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(54) **Title:** IMPROVEMENTS RELATING TO DOCUMENT INTERACTION AND FEEDBACK
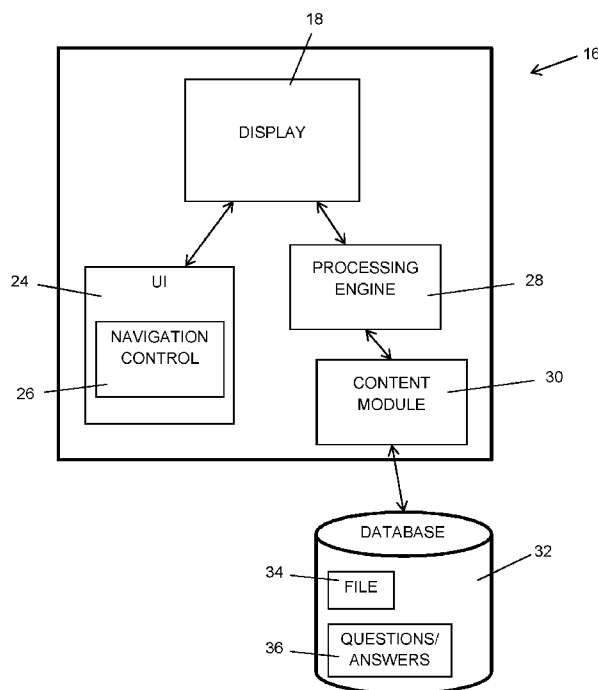
FIGURE 5

(57) **Abstract:** An interactive electronic document presenta-
tion device for displaying an electronic document is de-
scribed. The device comprises: a display for displaying a dis-
playable content portion of the electronic document; at least
one navigation control for controlling viewing of the display-
able content portion; and a content assimilation module for
eliciting user feedback regarding the displayable content por-
tion, wherein the content assimilation module comprises: an
active element detector for detecting user interaction with an
active element within a currently displayed content portion,
the active element having being previously embedded within
the electronic document;a question presentation module for
presenting a question to the user regarding the displayed con-
tent portion, the question requiring a data input response from
the user; and a comparator for comparing a received data in-
put response to the question with a predetermined correct an-
swer; wherein the content assimilation module is arranged to
disable the at least one navigation control on detection of user
interaction with the active element; and the device further
comprises an implementation module for releasing a further
portion of content of the electronic document in response to
receiving a correct answer in the data input response.

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Improvements Relating to Document Interaction and Feedback

Field of the Invention

[0001] The present invention concerns improvements relating to document interaction and feedback. In particular, but not exclusively, the invention concerns processes for monitoring user interaction with electronic documents and providing feedback as a security measure and/or an assessment mechanism to calculate customer absorption of the information in a secure manner.

Background to the Invention

[0002] There are many scenarios in which it is desirable to control the way in which a user interacts with an electronic document. In particular, the ability to control user interaction with an electronic document enables measures to be taken to ensure that the user has read and understood all parts of the document. Some other general reasons for controlling user interaction include ensuring that the user is not a program designed to masquerade as a human, or that the user is entitled to access the content of the document.

[0003] One example of a scenario in which it is important to ensure that content has been understood is in the context of children's education. Learning materials are routinely provided in electronic form for pupils to read using the display of a computer or tablet device. In current arrangements, questions are posed at the end of the text to test whether the child has properly read and understood the content of a document. If the child does not know the answer to a question, they must scroll a long way back into the document to locate the answer, or scour the entire document if the location of the answer is not known. This wastes time, particularly if the document is large, which can be disruptive to learning. It also places a technical burden as to the amount of data that is in "active" display or memory.

[0004] Similarly, advertisers seek to implement measures to ensure that the content of their advertisements is read fully and absorbed by target consumers, in order to maximize the impact of marketing initiatives. Electronic advertisements commonly include links to offers or prize draws which the user can click to activate. The intention behind providing such links is to encourage reading of the advertisement. However, the user need not read the entire advertisement in order to access the offer; as soon as they see the offer, they can click on the respective link and disregard the remainder of the advertisement.

[0005] A further example of a scenario in which control over viewing of a document would be an advantage is in the case of instructions for manufacturing or testing. When following such instructions, users tend towards a human temptation to skip ahead and find short-cuts to circumnavigate procedures. This can lead to mistakes, which if detected take time to rectify, and if undetected may present a hazard.

[0006] A well-known example of a means for controlling access to documents is a 'CAPTCHA' test, a type of challenge-response test in which a user is required to reproduce a series of alphanumeric characters presented in non-uniform format that software cannot read. Such tests are routinely implemented in order to prevent automatic downloading of documents and files by malicious third-party programs. Typically, the challenge is presented in a pop-up dialogue box which is triggered when the user clicks on a link.

[0007] There is no obvious way to apply the 'CAPTCHA' technique to the purpose of ensuring that the content of a document has been fully read and understood; it serves only to control access to the document.

[0008] Other examples or measures for controlling the viewing of electronic documents include requesting user confirmation of agreement to terms and conditions, and online quizzes in which users must answer correctly to progress. As above, these known measures are not readily adaptable for the purpose of ensuring that content of a document is absorbed: it is well known that users regularly accept online terms and conditions, for example by way of a clickwrap agreement, without reading them; and online quizzes test prior knowledge rather than knowledge absorbed from a particular document. This also places a technical limit as to where and when the quizzing terms appear. For example the provider may want to test only a relevant section in a large document, and thereafter a similar section elsewhere in the document.

[0009] It is against this background that the present invention has been devised.

Summary of the Invention

[0010] It is one object of the present invention to provide an improved means for controlling the viewing of content provided electronically, which overcomes or alleviates the aforementioned disadvantages known in the prior art. Accordingly, in a first aspect there is provided an interactive electronic document presentation device for displaying an electronic

document, the device comprising: a display for displaying a displayable content portion of the electronic document; at least one navigation control for controlling viewing of the displayable content portion; and a content assimilation module for eliciting user feedback regarding the displayable content portion, wherein the content assimilation module comprises: an active element detector for detecting user interaction with an active element within a currently displayed content portion, the active element having being previously embedded within the electronic document; a question presentation module for presenting a question to the user regarding the displayed content portion, the question requiring a data input response from the user; and a comparator for comparing a received data input response to the question with a predetermined correct answer; wherein the content assimilation module is arranged to disable the at least one navigation control on detection of user interaction with the active element; and the device further comprises an implementation module for releasing a further portion of content of the electronic document in response to receiving a correct answer in the data input response.

[0011] The content assimilation module may be arranged to present a question on the display for the user, in response to the active element detector detecting that the active element has been interacted with by the user.

[0012] User interaction with the active element may comprise the user attempting to use the at least one navigation control to read the next content portion of the document, or the user attempting to click or select the active element, or the user positioning a virtual pointer over the active element.

[0013] The content assimilation module may be arranged to at least partially enable the at least one navigation control in response to receiving a correct answer in the data input response.

[0014] The content assimilation means may be further arranged on active element detector detecting user interaction with the active element at a currently viewed location, to obscure the displayable content of the electronic document until the correct answer has been input by the user.

[0015] The question presentation module can be arranged to present a multiple-choice question regarding the content of the displayed content portion.

[0016] The active element may comprise a textual character, a portion of an image or a frame in a video data file.

[0017] On detection of user interaction with an active element, the question presentation module may be arranged to present a pop-up window with a plurality of multiple-choice questions regarding the currently displayed content portion.

[0018] The device may further comprise a communications module arranged to send a message to a remote server via a communications network. The message may comprise an entry into a future event, such as a prize draw or an update message for updating a file in a database, the file relating to the user. In this latter case, the communications module may also be arranged to receive a confirmation message from a remote server and the device can be arranged to present a notification of receipt of the confirmation to the display for the user.

[0019] The comparator can be arranged to use the communication module to request a correct answer to a presented question from a remote server or to send the received user input to a remote server for additional validation as a correct answer.

[0020] According to a second aspect of the present invention there is provided a method of displaying an interactive electronic document, the method comprising: displaying a displayable content portion of the electronic document; controlling viewing of the displayable content portion using a navigation control; and eliciting user feedback regarding the displayable content portion, wherein eliciting step comprises: detecting user interaction with an active element within a currently displayed portion; the active element having been previously embedded within the electronic document; presenting a question to the user regarding the displayed content portion, the question requiring a data input response from the user; receiving the data input response; and comparing the data input response with a predetermined correct answer; wherein the method further comprises: disabling the navigation control on detection of user interaction with the active element; and releasing a further portion of the content of the electronic document in response to receiving a correct answer in the data input response.

