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(54) Title: WEBSITE EVALUATION TOOL
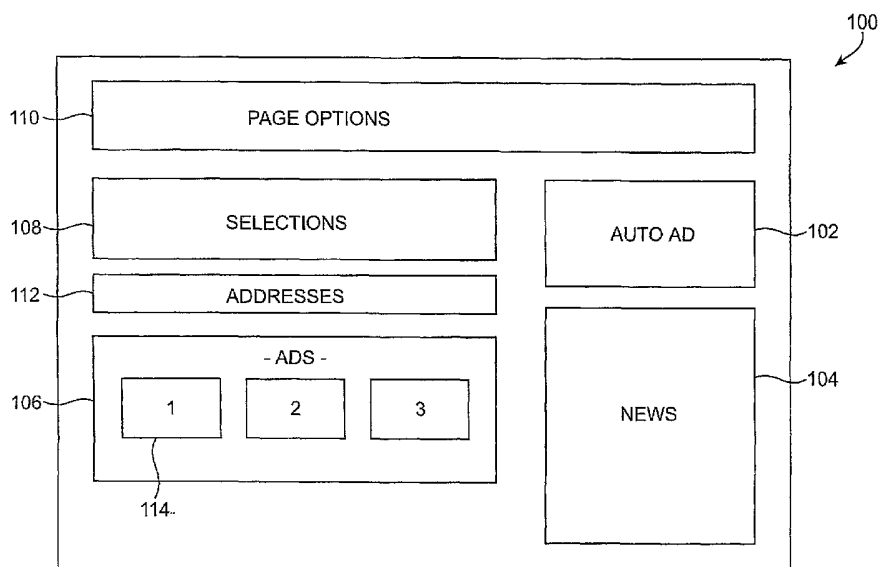
(57) Abstract: Embodiments of the invention provide a method and apparatus for determining user interactions with specific content on a content page. The method includes tracking eye movement of the user with an eye tracking device, determining a location on the content page that the user is viewing from the monitored eye movements, storing data representative of the tracking or determined location in a database, and analyzing the data to determine a most viewed area on the content page. The apparatus includes an eye tracker, a content display apparatus, and a computer configured to control the operation of the tracker and display, while also running algorithms configured to extract user fixation information from eye tracking data to determine a most viewed area on the content page.

TITLE OF THE INVENTION:

WEBSITE EVALUATION TOOL

CROSS REFERENCE TO RELATED APPLICATIONS:

This application claims priority under 35 U.S.C. §119 to United States Provisional Application Serial No. 60/669,807, which was filed on April 7, 2005, the contents of which are hereby incorporated by reference into the present application.

BACKGROUND OF THE INVENTION:

Field of the Invention:

Embodiments of the invention relate to a method for measuring and evaluating user interaction with electronically presented content.

Description of the Related Art:

The Internet presents a plethora of advertising options to users, including fixed icon sponsorship advertisements, rotating banners, buttons, interstitial advertisements, pop-ups, etc., all of which contribute to the success of online advertising. The rapid and sometimes volatile growth of the online advertising industry over the last several years, along with an increasing cost associated with online advertising, has created a demand for information correlating advertising spending to actual customer exposure.

Conventional methods of correlating or tracking advertising spending to customer exposure have been based on a "click count." A click count is a method of tracking each advertisement or site that a user selects or clicks on. However, simply tracking what sites or advertisements that a user clicks is not an accurate representation of the exposure that the advertiser is getting. For example, an advertiser may present an online banner to a user, and the user may read the entire banner, but not click on the banner for whatever reason. In this situation, the click

count method will not record any statistics, as the user didn't actually click on the banner. However, since the user actually read the entire banner, the advertiser has received unrecorded value from the banner, despite the lack of indication by the click index data.

Therefore, there is a need for an accurate method for tracking user views of online advertising that is not click based.

SUMMARY OF THE INVENTION:

Embodiments of the invention generally provide a method for tracking and analyzing user interaction with content, which is generally web content. The method of the invention generally monitors the areas within content that a user views. The method of the invention may further monitor the duration that a user views a particular area of content, the pattern or order that a user views content, and the dilation of the user's eyes when viewing specific areas of content. The method may further include storing the monitored metrics (metrics generally refers to all of the monitored parameters of the method) in a data file for future analysis. The method further includes applying one or more algorithms to sections of the data file to analyze selected metrics, and further, the method may include presenting results of the analysis to a user of the method.

Embodiments of the invention may further provide a software program configured to control a process that may include capturing data representative of user interaction with content, storing the captured data, and analyzing the data to extract information representative of metrics for user interaction with content.

Embodiments of the invention may further provide a method for determining user interactions with specific content on a content page. The method includes tracking eye movement of the user with an eye tracking device, determining a location on the content page that the user is viewing from the monitored eye movements, storing data representative of the tracking or determined locations in a database, and analyzing the data to determine a most viewed area on the content page.

