processors and communication units, etc. The one or more processors may be, for example, one or more central processing units (CPU) 1501 and/or one or more graphics processing units (GPU) 1513, etc. The processor may perform various appropriate actions and processes according to executable instructions stored in read-only memory (ROM) 1502 or executable instructions loaded from storage 1508 into random access memory (RAM) 1503. Communication unit 1512 may include, but is not limited to, a network card, and the network card may include, but is not limited to, an Infiniband (IB) network card. The processor may communicate with the read-only memory 1502 and/or the random access memory 1503 to execute executable instructions, connect with the communication unit 1512 via a bus 1504, and communicate with other target devices via the communication unit 1512, thereby completing the operation corresponding to any

method provided by the embodiments of the present disclosure.

[00237] In addition, the RAM 1503 may also store various programs and data required for the operations of the electronic device. The CPU 1501, ROM 1502, and RAM 1503 are connected to each other through the bus 1504. In the case where the RAM 1503 is present, the ROM 1502 is an optional module. The RAM 1503 stores executable instructions, or writes the executable instructions into the ROM 1502 at runtime, and the executable instructions cause the processor 1501 to execute an operation corresponding to the foregoing communication method. An input/output (I/O) interface 1505 is also connected to the bus 1504. The communication unit 1512 may be integrally arranged, or may be arranged to have a plurality of sub-modules (for example, a plurality of IB network cards) and connected to a bus link.

[00238] The following components are connected to the I/O interface 1505: an input section 1506 including a keyboard, a mouse, etc. an output section 1507 such as a cathode ray tube (CRT), a liquid crystal display (LCD), and the like, and a speaker; a storage 1508 including a hard disk or the like, and a communication section1509 including a network interface card such as a LAN card, a modem or the like. The communication section 1509 performs communication processing via a network such as the Internet. A driver 1510 is also connected to the I/O interface 1505 as needed. A removable medium 1511, such as a magnetic disk, an optical disk, a magneto-optical disk, a semiconductor memory, etc., is installed on the driver 1510 as needed, so that the computer program read therefrom is installed into the storage 1508 as needed.

[00239] It should be noted that the structure shown in FIG. 8 is merely an optional implementation, and during specific practice, the number and type of the components shown in FIG. 8 may be selected, deleted, added or replaced according to actual needs.

Implementations such as separation setting or integration setting may also be adopted on different functional component settings, for example, the GPU and the CPU may be separately set or the GPU may be integrated on the CPU, the communication section may be separately set, or may be integrated on the CPU or the GPU, etc. These alternative embodiments all belong to the scope of protection disclosed herein.

[00240] In particular, according to embodiments of the present disclosure, the processes described above with reference to the flowcharts may be implemented as computer software programs. For example, embodiments of the present disclosure include a computer program product including a computer program tangibly contained on a machine readable medium, the computer program including program code for executing the method shown in the flowchart, and the program code may include instructions corresponding to the method steps provided in the embodiments of the present disclosure. In such embodiments, the computer program may be downloaded and installed from the network through the communication section 1509 and/or installed from the removable medium 1511. When the computer program is executed by the central processing unit (CPU) 1501, the described functions defined in the methods of the present disclosure are executed.

[00241] Various embodiments in the present description are described in a progressive manner, and the emphasizing description of each embodiment is different from the other embodiments, and the same or similar parts between various embodiments may be referred to for each other. For the apparatus and system embodiments, since the apparatus substantially corresponds to the method embodiments, the description is relatively simple, and reference may be made to some of the description of the method embodiments.

[00242] The methods, apparatuses and systems of the present application may be implemented in various ways. For example, the methods, apparatuses and systems of the present disclosure may be implemented by software, hardware, firmware, or any combination of software, hardware, firmware. The above-mentioned order of the steps for the methods is merely for illustration, and the steps of the methods of the present disclosure are not limited to the order specifically described above, unless specifically stated otherwise. Furthermore, in some embodiments, the present disclosure can also be embodied as programs recorded in a recording medium, including machine-readable instructions for implementing the methods according to the present disclosure. Accordingly, the present disclosure also covers a recording medium storing a program for executing the methods according to the present disclosure.

[00243] The description of the present disclosure is given for purposes of example and description and is not missing or limiting the present disclosure to the disclosed forms. Many modifications and variations will be apparent to those skilled in the art. The embodiments are chosen and described in order to better illustrate the principles and practical applications of the present disclosure, and to enable those skilled in the art to understand the present disclosure in order to design various embodiments with various modifications suitable for a particular use.

CLAIMS

1. A method for processing attention information, comprising:

displaying first content data;

obtaining feature information of at least one display object;

determining attention information between the at least one display object and the first content data based on the feature information of the at least one display object; and

performing a statistical analysis of the attention information on the first content data based on the attention information between the at least one display object and the first content data.

2. The method of claim 1, further comprising:

determining, based on the statistical result of the attention information, second content data to be recommended; and

displaying the second content data.

3. The method of claim 1, wherein obtaining feature information of the at least one display object and determining the attention information between the at least one display object and the first content data based on the feature information of the at least one display object comprises:

obtaining line-of-sight direction information of the at least one display object; and

determining the attention information between the at least one display object and the first content data based on the line-of-sight direction information of the at least one display object.