[0021] According to a further aspect of the present invention there is provided an electronic document viewing control mechanism, the mechanism comprising: a display means for displaying a portion of content of the electronic document on a display of a device; navigation control means of controlling at least one navigation control of the device; and content assimilation means for eliciting user feedback regarding the portion of content displayed, wherein the content assimilation means is arranged to: detect the presence of

user interaction with an active element within a currently viewed portion of the electronic document, the active element having been previously embedded within the electronic document; instruct the navigation control means to disable the at least one navigation control; present a question to the user regarding the portion of content displayed, the question requiring a data input response from the user; and receive the data input response; wherein the viewing control device further comprises: a comparator for comparing the data input response with a predetermined correct answer; and an implementation module for releasing a further portion of content of the electronic document in response to receiving a correct answer in the data input response.

[0022] It will be appreciated that preferred and/or optional features of the first aspect of the invention may be incorporated alone or in appropriate combination in the second aspect of the invention also.

Brief Description of the Drawings

[0023] In order that the invention may be more readily understood, preferred non-limiting embodiments thereof will now be described, by way of example only, with reference to the accompanying drawings, in which like features are assigned like reference numerals, and in which:

[0024] Figure 1 is a schematic illustration of an electronic text document containing active elements arranged to cooperate with viewing control mechanisms according to embodiments of the invention;

[0025] Figure 2 is a schematic illustration of a mobile device including a viewing control mechanism according to an embodiment of the invention, with a portion of the electronic document of Figure 1 displayed, the portion containing four segments defined by three active elements;

[0026] Figure 3a is a schematic illustration of the mobile device of Figure 2 with three segments of the document masked;

[0027] Figure 3b is a schematic illustration of the mobile device of Figure 2 with a pop-up window displayed;

[0028] Figure 3c is a schematic illustration of the mobile device of Figure 2 with two segments of the document masked;

[0029] Figure 3d is a schematic illustration of the mobile device of Figure 2 with one segment of the document masked;

[0030] Figure 4 is a schematic illustration of a mobile device including a viewing control mechanism according to an alternative embodiment of the invention, in which the display has zoomed-in on a specific segment of the document of Figure 1;

[0031] Figure 5 is a schematic illustration of an architecture for a mobile device including a viewing control mechanism according to an embodiment of the invention;

[0032] Figure 6 is a schematic illustration showing in greater detail a processing engine of Figure 5;

[0033] Figure 7 is a flow diagram showing a process for using a viewing control mechanism according to an embodiment of the invention;

[0034] Figure 8 is an illustration of an electronic image document containing active elements arranged to cooperate with viewing control mechanisms according to embodiments of the invention; and

[0035] Figure 9 is an illustration of an electronic video file containing active elements arranged to cooperate with viewing control mechanisms according to embodiments of the invention.

Detailed Description of Embodiments of the Invention

[0036] Embodiments of the present invention provide viewing control mechanisms for use with electronic documents and files, that ensure that a user reads certain parts of a document in order, or that content of a document has been understood before the user progresses on to read more of the document. It is to be appreciated that the term 'document' covers all manner of electronic media which can be presented to a user, for example, a text image, a data video, an advertisement, a text book, an article, a contract, or any form of media imparting information which a provider wants to ensure the user has absorbed to some degree.

[0037] In one commercial context, an embodiment of a viewing control mechanism enables publishers (e.g. advertisers) to ensure that customers have read and understood their electronic content (e.g. advertisement). In order to do this, the viewing control mechanism reads an active element within the text of the electronic document at a particular location. The active elements have previously been placed in the document at positions where the author requires feedback from the reader as to their understanding of the content prior to that point. This active element requires user interaction in order to enable the reader to progress in reading the document further, or to benefit from some form of prize offer.

[0038] In another alternative embodiment various interactive tests produce a collective absorption score that can then allow or disallow some form of progression to a later stage, and/or to an incentive tied to the score such as a prize.

[0039] An example of a text document 10 containing several such active elements 12 is shown in Figure 1. The text document 10 is stored in an electronic file format such that it can be read by a processor and presented to a user on a device with a display, for example on a computer, a mobile telephone, a laptop or a tablet device (e-reader, tablet computer, etc.).

[0040] The illustrated document 10 represents a very large document including many lines of text, and which is too large to be displayed in its entirely on a screen without reducing the size of the text to an unreadable level. As will be appreciated by the skilled reader, when a processor reads the electronic document 10, a suitable portion of the text to present on the display is determined, taking into account the physical size and resolution of the display.

[0041] The document 10 contains several active elements 12, which between pairs of them define segments 14 of the document 10, as illustrated by the dashed lines. For clarity, only two segments are highlighted in Figure 1, although it should be appreciated that a distinct segment 14 is defined between each and every pair of active elements 12, such that each part of the text of the document 10 falls within one of the segments. Accordingly, Figure 1 actually shows eight segments.

[0042] In this embodiment, the active elements 12 are characters that are provided within the text which have functionality associated with them, in a similar manner to a hyperlink on a keyword. For example, an 'e' character can be used, which has the benefit that there is likely to be an 'e' in close proximity to any chosen location within the text, as 'e' is a commonly used letter in the English language. This approach therefore enhances flexibility

in the choice of location of the active elements 12, without distorting the text which is being presented to the user to read.

[0043] Figure 2 illustrates a mobile device 16 arranged to implement an embodiment of a viewing control mechanism according to the present invention. The device 16 includes a display 18 on which a portion 20 of the document 10 of Figure 1 is displayed. As is apparent in the figure, the portion 20 of text displayed contains three active elements 12, which between them define four segments 14 of the document 10. For illustrative purposes, Figure 2 shows the portion 20 of text displayed without control applied. Figures 3a, 3b, 3c and 3d show the device 16 with a first type of control implemented, and Figure 4 shows the device 16 with a second type of control applied, as will be described below.

[0044] It is also to be appreciated that several devices will also come with built in communications modules for example a Wi-Fi channel receiver/transmitter or a 3/4G telecommunications radio transceiver. Whilst it has not explicitly shown in the figures or described in detail herein, it is to be appreciated that the present embodiments can also include such a communications module for communication via the communications network to a remote server. This enables additional verification of a user response to be carried out as well as updating of the data which is stored in the device itself.

[0045] In this embodiment, when a particular active element 12 is clicked on or interacted with (for example by the user hovering (positioning) their cursor over the character), a pop-up window appears on the display 18, which contains one or more relevant multiple-choice questions pertaining to content of the segment 14 preceding the active element 12. The user can select from a plurality of possible answers by way of user interaction, such as normal touchscreen interaction as is typical of mobile devices. Selection of the correct answers by the user releases a further segment 14 of the document 10 for viewing. A timer may also be employed to require the question to be answered within a time period. Until the user correctly answers the questions, all subsequent segments 14 of the document 10 are hidden, using one of the methods described below. Alternatively a collective score can be kept on a rolling basis such that if the average score drops below a set level the user can be required to complete certain sections where that average itself has varied also.

[0046] Figures 3a to 3d illustrate a control method in which segments 14 of the document 10 which have not been released are masked so as to obscure them from view. These figures illustrate a progression as a user interacts with each active element 12 in turn to successfully release the next segment 14 for display.

[0047] In Figure 3a, the mobile device 16 has detected the presence of the first active element 12, and has processed the document 10 such that only the first segment 14 of text is displayed. The user has yet to interact with the active element 12 and answer the associated questions in order to release further segments 14.

[0048] Once the user has read the visible text, the active element 12 must be activated in order to allow the user to attempt the questions to enable them to progress. In this embodiment, activation of the active element 12 is effected by attempting to use navigation controls to scroll down, although in other embodiments activation may be triggered by clicking on or hovering over the active element 12, as mentioned above.

[0049] A 'navigation control' refers to any component of the device arranged to enable a user to interact with the mobile device 16 so as to manipulate the portion 20 of the document 10 that is presented on the display 18. This can mean either moving the part of the document included in the portion 20, for example in a scrolling operation, or resizing or reformatting the document in some other way to alter the portion 20 presented. Examples of navigation controls include scrollbars in a PC window which can be selected and moved to effect panning or scrolling of the document, arrow keys on a keyboard for moving the current view of a portion of the document to another part of the document, a mouse wheel acting to scroll the screen, and a module for interpreting gesture commands on a touchscreen device.

[0050] When the active element 12 is interacted with or activated, as illustrated in Figure 3b questions are presented to the user in a pop-up window 22 along with respective sets of possible answers, and the user must answer the questions correctly in order to release the next segment 14 of text. This process is described in more detail later with reference to Figure 7. Once the questions have been answered correctly, the mobile device 16 scans the text to detect the next active element 12, and then unmasks the next segment 14 of text accordingly. The result of this action is shown in Figure 3c, in which two segments 14 of text are visible. The process then repeats until a third segment 14 is unmasked, as illustrated in Figure 3d.