Embodiments of the invention may further provide a computer program embodied on a computer readable medium, that when executed by a processor, is configured to control a process that includes tracking eye movement of a user with an eye tracking device, determining a location on the content page that the user is viewing from the monitored eye movements, storing data representative of the tracking or determined location in a database, and analyzing at least a portion of the data to determine a most viewed area on the content page.

Embodiments of the invention may further provide an apparatus for determining a space on a content page where a viewer is most likely to view. The apparatus includes an eye position tracking device positioned proximate a content page display device, and a computer configured to provide content to the display device. The computer is also generally configured to simultaneously receive information from the tracking device that is representative of eye movement of the user, to determine a locations on the content page that the user is viewing from the information representative of eye movements, and to analyze the determined locations to determine at least a most viewed area on the content page.

Embodiments of the invention may further provide a method for determining a most viewed advertising space on a web content page. The method includes tracking eye movements of a user viewing the content page, correlating the tracked eye movements with calibration data to determine locations on the content page that the user is looking at for specific times, storing data representative of each location on the content page that the user looked at, and analyzing the data to determine a location on the content page that the user looked at more than any other location on the content page.

BRIEF DESCRIPTION OF THE DRAWINGS:

For proper understanding of the invention, reference should be made to the accompanying drawings, wherein:

Figure 1 illustrates an exemplary content page that is analyzed by an embodiment of the invention;

Figure 2 illustrates an exemplary hardware configuration of an embodiment of the invention;

Figure 3 illustrates an exemplary content page of the invention; and

Figure 4 illustrates a flowchart of an exemplary method of tracking and analyzing user interaction with a content page the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S):

The present invention generally provides a method for tracking and analyzing user interaction with web advertising content. Interaction, as described herein, generally refers to areas, spaces, locations, or blocks on a content page that a user views or looks at on a content page. Interaction also includes mouse overs and clicks, although the majority of the interaction measured by the present invention involves what a user views or looks at as compared to what a user clicks on or mouses over. Generally speaking, the method includes monitoring a user's interaction with a predetermined content page, storing data representative of the user's interaction with the content page, analyzing the data for information representative of a measure of brand advertising, and presenting the information to a user of the method.

The process of monitoring a user's interaction with advertising content is generally a two stage process. One stage of the process generally includes setting up the page or pages that the user views. Specifically, Figure 1 illustrates an exemplary content page 100, which has several exemplary content areas 102-112. Each individual content area 102-112 may be defined as a specific area at specific coordinates of the total page area. Another stage of the process generally includes physically monitoring a user's interaction with the content page 100, and more particularly, the user's interaction with the individual content areas 102-112. The monitoring information may be stored in a

data file and then analyzed by a one or more selected algorithms to parse out specified metrics related to the user's interaction with the content page 100.

The step of setting up the content page 100 generally includes defining the specific page area for each individual content portion of the page. For example, the setting up process for the exemplary content page 100 generally includes defining the advertising spaces on the page, *i.e.*, space 102, which happens to be an automobile advertisement in the exemplary content page of Figure 1, would be defined by the position and area of the advertisement on the content page 100. Each space may be defined, for example, by an origin and an area, *e.g.*, in the situation where the area is a square or rectangle, then the position of an upper left hand corner may be defined as a coordinate pair and the total area of the rectangle may be specified and applied to the origin coordinate pair to define the position of the space on the content page.

Regardless of the shape, position, or size of the space on the content page 100, the process of defining the space on the content page includes defining a perimeter of each of the individual spaces 102-112 within the content page 100. Additionally, in some embodiments of the invention, one or more additional spaces or perimeters may be defined within a larger perimeter. For example, space 106 includes several different advertisements, and the perimeter defined for space 106 may include all of the advertisements; however, a secondary perimeter or space 114 may also be defined within space 106. Secondary space 114 may, for example, represent a specific product advertisement, and a second perimeter may be defined to encompass space 114, where the second perimeter is within the perimeter defined by space 106.

The second stage of the monitoring process generally includes acquiring the data representative of the user's interaction with the content page 100. The data may be acquired either before or after the content page is mapped to determine the area and position of each content space 102-112 on the page. In order to monitor a user's interaction with a content page, an electronic eye tracker may generally be employed. One example of an eye tracker is a Tobii series 1750ET, which is a high quality eye

tracking device that is configured to measure eye movement without interfering with the user or the user environment. The 1750ET is integrated into a computer monitor that is configured to present content pages to the user via a CPU. The 1750 ET tracker is accurate to within about 0.5° with a spatial resolution of about 0.25° and a drift of less than about 1°. The capture rate of the 1750 is generally about 50 frames per second.