4. The method of claim 3, wherein

the attention information comprises indication information for indicating whether the display object pays attention to the first content data;

determining the attention information between the at least one display object and the first content data based on the line-of-sight direction information of the at least one display object comprises:

determining, based on the line-of-sight direction information of the at least one display object, whether a line-of-sight of the at least one display object falls into a first display area, the first display area indicates an area for displaying the first content data on a display device.

5. The method of claim 4, wherein,

for a display object whose line-of-sight falls into the first display area, the indication information corresponding to the display object is set to indicate that the display object pays attention to the first content data;

for a display object whose line-of-sight does not fall into the first display area, the indication information corresponding to the display object is set to indicate that the display object does not pay attention to the first content data.

6. The method of claim 4 or 5, wherein

the attention information further comprises a degree of attention that the display object pays to the first content data;

determining the attention information between the at least one display object and

the first content data based on the line-of-sight direction information of the at least one display object further comprises:

for a display object whose line-of-sight falls into the first display area,

determining, based on the line-of-sight direction information of the display object, a target position where the line-of-sight of the display object is projected on the first display area, and

determining the degree of attention that the display object pays to the first content data based on a positional relationship of the target position with the first display area.

7. The method of claim 4 for 5, wherein

the attention information further comprises a duration of attention that the display object pays to the first content data;

determining the attention information between the at least one display object and the first content data based on the line-of-sight direction information of the at least one display object further comprises:

for a display object whose line-of-sight falls into the first display area,

performing a statistical analysis of a duration for which the line-of-sight of the display object falls into the first display area and

determining, based on the statistical result of the duration, the duration of attention that the display object pays to the first content data.

8. The method of any one of claims 3-7, wherein obtaining the line-of-sight information of the at least one display object comprises:

obtaining eyeball angle information and head posture information of the at least one display object; and

determining the line-of-sight direction information of the at least one display object based on the eyeball angle information and the head posture information of the at least one display object.

9. The method of claim 8, wherein obtaining the eyeball angle information and the head posture information of the at least one display object comprises:

obtaining an image of the at least one display object;

obtaining the eyeball angle information of the at least one display object by processing the image of the at least one display object with a first neural network; and

obtaining the head posture information of the at least one display object by processing the image of the at least one display object with a second neural network.

10. The method of any one of claims 3-9, wherein performing a statistical analysis of the attention information on the first content data based on the attention information between the at least one display object and the first content data comprises:

performing a statistical analysis, based on the attention information between the at least one display object and the first content data, of at least one of following attention information on the first content data:

a number of people who pay attention to the first content data,

a number of people corresponding to each of different degrees of attention,

a number of people corresponding to each of different durations of attention.

11. The method of claim 1, wherein obtaining the feature information of the at least one display object and determining the attention information between the at least one display object and the first content data based on the feature information of the at least one display object comprises:

obtaining geographic location information of the at least one display object, and

determining, based on the geographic location information of the at least one display object, the attention information between the at least one display object and the first content data.

12. The method of claim 11, wherein

the attention information comprises indication information for indicating whether the display object pays attention to the first content data;

determining the attention information between the at least one display object and the first content data based on the line-of-sight direction information of the at least one display object comprises:

determining, based on the geographic location information of the at least one display object, whether a position of the at least one display object falls into a first area range, the first area range is determined based on a position of a display device.

13. The method of claim 12, wherein,

for a display object whose position falls into the first area range, the indication information corresponding to the display object is set to indicate that the display

object pays attention to the first content data;

for a display object whose position does not fall into the first area range, the indication information corresponding to the display object is set to indicate that the display object does not pay attention to the first content data.

14. The method of claim 12 for 13, wherein

the attention information further comprises a duration of attention that the display object pays to the first content data;

determining, based on the geographic location information of the at least one display object, the attention information between the at least one display object and the first content data further comprises:

for a display object whose position falls into the first area range,

performing a statistical analysis of a duration for which the position of the display object falls into the first area range and

determining, based on the statistical result of the duration, the duration of attention that the display object pays to the first content data.

15. The method of any of claims 11-14, wherein performing a statistical analysis of the attention information on the first content data based on the attention information between the at least one display object and the first content data comprises:

performing a statistical analysis, based on the attention information between the at least one display object and the first content data, of at least one of following attention information on the first content data:

a number of people who pay attention to the first content data,

a number of people corresponding to each of different durations of attention.

16. The method of claim 1, wherein obtaining the feature information of the at least one display object and determining the attention information between the at least one display object and the first content data based on the feature information of the at least one display object comprises:

obtaining interaction information between the at least one display object and the first content data, and

determining the attention information between the at least one display object and the first content data based on the interaction information between the at least one display object and the first content data.

17. The method of claim 16, wherein performing a statistical analysis of the attention information on the first content data based on the attention information between the at least one display object and the first content data comprises:

performing a statistical analysis, based on the attention information between the at least one display object and the first content data, of the following attention information on the first content data:

a number of people corresponding to each of different interaction frequencies.

18. A storage medium storing executable instructions, wherein the instructions are executed by a processor to cause the processor to implement the method of any of

claims 1 to 17.

19. An electronic device, comprising:

a memory configured to store executable instructions; and

a processor configured to communicate with the memory to execute the executable instructions to implement the method of any of claims 1 to 17.