[0051] It is noted that in this embodiment, navigation controls of the mobile device 16 are partially disabled after a segment 14 is displayed and before correct answers to the questions are recited, preventing the user from scrolling down beyond segments 14 that have been released. In other embodiments, manual document navigation is fully disabled until the questions are answered correctly, and instead navigation of the document 10 is

performed automatically by the mobile device 16 such that the most recently released segment 14 is always displayed.

[0052] In addition, some or all gesture commands (such as those used for document navigation on touchscreen devices in place of keyed-in commands) can be disabled until such time as the questions have been correctly answered.

[0053] If the user gets the multiple-choice questions wrong, the questions can be changed to allow another chance at getting through this test. Clearly with multiple choice questions, multiple guesses at the same questions will inevitably lead to the right answer, which would be unacceptable as it would allow for a way around the testing. However this may be avoided by requiring a further read through during which alternative questions to those previously asked may emerge within the pop up window or multiple choice answers.

[0054] Figure 4 shows an alternative method of controlling user interaction with the electronic document 10 of Figure 1. In this embodiment, the mobile device 16 detects the next active element 12 and thus determines a segment 14 to be displayed, as in the arrangement of Figures 3a to 3d. However, in this arrangement, the segment 14 is then enlarged, effectively zooming in on the text, such that the segment 14 fills the available display 18 of the mobile device 16. Navigation controls are fully disabled, preventing the user from scrolling to the next segment 14 until the correct answers have been input to the questions. In this way, only the current segment 14 of text can be viewed.

[0055] When the user wishes to progress and release a further segment 14 of the document 10, the active element 12 must be activated in the same manner as for the embodiment shown in Figures 3a to 3d, i.e. by attempting to navigate, for example. As before, the user must provide the correct answers to a series of questions before the next segment 14 is released. The next segment 14 is unlikely to be of the same length as the current segment 14. Therefore, before the next segment 14 is displayed, the mobile device 16 analyses the length of the segment 14 and resizes the text accordingly such that the segment 14 fills the display 18. The resizing of the text not only involves changing the font size but also recalculating the line spacings in proportion and the number of characters per line. The objective is to reformat the text to fill the available space without requiring a scroll bar to see the whole document 10. In this regard, the resizing is not just a pure zooming operation into the image of the text of the next segment 14, but rather reformatting to fit the available viewing screen size.

[0056] An example of a suitable architecture for a mobile device 16 including a viewing control mechanism according to an embodiment of the invention is shown in Figure 5. The device 16, a smartphone for example, includes a touchscreen display 18 which the user can manipulate by way of a user interface (UI) 24 including navigation controls 26 (for example gesture commands or oral commands), along with other standard controls. Content to be presented on the display 18 is controlled by a processing engine 28, which receives raw data from a content module 30. The content module 30 is in communication with a database 32, from which the content module 30 extracts an electronic document file 34. The file 34 is passed to the processing engine 28 which determines a suitable portion 20 of the electronic file 34 to display to the user.

[0057] In this embodiment, the database 32 is held on a remote server belonging to a provider of the content to be read by the user. The provider may be, for example, a producer of educational materials, or an advertiser. The provider uploads the file 34 to be displayed to the user into the database 32, therefore making it available to the content module 30 of the mobile device 16. The file 34 defines a document 10 containing active elements 12 which divide the document 10 into predefined segments 14 as described above. The database 32 also includes a set of questions and answers 36 which can be used for controlling access to the segments 14 of the document 10. In an alternative embodiment, the database 32 is provided in the device 16 itself. The data files may be uploaded to the database 32 by the producer of the document 10, and made available to the user in the manner described above.

[0058] The processing engine 28 holds overall control over the content that is presented on the display 18, although the user can influence the processing engine 28 by providing feedback using the UI 24 through the touchscreen display 18. The navigation controls 26 therefore suitably include functionality to detect gesture commands such as a scrolling gesture made on the display 18. This enables the user to navigate the document 10, within constraints applied by the processing engine 28 in accordance with the control regime used. It is noted that if the control approach exemplified in Figure 4 is used, the navigation controls 26 are permanently disabled, and navigation of the document 10 is entirely controlled by the processing engine 28.

[0059] The processing engine 28 is shown in greater detail in Figure 6, in which it can be seen that the processing engine 28 comprises five key components. These components include an active element detector 38, a masking engine 40, a zoom control module 42, a question generator 44 and a matching engine 46. These components interact with each

other within the processing engine 28, each being arranged to handle specific tasks in order to enable the processing engine 28 to determine what should be presented on the display 18, as described below.

[0060] The active element detector 38 is arranged to scan the content of the electronic document file 34 to identify active elements 12. Through identifying the active elements 12 and their positions within the document 10, the segments 14 of the document 10 can be determined. Knowledge of the segments 14 is used to determine the portion 20 of the document 10 to display, in line with the form of control to be used, i.e. whether a single segment 14 is to be displayed, or if multiple segments 14 are to be displayed with masking of segments 14 yet to be released. This information also informs decisions concerning the handling of requests generated as the user interacts with the navigation controls 26, in that the positions of the active elements 12 determines the range of scrolling allowed, if any. In this embodiment, the active element detector 38 is configured to determine occurrences of user interaction with active elements 12 contained in the document 10 via feedback from the UI 24. In other embodiments, user interaction may be determined directly by the UI 24.

[0061] The masking engine 40 enables implementation of the control approach illustrated in Figures 3a to 3d, in which unreleased segments 14 of the document 10 are masked. The masking engine 40 receives an input from the active element detector 38 which indicates the portion 20 of the document 10 to be displayed, and the locations of active elements 12 within the portion 20. The masking engine 40 uses this information to process the portion 20 of the document 10 to obscure segments 14 that have not been released by the user through the process described above. The processed portion 20 is then output by the processing engine 28 and displayed as illustrated in Figures 3a to 3d.

[0062] The zoom control module 42 is used for enlarging or reducing segments 14 of the document 10 (with appropriate reformatting) such that the segment 14 fills the display 18 of the device 16, in line with the control approach described above with reference to Figure 4. Accordingly, the zoom control module 42 has knowledge of the dimensions and resolution of the display 18, and using this information, the zoom control module 42 is capable of calculating a correct size for the document segment 14 to be displayed. The zoom control module 42 receives the segment 14 to be displayed from the active element detector 38, and then detects the current size of the segment 14 and resizes and reformats it appropriately. The resized, reformatted segment 14 is then output by the processing engine 28 and displayed as illustrated in Figure 4.

[0063] The question generator 44 is used to compile questions to pose to the user in order to control navigation between segments 14 of the document 10. The content module 30 reads the list of questions and answers 36 contained in the database 32, and passes them to the question generator 44. The question generator 44 then selects an appropriate question(s) to use, along with a set of possible answers from which the user must make a selection, in accordance with the content of the segment 14 that the user has just seen. The question and the possible answers are then output by the processing engine 28 and presented to the user on the display 18. The processing engine 28 can also include a timer to define an answer acceptance period, and the user may be required to provide their answers to the questions within that time period. If the user takes too long, they can be considered to have answered incorrectly.

[0064] Once the user has selected an answer, typically by pressing the touchscreen display 18 to activate a checkbox or 'radio button' style selector, the selection is passed to the matching engine. The matching engine compares the selected answer with a known correct answer stored in the database 32 to establish whether the user has answered correctly. The matching engine also records how many correct or incorrect answers have been supplied. If the matching engine receives the required number of correct answers, the processing engine 28 releases the next segment 14 of the document 10. Alternatively, if the user exceeds a predetermined threshold for unsuccessful attempts at answering questions, as indicated by the number of incorrect answers received, the processing engine 28 determines that the content of the current segment 14 has not been understood by the user. In this event, no further questions are presented, and the segment 14 is re-displayed to the user to allow them another opportunity to absorb the content fully.

[0065] It will be appreciated by the skilled reader that elements of the arrangement shown in Figures 5 and 6 may need to integrate into conventional host programs such as word processors, spreadsheets, document viewers, etc. In order to implement a viewing control mechanism according to embodiments of the invention, functionality has to be provided to host software programs which allow reading of documents containing active elements 12. One way to achieve this, for example for programs such as Adobe Acrobat® or Microsoft Word®, could be to implement viewing control mechanisms by way of a plugin, i.e. a sub-program arranged to interact with the host program to expand its functionality. This allows the interactive functioning of the active element 12 as described above to be added into conventional systems.