Figure 2 illustrates an exemplary hardware configuration of an embodiment of the invention. The exemplary tracking system 200 of the invention includes a computer monitor 202 that is configured to display content pages 204 and that has in eye tracking device 206 integrated therein. The eye tracking device 206 is generally configured to monitor an eye 208 of a user to determine what areas of the content page 204 the use is looking at a particular time. The tracking of the eye movement is generally accomplished by taking a camera image 210 about 50 times a second. The recorded image of the eye 208 is then used with eye calibration data to correlate movement of the eye 208 with the position that is being looked at on the content page 204. The calibration data is generally set up or acquired before the monitoring process begins and generally includes the process of the tracking device 206 learning the movement characteristics of the eye 208 of the individual user. In an exemplary calibration process, a dot appears in different positions on the screen 202 and the user views the dot in the different positions while the eye movement is recorded. The correlation between measured eye position and the position of the dot on the screen in the calibration process allow a computer to determine what location on the screen the user is looking at. Depending on calibration options, this process will generally takes between about 5 to about 60 seconds. The calibration procedure is generally fully automatic, and is configured to filter out bad calibration points and requires no manual data adjustment. The calibration process also generally provides indications of the resulting calibration quality. The monitor 202 and tracking device 206 are generally in communication with a computer or CPU 212 via a communication link 216, which may be hard wired or wireless. The computer 212 may also be in communication with a network 214 of other computers, servers, or online content pages, for example.

The actual monitoring or data acquisition process generally includes presenting a user with a content page 300, as illustrated in Figure 3, and tracking where, how long, and in what order the user views the individual advertising content spaces 302A-D of the content page 300. For example, in a monitoring process, the user may first view an undefined (non advertising) area 304, which is generally not of concern to advertisers. Then user may then view area 302C for a period of time, which is denoted by 306. Since area 302C is an advertising area, the metrics of the users viewing of the space 302C is measured by the eye monitoring device. Specifically, the eye monitoring device will generally be configured to measure the user's dwell time (the time the user spent looking at area 302C and the user's pupil dilation while viewing area 302C.

At some point in time, the user stops looking at area 302C and looks at another area on the screen. The next area viewed by the user may be an advertising area or it may not be. In this present example, the next area or space that the user looks at is area 302A, as indicated by 308. In similar fashion to the monitoring and recording process used when the user viewed area 302C above, the eye monitoring device will capture and record the dwell time and dilation of the user's eyes while viewing area 302A. Additionally, since area 302 A is the second area viewed by the user on the content page 300, the eye monitoring device also records the order or pattern in which the user views the areas 302A-D on the content page 300. At step 310, the eye tracking device of the invention records that the user looked at a non-advertising space for a specific period of time. At step 312, the eye tracking device records that the user looked at the advertisement contained in space 302B for a period of time, along with the user's pupil dilation during the time while the user is looking at space 302B.

The data representing each step of the user's interaction with the content page 300 is recorded and stored by the eye tracking device of the invention. Specifically, in an embodiment of the invention, the data recorded by the eye tracking device 206 is transmitted to the CPU 212. The CPU 212 then stores the data in a memory (not shown), which may be a hard drive or other local memory device, or alternatively, the

CPU 212 may transmit the data to a remote location for storage via the network 214.

Once the data has been acquired by the eye tracking device and stored in a database, embodiments of the invention apply one or more selected algorithms to the data to extract specific metrics that are representative of desired brand advertising parameters. For example, an algorithm may be configured to determine the areas on the content page where the user's eyes spend the largest percentage of the time. In another algorithm, the data may be processed to determine the most probable pattern for eye movement around a content page, *i.e.*, where does the user's eye travel first, second, third, etc. Other parameters that may be extracted by various algorithms include, but are not limited to, fixations, dwell time, the order in which areas are viewed, the time spent viewing each individual area, the time spent viewing content outside the measured areas, pupil dilation for each area or page, the time to the first fixation, and/or the content that the user clicks on or that the user mouse over compared to the content that the user fixes on visually.

Figure 4 illustrates a flowchart of an exemplary method of tracking and analyzing user interaction with a content page the invention. The exemplary method begins at step 400 and continues to step 402, where the tracking system of the invention is calibrated. The calibration process generally includes the user viewing several screens while the eye measurement and tracking apparatus records the eye movements. Specifically, a dot may be illuminated in the middle of the screen and the eye tracking device may measure the user's eye position. Thereafter, the screen may display dots in several other known positions of the screen and the eye tracking device may measure the user's eye position. This information may then be used to determine what location on the screen the user is viewing in subsequent pages.

When the calibration process is completed, the method continues to step 404, where the content pages (also called user stimuli) are prepared. This step is optional in embodiments of the invention where the user is not confined to specific pages for measurement. In embodiments of the invention where the user is presented with specific

content pages, this step is used to determine the advertisement space on the respective pages. The determination of advertising space generally includes determining the location, size, and perimeter of each advertising space, as described above. The set up process also includes defining the parameters for the fixations. For example, the duration of a fixation may be defined, *i.e.*, any user look at a particular area for more than 50ms constitutes a fixation. These parameters are variable and may generally be set by the user.