[0066] For example, this functioning would enable the host program to recognise user interaction with the document 10, generate the pop-up window 22, note the user's response and compare that with a predetermined answer. For each stage, the plugin provides the relevant processing engine 28 modules, and also allows access to the database 32. For added security, the answers can be encrypted to prevent an inquisitive user from seeing the answers before the questions were asked. If the entered response is correct, the host application enables manipulation of the electronic document 10 for continued reading purposes, or enables the user to progress to the next stage of learning. Otherwise, the host application prevents use of those functions until the questions have been answered correctly. This functionality is similar to that provided in a document having a hyperlink which can cause a browser to be launched and a web page to be navigated to automatically.

[0067] Figure 7 shows in overview a process 50 for operating the mobile device 16 of Figures 5 and 6. It is noted that there are a wide variety of mechanisms available to the skilled person to implement the required functionality between a conventional document presentation program such as Adobe Acrobat® and an electronic document 10 containing active elements 12. Such implementation would be within the ability of the skilled addressee. Accordingly there is no need to provide detailed information about the manner of implementing this functionality.

[0068] As shown in Figure 7, the process 50 begins with the content module 30 reading at Step 52 the document from the database 32. The document may be a text document 10 as described above, or alternatively any other form of electronic media suitable for presenting to a user. The document is held in a local memory, for example a RAM module, for fast access by the processing engine 28 until the process 50 is terminated or the mobile device 16 is powered off.

[0069] Once the document has been read, the active element detector of the processing engine 28 scans at Step 54 the document to identify the first active element 12, thereby determining the first segment 14. From this, the processing engine 28 determines at Step 56 a portion 20 of the document to display, ensuring that text is readable.

[0070] Once the portion 20 has been determined, the processing engine 28 then applies at Step 58 either zooming to the segment 14 or masking to the portion 20, such that subsequent segments 14 are either masked or outside of the current portion 20 for display, as shown in the examples of Figures 3a, 3b, 3c, 3d and 4. The current portion 20 is then displayed at Step 60 on the display 18 of the mobile device 16.

[0071] The mobile device 16 then waits at Step 62 for the user to interact with the document, for example by attempting to navigate the document. This activates the first active element 12, triggering a verification process to check whether the user has read and understood the content of the first segment 14. The processing engine 28 then generates at Step 64 a question based on the content of the first segment 14, and displays it to the user along with a set of possible answers. The user then selects an answer, and the matching engine determines at Step 66 whether the answer supplied by the user is correct. In this example, the user need only answer one question correctly, but it will be readily appreciated that a series of questions may be used.

[0072] If the correct answer has been supplied, the processing engine 28 then checks at Step 68 whether the end of the document has been reached, or whether there are further segments 14. If the end of the document has been reached, the process 50 ends at Step 70. At this stage, the mobile device 16 may output a result, for example in the context of advertising an entry into a promotion, or in an education context an indication that the reader has successfully completed a module, to be held on their record.

[0073] If the end of the document has not been reached, the process 50 returns to the scanning step 54, with the active element detector scanning the electronic document for the next active element 12, and in doing so, determining the next segment 14 to be displayed. The process 50 then repeats for the second segment 14, and continues to iterate for all remaining segments 14 of the document.

[0074] If an incorrect answer is supplied, the matching engine checks at Step 72 whether an allowable number of attempts at answering a question has been exceeded. If not, the process 50 returns to the question generating step and a new question is presented to the user. It will be appreciated that, due to the multiple-choice nature of the questioning, the original question cannot be reused. Also a timer function can be applied to give the user a predetermined period to review the question and provide their answer.

[0075] If the user has supplied too many incorrect answers, for example three attempts, it is assumed that the user has not read or properly understood the content of the segment 14. Therefore, the process 50 returns to the display step, and the portion is re-displayed to the user.

[0076] Figure 8 illustrates an alternative form of electronic document 80 which can be used with a viewing control mechanism according to an embodiment of the invention. This image document 80 includes a series of images 82 rather than a series of segments 14 of text, each image 82 having an associated active element 12 attached to it. In this arrangement, the active element 12 may be a portion of the image 82 that is common to each image 82, for example. The viewing control mechanism identifies the first image 82 by way of the active element 12, and displays the first image 82 to the user. Typically, in this embodiment the zooming approach is used, such that the size of the displayed image 82 is maximized to raise its impact. As before, navigation controls 26 are locked, thus preventing the user from viewing the next image 82.

[0077] Once the user has seen the image 82, the active element 12 is activated when the user attempts to view further images 82. A verification process such as that described with reference to Figure 7 then initiates, to test whether the user has absorbed and understood the content of the image 82. If the user answers the question correctly, the second image 82 is then displayed, and so on.

[0078] As with the text document 10, this image document 80 could be used in a range of contexts. The skilled reader will have an understanding of the application of images in education. In marketing, the images 82 may be, for example, representations of a product or images designed to raise the appeal of a product. The viewing control mechanism enables an advertiser to ensure that each image 82 of the document 80 has been viewed and understood by a user, who may otherwise ignore parts of the advertisement.

[0079] As before, completion of the document 80 may be incentivised, for example through an entry into a prize draw. Since the navigation controls 26 are disabled, the user is prevented from skipping to the end of the document 80 to click a link into a promotional entry without reading the advertisement. In this way, the marketer can control the distribution of incentives such that only consumers who have read the marketing material and have demonstrated that they have absorbed it receive them.

[0080] A marketing-based document 80 may be attached to an email, or may pop-up when a user visits a particular web-site. Additionally, geographically located advertisements, for example advertisements originating from an interactive advertising board, can also interact with a mobile device 16 and/or other form of electronic reader having a viewing control mechanism of the invention running, to push advertising content to the device 16.

[0081] Figure 9 shows that in a further alternative, the document may be an electronic video file 90, with active elements 12 attached to particular frames 92 of the video to define clips which are displayed to the user. The frames 92 including active elements 12 therefore act as freeze-frames 92. As before, at the end of each clip the user must correctly answer one or more questions relating to the content of the clip in order to see the next clip.

[0082] This type of document is particularly suited to educational or training purposes, in which viewers must demonstrate that they have understood a clip of the video before continuing on to the next clip. However, a wide range of other applications are possible. In this embodiment, rather than masking off a portion of the file 90, or zooming into a segment 14 only, the size of the displayed image does not change. Rather, in this embodiment it is possible to use the parameter of time to control the amount of content displayed. Namely, progression through the frames 92 is prevented unless the correct answers to the questions are provided. This can in some ways be considered temporal masking of portions of the video file.

[0083] There are many different ways in which embodiments of the present invention can be implemented on many different document viewing platforms. It is particularly suited to e-readers and tablet computers, as well as smartphones, where some form of incentive is required to encourage children to read or to ensure correct comprehension of a portion of text. It can also be used by other forms of non-mobile computers and display devices. In the more commercial field, advertisers can generate valuable feedback on the effectiveness of their marketing campaigns. Furthermore, from a safety point of view, it can be ensured that instructions for use of machinery or medicines can be understood before use of that machinery or medicine is permitted (in this case operating instructions would be at the end of the document and accessible only after the safety operation knowledge had been provided and tested).

[0084] In order to aid understanding of the inventive concept, further specific examples of applications of embodiments of the invention are now described.

[0085] Embodiments of the above new concept could apply to advertisements, textbooks or any form of informational transfer where the transferor wanted to make sure that the transferee has actually received and absorbed the information to some degree. This would be especially true if an advertiser were looking to place advertisements such that the reader could earn credits for absorbing the advertisement.

[0086] In this embodiment, the advertiser could use a portion of revenue normally paid to an advertising site to pay for proof of advertisement absorption. The idea would be that the user has an 'app' (application) on their mobile device which is activated by receipt of a predetermined signal via Blutooth or Wi-Fi, and the advertisement is transmitted to and received by the app. The app then presents the advertisement to the user on the mobile device. In the course of reading the advertisement, the user has to click on certain questions, causing a drop-down box to open, which provides a choice of answers for the user to select from. These can be simple 'yes' or 'no' responses, or could require selection from a series of multiple-choice style answers.

[0087] In the textbook education example, the user can't go further (continue reading the document) without answering the question correctly. In the advertising example, the user earns a credit for every correct answer, or conceptually can't earn an amount of credit unless certain questions are answered correctly. An advertiser can be sure the advertisement has been read and absorbed, or alternatively an educator can be sure the student can go on to the next level. In both cases there is a purgative effect if the question is not clicked on and the correct answer not given.

[0088] Some embodiments of the present invention have the potential to be products in their own right, such that they can be used on internet sites in conjunction with PCs. Conceptually, such a product could be implemented in televisions, mobile devices, or anything enabling a testing of understanding approach, i.e. asking a content-related question requiring user interaction before proceeding and/or gaining credits. Conceptually, this could be also tied to a prize draw such that you earn sufficient credits to buy a prize draw ticket from absorbing the advertisement. Hence, the advertisement can be used for implementing a lottery function.

[0089] An embodiment of the present invention works within a document presentation program or application (host application). Examples of such applications are Adobe Acrobat® and Microsoft Word®, which present text documents for a user to read, sometimes including images also. Other examples include software embedded into in e-book readers such as the Amazon Kindle®, or in an internet browser such as Google Chrome® or Microsoft Explorer® for displaying a web page in HTML or another mark-up language. Any such document presentation application provides interaction tools for enabling the user to at least navigate through the document. Other functions may also be possible, such as editing of the document. Such document presentation programs may be operable on standard desktop

computers as well as mobile devices such as laptop, notebook or tablet computers or smaller smart devices (smart phones and mini tablet computer devices).

[0090] The document presentation program is configured to be responsive to the active commands (active elements) embedded within the electronic document, which would disable the navigation or other user interaction commands of the document presentation program until the correct answers had been provided at the appropriate part of the electronic document. This interaction also would involve the document presentation program providing the pop-up window at the relevant part of the document to enable the user to take the test and thus provide the required answers to unlock the navigation commands for example, and to enable the reader to progress on to access other parts of the electronic document.

[0091] It will be appreciated by a person skilled in the art that the invention could be modified to take many alternative forms to that described herein, without departing from the scope of the appended claims.

[0092] For example, embodiments of the invention are envisaged in which a document containing a mixture of text, images and video is adapted for use with a viewing control mechanism. Furthermore other embodiment of the present invention can be used as an educational tool or teaching aide. In this regard, the present invention could be used to test a user's comprehension of a portion of content of a document prior to permitting advance of the user to the next portion of content.

[0093] It is also envisaged that embodiments of the present invention could be used to create a storybook-style game where asking of questions regarding the story so far could release new portions of the story. In fact there may be multiple different pathways through the story and the particular answer selected by the reader would determine which pathway the user progressed through the story, thus making the electronic document provide different content to different readers depending on their understanding of the content displayed so far. This would be relatively simple to implement with the electronic document having different tags to different parts of the story and the answers submitted to questions would determine which part the story would jump to next.

[0094] Also the navigation controls could be disabled to prevent access to restricted content, allowing for single document containing various levels of restricted information such as age-restricted content where the questions would be provided to test the reader's age, for example. Similarly, the navigation controls could be disabled to prevent access to

confidential material, which would require the user confirming their identity/qualifications in response to challenge questions from the device. In this case the device may have pre-stored authentication information such as passwords stored in its database. These may regularly updated by information received remotely from a secure remote server for example. Finally, access could be prevented to documents, images, and video files unless the correct response was provided to a challenge.

[0095] The forms of content which could be used with embodiments of the present invention include assembly/manufacture/testing instructions and the present embodiments would helpfully enable the content provider to ensure that instructions had been complied with up to that point in the document. Also the reader could be asked to enter test results/verification code to continue which would also be helpful in confirming that they were authorized to receive the following information which could be documents, images, and/or video files.

Claims:

1.   An interactive electronic document presentation device for displaying an electronic
        document, the device comprising:
                a display for displaying a displayable content portion of the electronic
        document;
                at least one navigation control for controlling viewing of the displayable
        content portion; and
                a content assimilation module for eliciting user feedback regarding the
        displayable content portion, wherein the content assimilation module comprises:
                        an active element detector for detecting user interaction with an active
                element within a currently displayed content portion, the active element
                having been previously embedded within the electronic document;
                        a question presentation module for presenting a question to the user
                regarding the displayed content portion, the question requiring a data input
                response from the user; and
                        a comparator for comparing a received data input response to the
                question with a predetermined correct answer;
                wherein the content assimilation module is arranged to disable the at least
        one navigation control on detection of user interaction with the active element; and
                the device further comprises an implementation module for releasing a further
        portion of content of the electronic document in response to receiving a correct
        answer in the data input response.

2.   The device of Claim 1, wherein the content assimilation module is arranged to
        present a question on the display for the user, in response to the active element
        detector detecting that the active element has been interacted with by the user.

3.   The device of Claim 2, wherein user interaction with the active element comprises the
        user attempting to use the at least one navigation control to read the next content
        portion of the document.

4.   The device of Claim 2, wherein user interaction with the active element comprises the
        user attempting to click or select the active element.

5.   The device of Claim 2, wherein user interaction with the active element comprises the
        user positioning a virtual pointer over the active element.

6.   The device of Claim 1 wherein the content assimilation module is arranged to at least partially enable the at least one navigation control in response to receiving a correct answer in the data input response.

7.   The device of Claim 1, wherein the content assimilation means is further arranged on detection of user interaction with the active element at a currently viewed location, to obscure the displayable content of the electronic document until the correct answer has been input by the user.

8.   The device of Claim 1, wherein the question presentation module is arranged to present a multiple-choice question regarding the content of the displayed content portion.

9.   The device of Claim 1, wherein the active element comprises a textual character.

10.   The device of Claim 1, wherein the active element comprises a portion of an image.

11.   The device of Claim 1, wherein the active element comprises a frame in a video data file.

12.   The device of Claim 1, wherein when the active element detector detects user interaction with an active element, the question presentation module is arranged to present a pop-up window with a plurality of multiple-choice questions regarding the currently displayed content portion.

13.   The device of Claim 1, further comprising a communications module arranged to send a message to a remote server via a communications network.

14.   The device of Claim 13, the communications module is arranged to send a message which comprises an entry into a future event, such as a prize draw.

15.   The device of Claim 13, wherein the communications module is arranged to send an update message for updating a file in a database, the file relating to the user.

16.   The device of Claim 15, wherein the communications module is arranged to receive a confirmation message from a remote server and the device is arranged to present a notification of receipt of the confirmation to the display for the user.

17.   The device of Claim 13, wherein the comparator is arranged to use the communication module to request a correct answer to a presented question from a remote server.

18.   The device of Claim 13, wherein the comparator is arranged to use the communications module to send the received user input to a remote server for additional validation as a correct answer.

19.   A method of displaying an interactive electronic document, the method comprising:

displaying a displayable content portion of the electronic document;

controlling viewing of the displayable content portion using a navigation control; and

eliciting user feedback regarding the displayable content portion, wherein eliciting step comprises:

detecting user interaction with an active element within a currently displayed portion; the active element having been previously embedded within the electronic document;

presenting a question to the user regarding the displayed content portion, the question requiring a data input response from the user;

receiving the data input response; and

comparing the data input response with a predetermined correct answer;

wherein the method further comprises:

disabling the navigation control on detection of user interaction with the active element; and

releasing a further portion of the content of the electronic document in response to receiving a correct answer in the data input response.