When the content pages are set up for monitoring, the method continues to step 406 where the user's interaction with the specific content pages is recorded. This step involves monitoring the eye movements of the user to determine what specific areas on the content page are being viewed, for how long, and in what order the areas are being viewed. The measurement or tracking process may be terminated when the user clicks on a new page or when a predetermined time period expires, for example. Additionally, the monitoring and recording process may include monitoring the pupil dilation of the user. The dilation of the user pupil may be used to determine how well the user comprehends the advertising space being viewed, *e.g.*, larger pupil size would generally represent that the user does not comprehend the area being viewed. Similarly, smaller pupil sizes would indicate that the user is not having a problem understanding or comprehending the advertisement being viewed. The dilation may also be used to determine how well a user comprehends or understands a site or content page as a whole, as compared to the individual ad spaces noted above.

Once the measurement process is completed at step 406, the method continues to step 408, where the recorded data is saved. Generally speaking, for a standard data collection over 20 or more content pages, for example, which may span several minutes or even possibly hours, the representative data file may generally be in the Giga byte size range. When the data is stored, then one or more selected algorithms may be applied to sections of the data to determine specific metrics related to the user's interaction with the content page. The algorithms are generally configured to view data representing a

specified time slice or number of content pages (that is much less than a Giga byte in size) and to process the selected data in to extrapolate one or more desired metrics. If desired, however, the method may analyze the entire data file, despite the file size. Once the measurement process is completed, the method continues to step 412, where the results of the analysis and algorithms are presented to the user for analysis. This information will generally indicate to the user of the method where the most looked at space on the content page is located. This information may be presented or sorted according to a number of parameters or metrics, including demographics of the users, for example. Once the information has been presented to the user, the method ends at step 414.

In embodiments of the invention, the data analysis may include an algorithm that filters the data analysis by the demographics of the users. More particularly, the analysis of user interaction with content may be filtered on multiple levels, including the demographics of the users that are generally input by the users at the time of viewing the content page. This allows advertisers to better place banners, pop-ups, etc. for their target audience, as the analysis information reveals what areas of what sites are looked at by a particular demographic of users. This type of information is not available through conventional click monitoring techniques.

In embodiments of the invention, the data may be analyzed with an algorithm that determines what areas on the page are most likely to be looked at by viewers. This information may be cross analyzed with other parameters, such as the type of the content being viewed, the demographics of the viewer, etc. to determine what areas of specific types of pages are the most looked at areas of the page, irrespective of the content in the particular areas. This information is valuable to advertisers, as the advertisers can determine what areas of a content page will provide the best exposure to a particular target audience.

In embodiments of the invention, the analysis method may be configured to be applicable to various types and configurations of content pages. For example, a content

page such as MSN.com is not set up the same way as CNN.com, as the advertising layout positions advertisements in different places between the respective pages. As such, the analysis method that is set up for one page will generally not be applicable to another page. However, embodiments the invention allow for application of the methodology of the invention to any content page through the initialization and/or calibration processes. More particularly, in the initialization process, the advertisement areas may be defined and stored, and as such, when the user wants to apply the method of the invention to another content page, the user simply runs the initialization process on the new content page to define the advertising areas. After this process is complete, the methodology of the invention will continue as generally described above. This allows the method of the invention to be applied to any content page. Additionally, the calibration process for the method of the invention may be used to determine which participants will be best suited for the method. For example, some users may not pay attention for long enough to get meaningful data, some participants may not scan the areas of the page like others do, etc. These types of participants may be eliminated from the tracking and analysis of the invention in the calibration process, as the information gleaned from these participants will generally not be helpful to advertisers.

In embodiments of the invention, the algorithms may generally be configured to analyze sections or specified slices of data. More particularly, the data file for an exemplary user interaction monitoring process will generally be on the order of Giga bytes in size, and as such, the practicality of analyzing this quantity of data is low. Thus, the method of the present invention operates to segment the data into smaller manageable files for analysis. Specifically, the data files may be segmented into time segments, segmented by content page, segmented by click, or another parameter that an advertiser desires to use to sort data into smaller, more manageable and analyzable data portions.

In embodiments of the invention, the user interactions with a content page may be recorded and analyzed real time, and the results of the analysis may be used to determine

content presented to the user on a subsequent content page. For example, a user viewing a first page A may have their fixations on page "A" monitored and then the content presented to the user on a new page "B" may be determined in accordance with the fixations from page "A". More particularly, if a user has a substantially higher fixation (or other metric) on page "A" with an advertisement for a new car verses an advertisement for a cell phone, then the advertising presented on page "B" may be adjusted dynamically to present more advertising to the user that is related to new cars. This allows the advertisers to maximize exposure to parties that are likely to be interested in their products based upon what advertisements the users are reading on a current page by presenting related advertisements to the users on subsequent pages.