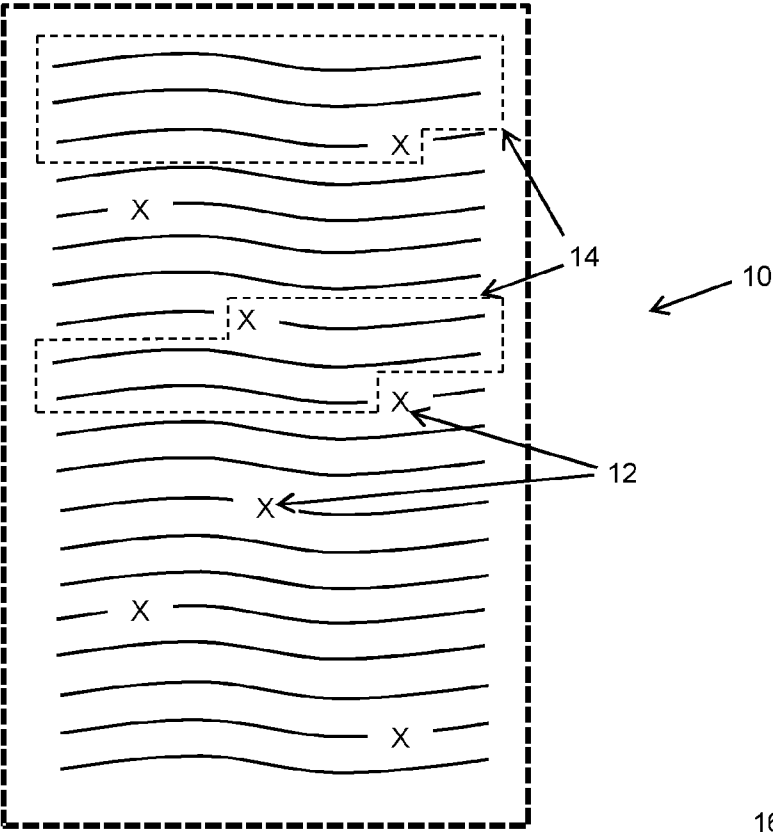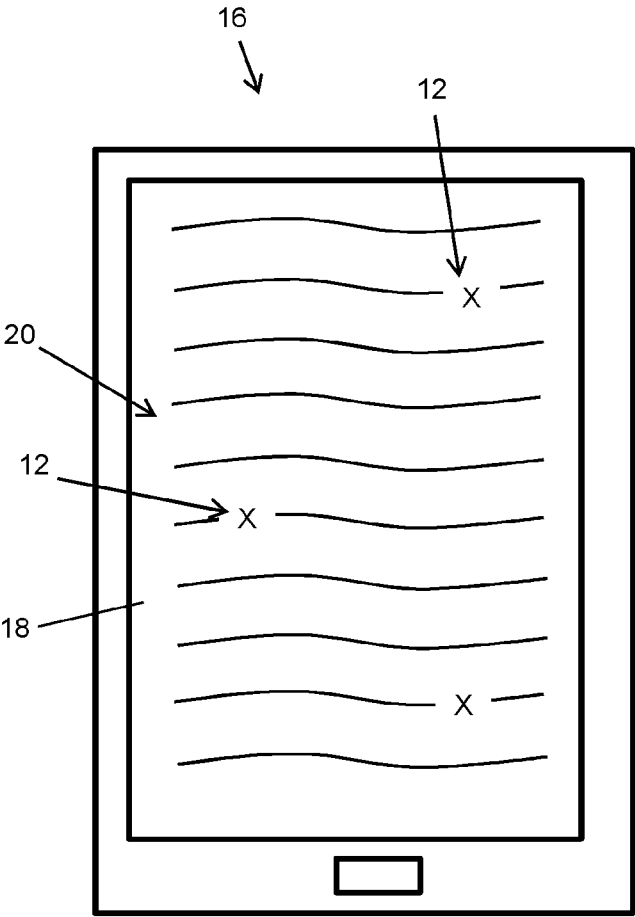20.   An electronic document viewing control mechanism, the mechanism comprising:

a display means for displaying a portion of content of the electronic document on a display of a device;

navigation control means for controlling at least one navigation control of the device; and

content assimilation means for eliciting user feedback regarding the portion of content displayed, wherein the content assimilation means is arranged to:

detect the presence of user interaction with an active element within a
currently viewed portion of the electronic document, the active element having
been previously embedded within the electronic document;

instruct the navigation control means to disable the at least one
navigation control;

present a question to the user regarding the portion of content
displayed, the question requiring a data input response from the user; and

receive the data input response;

wherein the viewing control device further comprises:

a comparator for comparing the data input response with a predetermined
correct answer; and

an implementation module for releasing a further portion of content of the
electronic document in response to receiving a correct answer in the data input
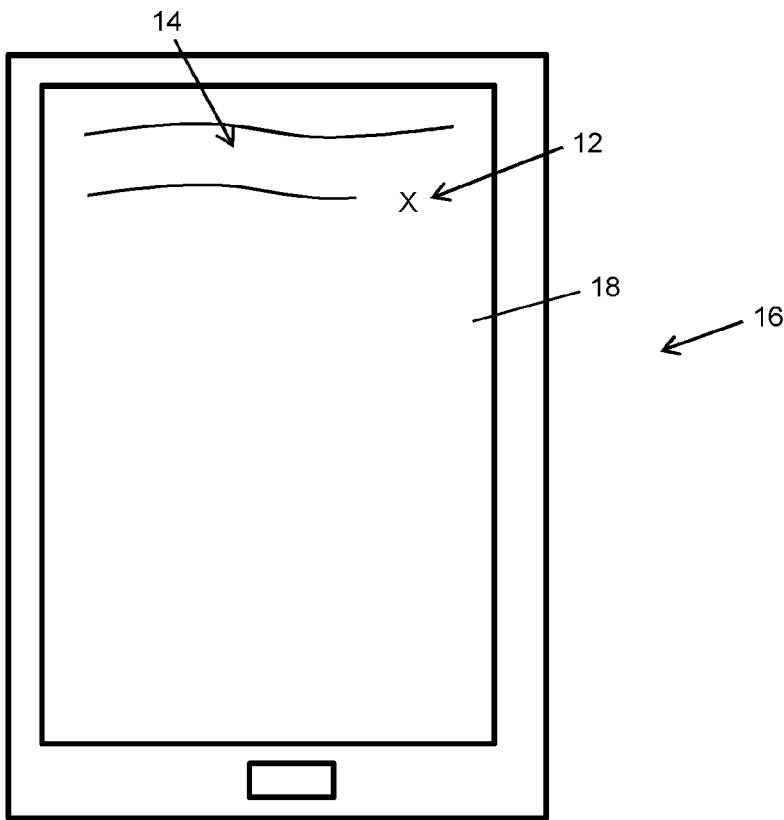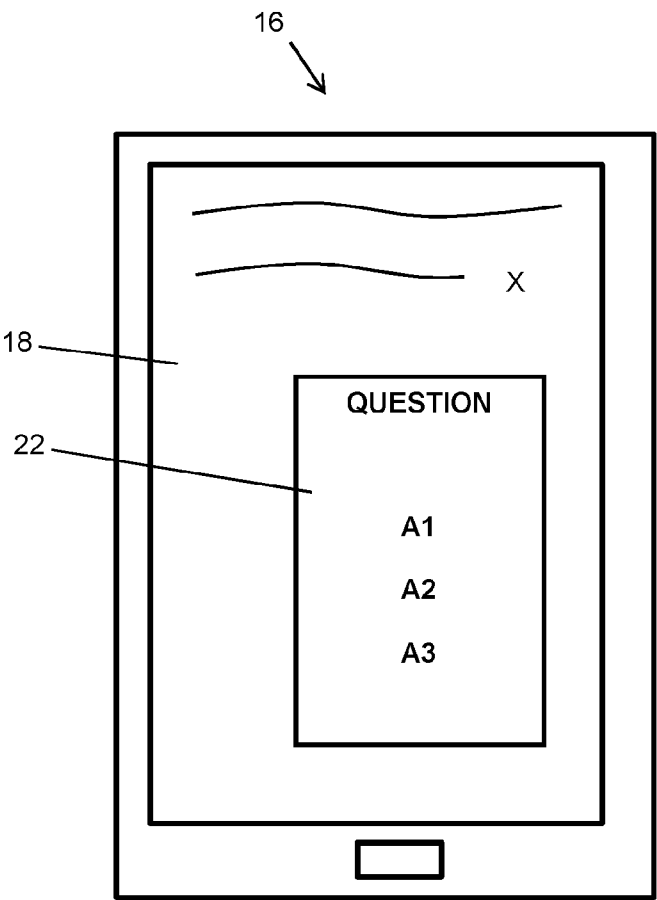response.

FIGURE 1

FIGURE 2

FIGURE 3a

FIGURE 3b

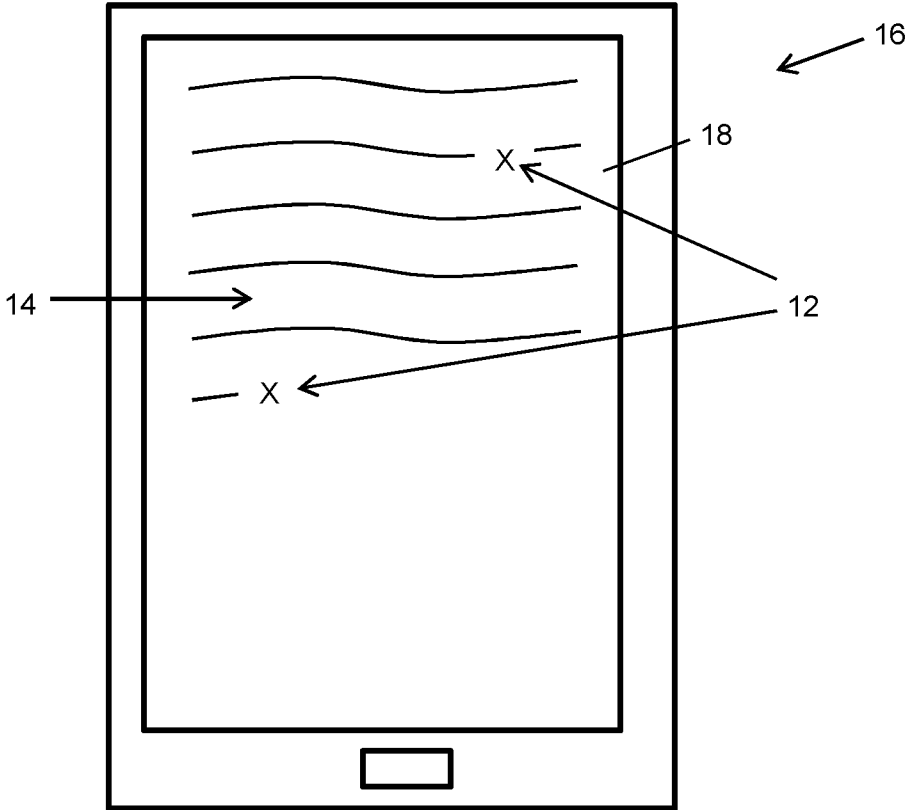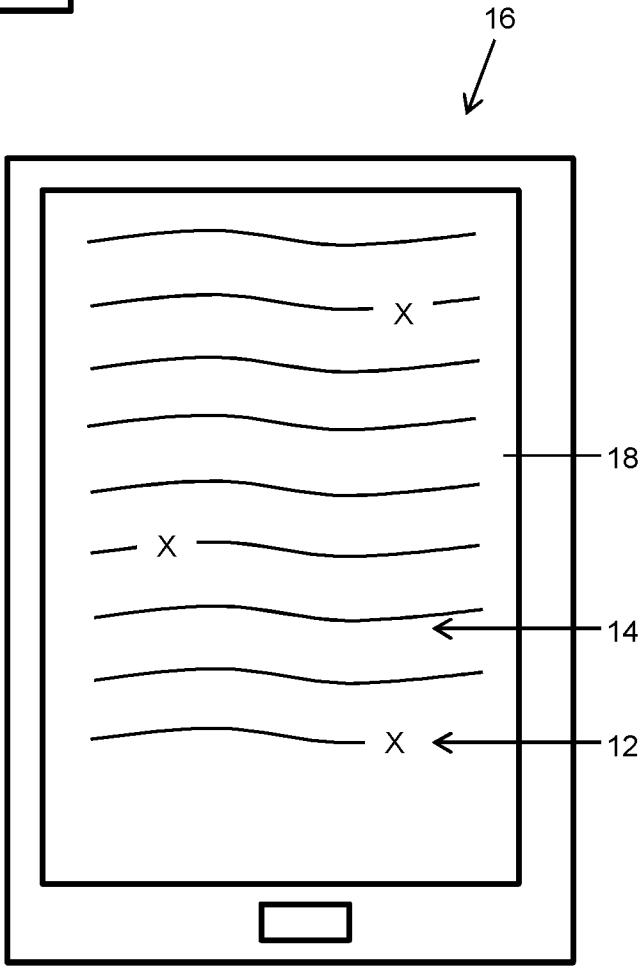FIGURE 3c