Embodiments of the invention also provide a method for analyzing user interactions with a content page, where the analysis uses goals or goal driven tasks. For example, a user may be set up on a particular web site and specific tasks may be correlated with specific goals. Thus, the users may look at content pages differently based on task goals, and the measurement method of the invention may be configured to account for the task goal correlation in the measurements and data analysis. Embodiments of the invention also provide for tracking and analysis of goal independent and tracking independent searching.

Embodiments of the invention also operate the tracking and analysis method of the invention repeated times on a single web site. Since web site configurations regularly change, e.g., the positioning and layout of content regularly change on many sites, the perimeter of the monitored spaces will generally be adjusted as the site layout changes. Embodiments of the invention are configured to detect layout changes in content pages, adjust to the new layout of the content page, and continue monitoring and analyzing the user interaction with the new content page.

Embodiments of the invention are also configured to block out irrelevant data observed by the tracking device. More particularly, when a user is being monitored and moves from one page to another page, there is a non-measurement time between the

pages. Although the eye tracking device may continue to detect eye movements while the page is transitioning, the analysis portion of the invention may be configured to ignore the data associated with the page transition to insure the integrity of the analysis results, as the locations that the user looks at during page transitions are irrelevant to brand advertising measurement.

One having ordinary skill in the art will readily understand that the invention as discussed above may be practiced with steps in a different order, and/or with hardware elements in configurations which are different than those which are disclosed. Therefore, although the invention has been described based upon these preferred embodiments, it would be apparent to those of skill in the art that certain modifications, variations, and alternative constructions would be apparent, while remaining within the spirit and scope of the invention. In order to determine the metes and bounds of the invention, therefore, reference should be made to the appended claims.

WE CLAIM:

1.   A method for determining user interactions with specific content on a content page, the method comprising:

receiving eye tracking movement of the user captured with an eye tracking device in a computer;

determining a location on the content page that the user is viewing from the monitored eye movements;

storing data representative of the tracking or determined location in a database; and

analyzing the data to determine a most viewed area on the content page.

2.   The method of claim 1, wherein analyzing the data further comprises determining a number of user fixations on the determined location, determining a dwell time on the determined location, or determining a user's pupil dilation for a time period while the user is viewing the determined location.

3.   The method of claim 1, wherein determining a location on the content page comprises correlating the tracked eye movement to an eye position.

4.   The method of claim 3, further comprising correlating the eye position to a specific location that the user is looking at on the content page.

5.   The method of claim 1, wherein tracking eye movement of the user with an eye tracking device further comprises calibrating the eye tracking device to eyes of the user.

6.   The method of claim 5, wherein calibrating comprises:

displaying an image on a screen;

measuring a user eye position when the user is looking at the image; and

moving the image to various locations on the screen and repeating the measuring

of the eye position.

7.   The method of claim 2, analyzing the data further comprises determining an area on the content page where a user is most likely to look based upon the analyzed data.

8.   A computer program embodied on a computer readable medium, the computer program controlling a processor to control a process comprising the steps of:

receiving eye tracking movement information of a user, that was captured by an eye tracking device, in a computer;

determining a location on a content page that the user was viewing from the eye tracking movement information;

storing data representative of the tracking information or determined location in a database; and

analyzing the data to determine a most viewed area on the content page.

9.   The computer program of claim 8, wherein analyzing the data further comprises determining a number of user fixations on the determined location, determining a dwell time on the determined location, or determining a user pupil dilation for a time period while the user is viewing the determined location.

10.   The computer program of claim 8, wherein analyzing the data further comprises determining an area on the content page where a user is most likely to look based upon the analyzed data.

11.   An apparatus for determining a space on a content page where a viewer is most likely to view, comprising:

an eye position tracking device positioned proximate a content page display device; and

a computer configured to provide content to the display device, the computer

being configured to receive information from the tracking device that is representative of eye movement of the user, to determine a location on the content page that the user is viewing from the information representative of eye movements, and to analyze the determined locations to determine a most viewed area on the content page.

12.   The apparatus of claim 11, further comprising a communication network in communication with the computer, the communication network providing for control over the operation of the tracking and analysis from remote locations on the communication network.

13.   A method for determining a most viewed advertising space on a web content page, comprising:

tracking eye movements of a user viewing the content page;

correlating the tracked eye movements with calibration data to determine locations on the content page that the user is looking at for specific times;

storing data representative of each location on the content page that the user looked at; and

analyzing the data to determine a location on the content page that the user looked at more than any other location on the content page.

14.   The method of claim 13, wherein calibration data is obtained by displaying an image on a screen, measuring a user eye position when the user is looking at the image, and moving the image to various locations on the screen and repeating the measuring of the eye position to determine an eye position calibration for an eye tracking device.

15.   The method of claim 13, wherein analyzing the data further comprises determining a number of user fixations on the locations on the content page that the user is looking at, determining a dwell time on the locations on the content page that the user is looking at, determining an order of the locations on the content page that the user is

looking at, or determining a user pupil dilation for a time period while the user is viewing the locations on the content page that the user is looking at.

16. The method of claim 13, further comprising determining if the locations on the content page are advertising related.

17. The method of claim 16, wherein the calibration process further comprises defining a perimeter for each advertising location on the content page.

18. The method of claim 17, wherein the correlating the tracked eye movements with calibration data to determine locations on the content page that the user is looking at for specific times further comprises determining which advertising location the user looked at the most.

19. The method of claim 18, further comprising determining in which order the user viewed the respective advertising locations.

20 The method of claim 18, further comprising determining the user's pupil dilation while viewing each advertising location and correlating the pupil dilation to the user comprehending the advertising location.

21. An apparatus for determining a space on a content page where a viewer is most likely to view, comprising:

an eye position tracking means positioned proximate a content page display device; and

a data processing means configured to provide content to the display device, the data processing means being configured to receive information from the tracking device that is representative of eye movement of the user, to determine a location on the content page that the user is viewing from the information representative of eye movements, and
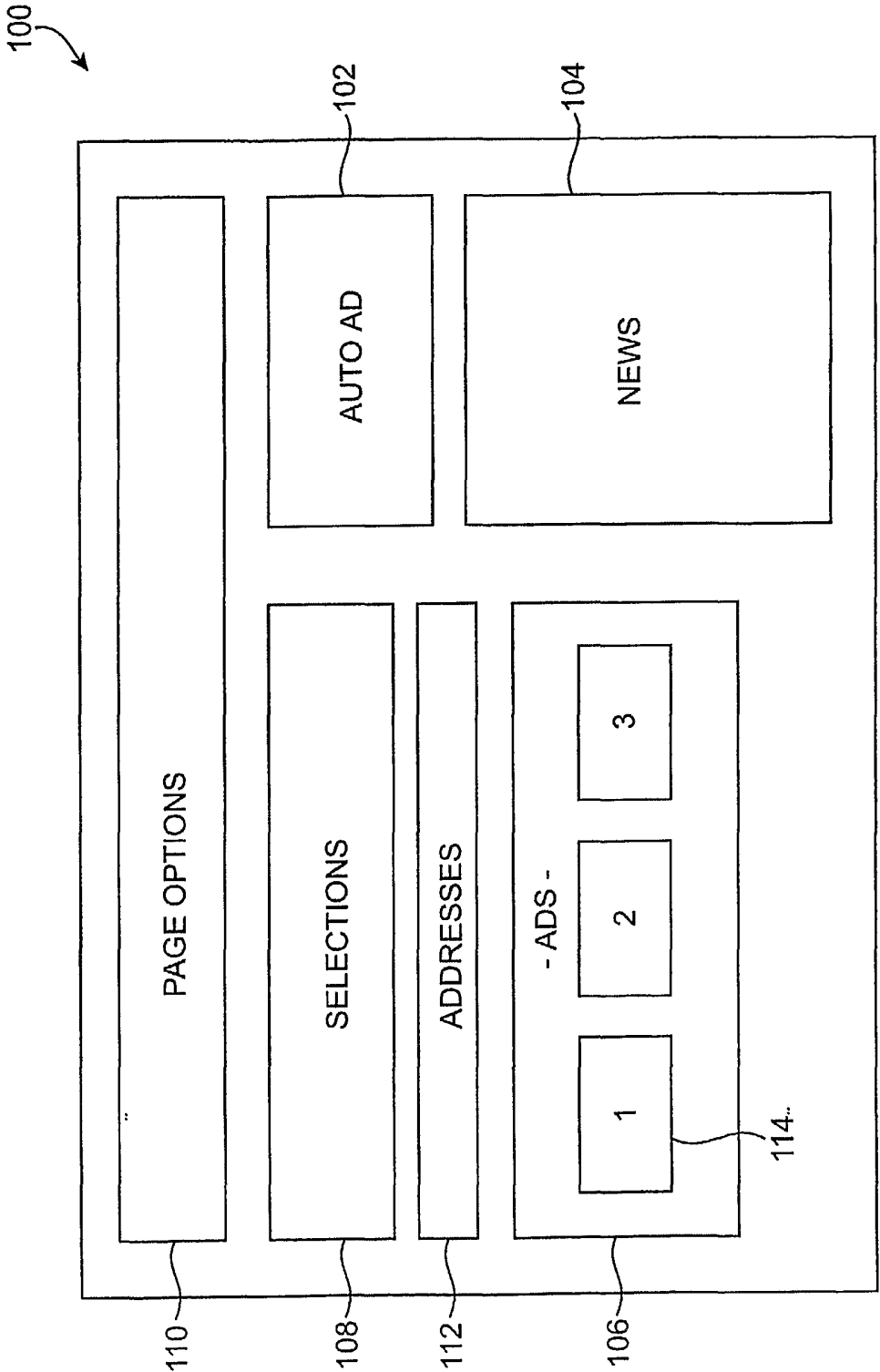
to analyze the determined locations to determine a most viewed area on the content page.
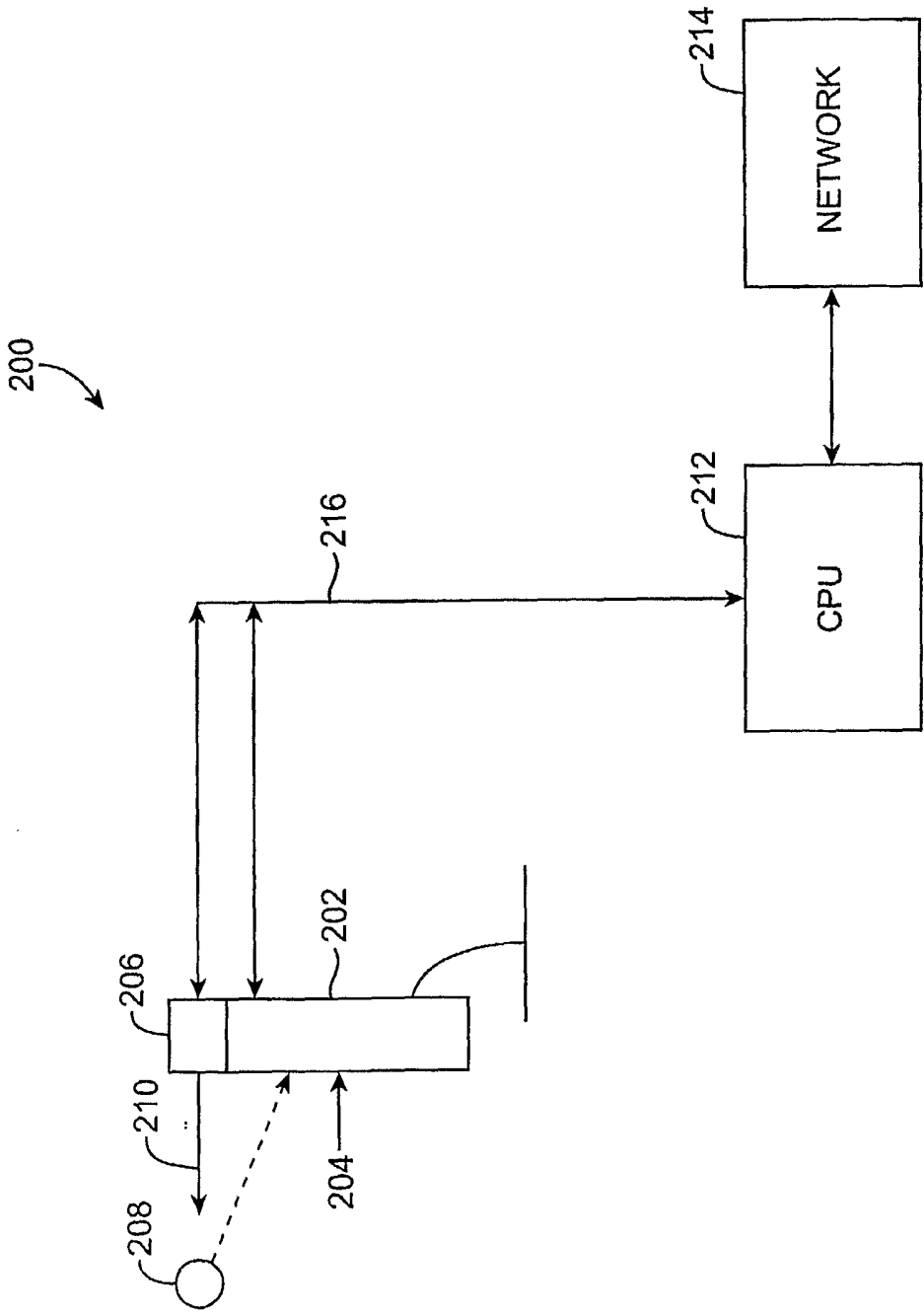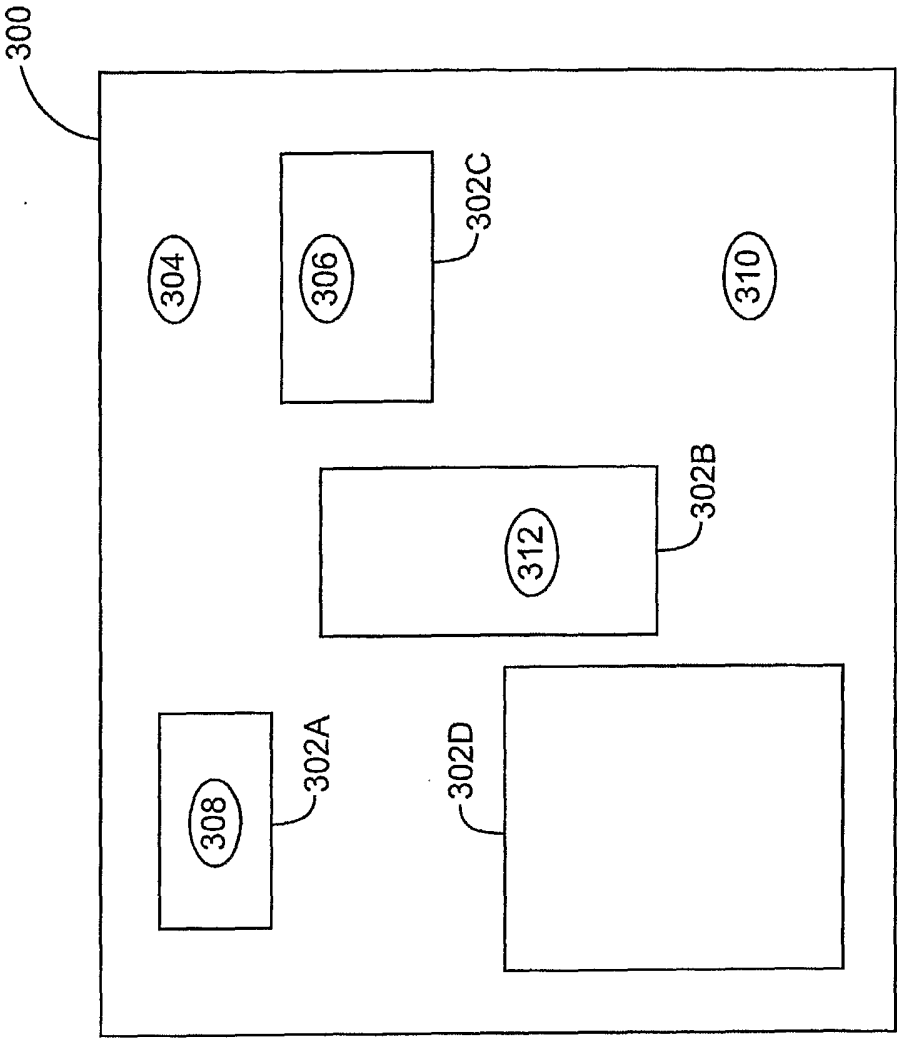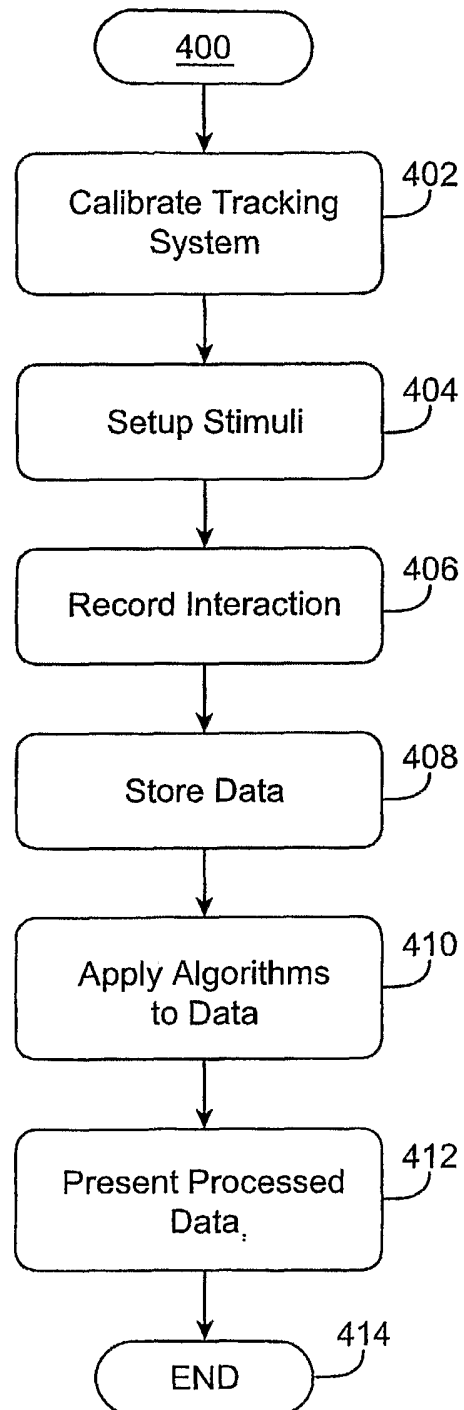
FIG. 1

FIG. 2

FIG. 3

FIG. 4