FIGURE 3d

FIGURE 4

FIGURE 5

FIGURE 6

50

| Read document | — 52

↓

| Scan document for next active element | — 54

↓

| Determine portion of document to display | — 56

↓

| Apply zooming/masking | — 58

↓

| Display portion | — 60

↓

| Wait until user attempts to navigate | — 62

↓

| Generate and display question | — 64

↓

Attempts exceeded? — 72

Correct answer supplied? — 66

End of document? — 68

| END | — 70
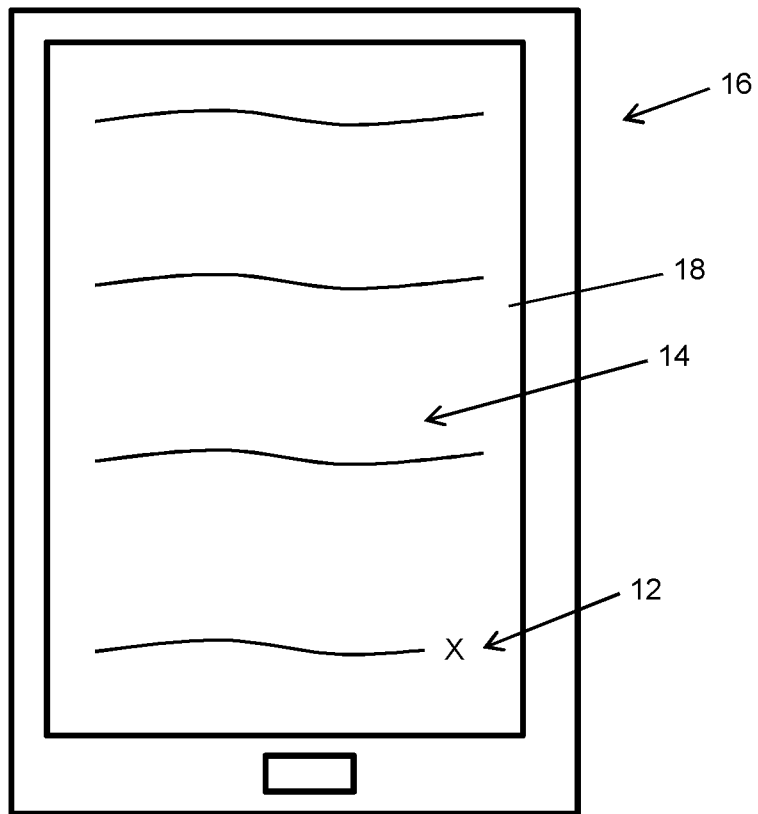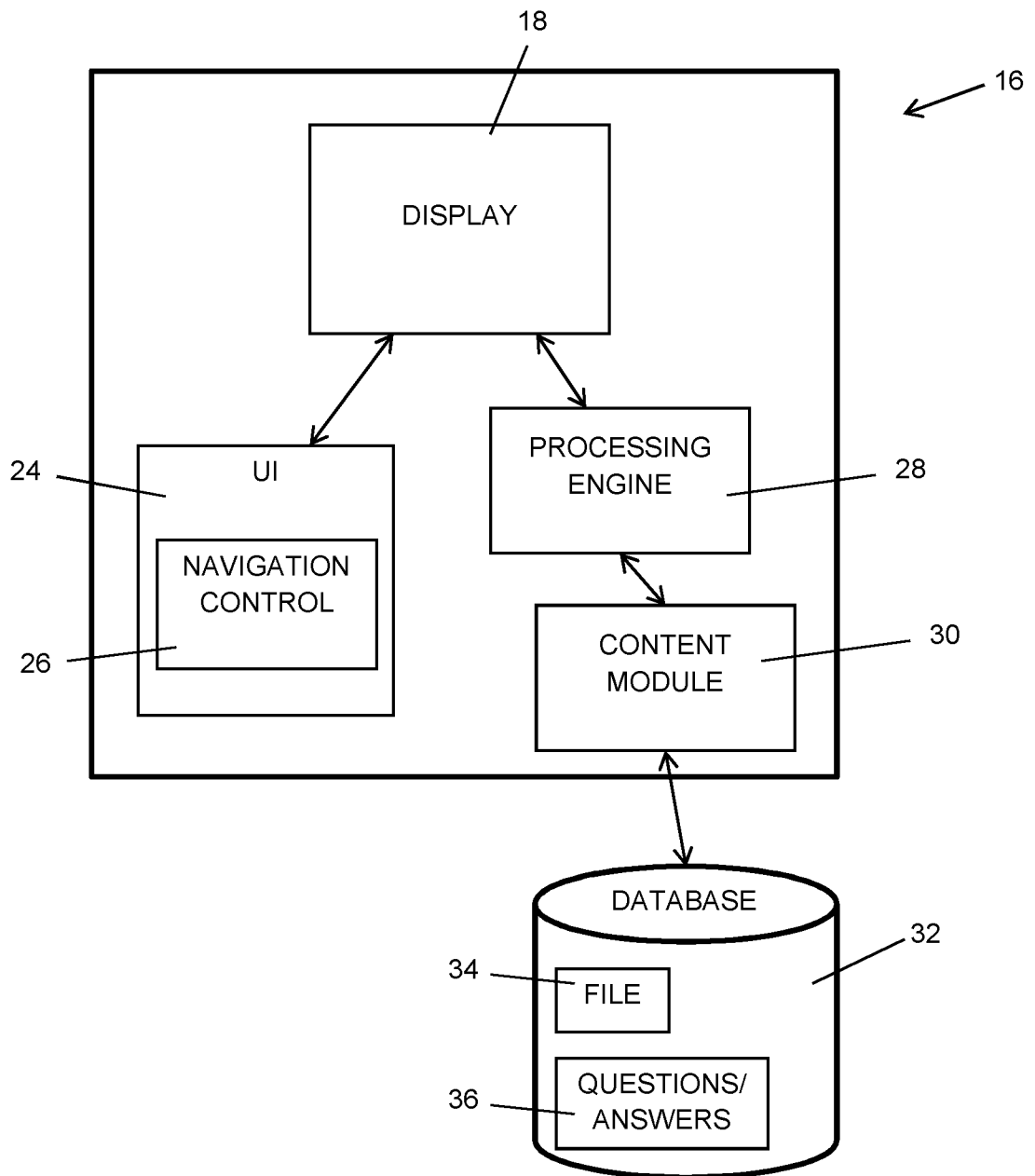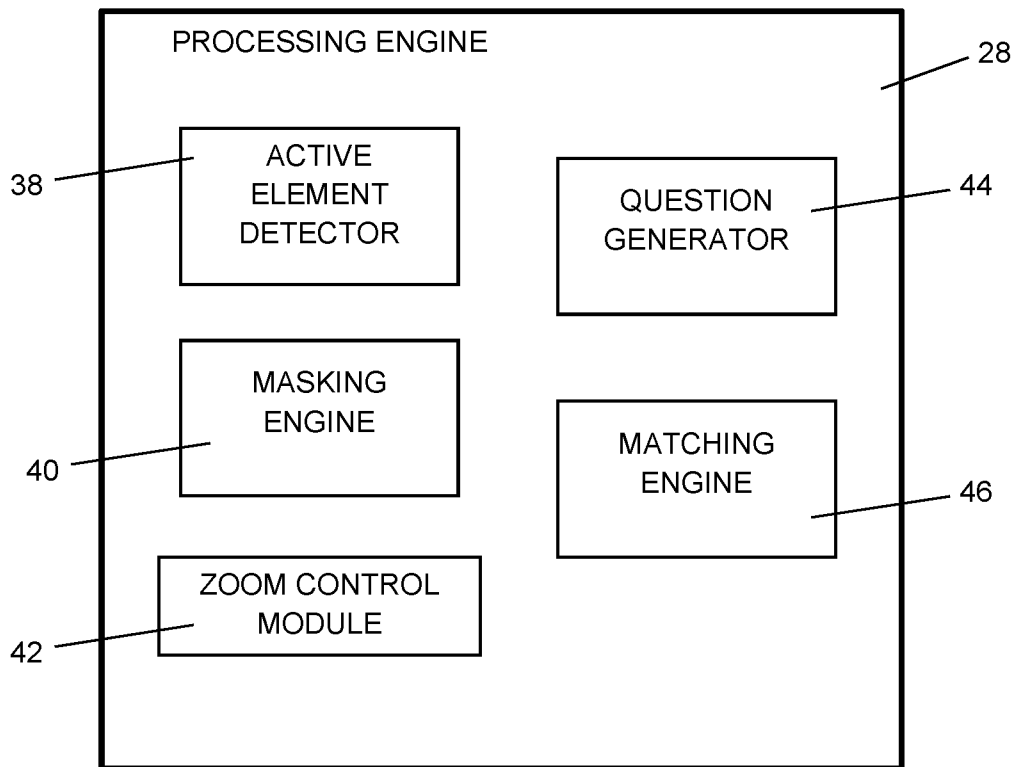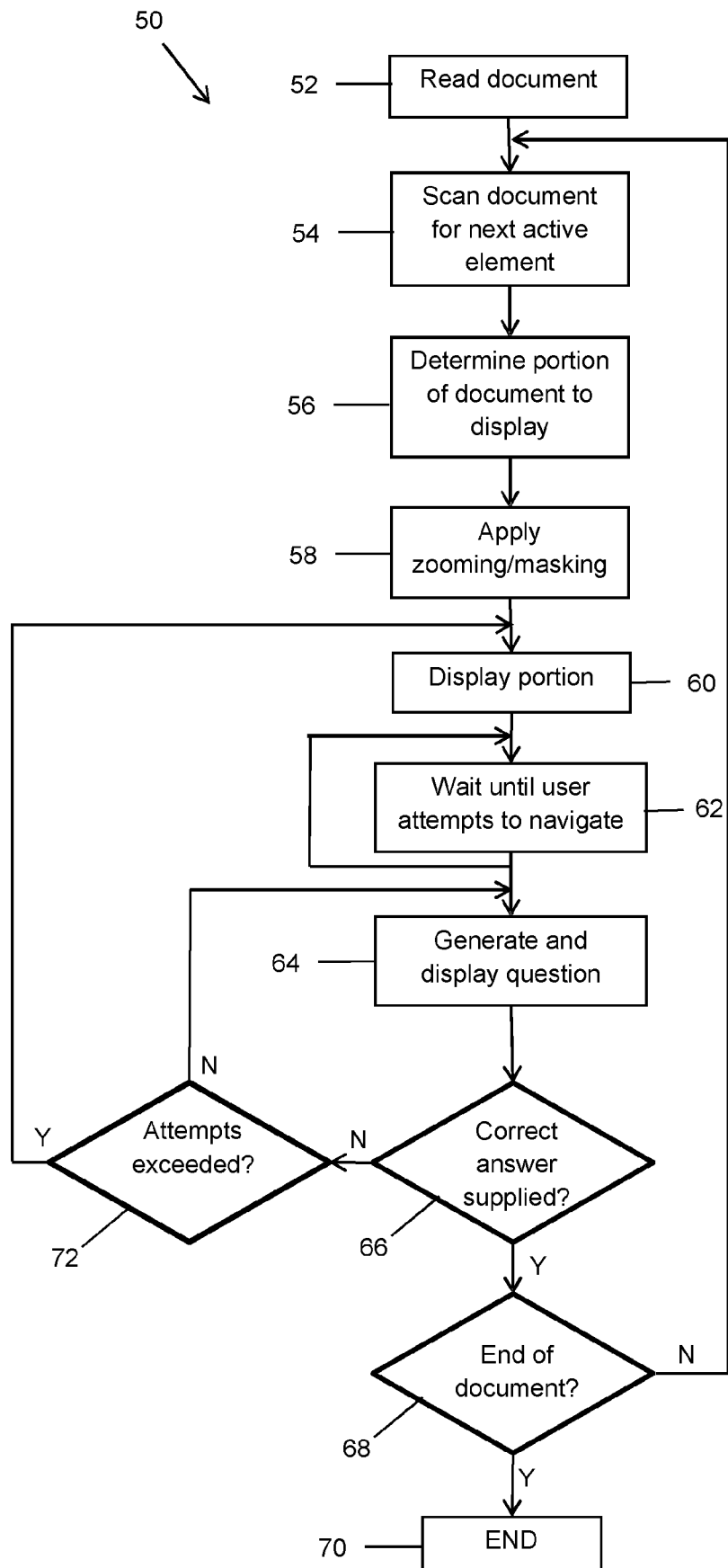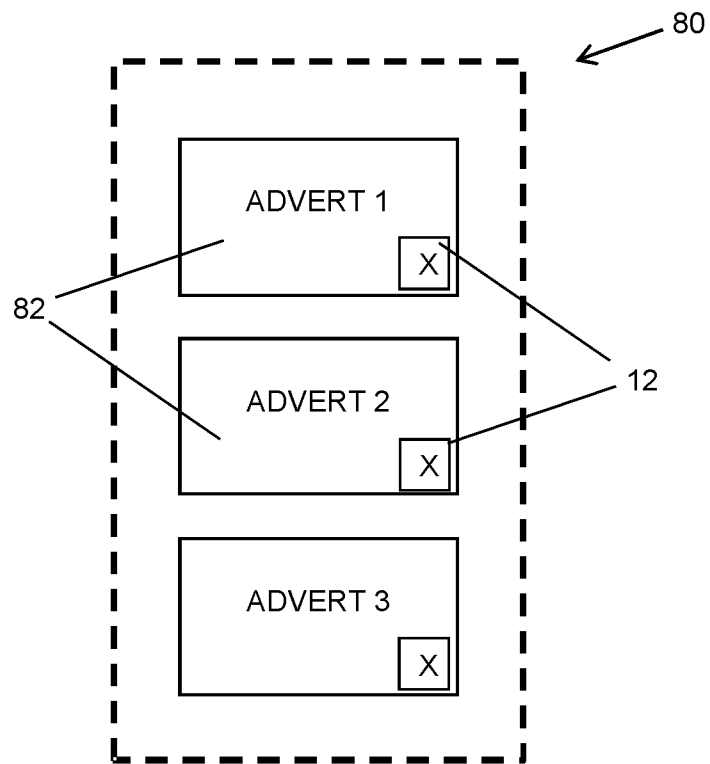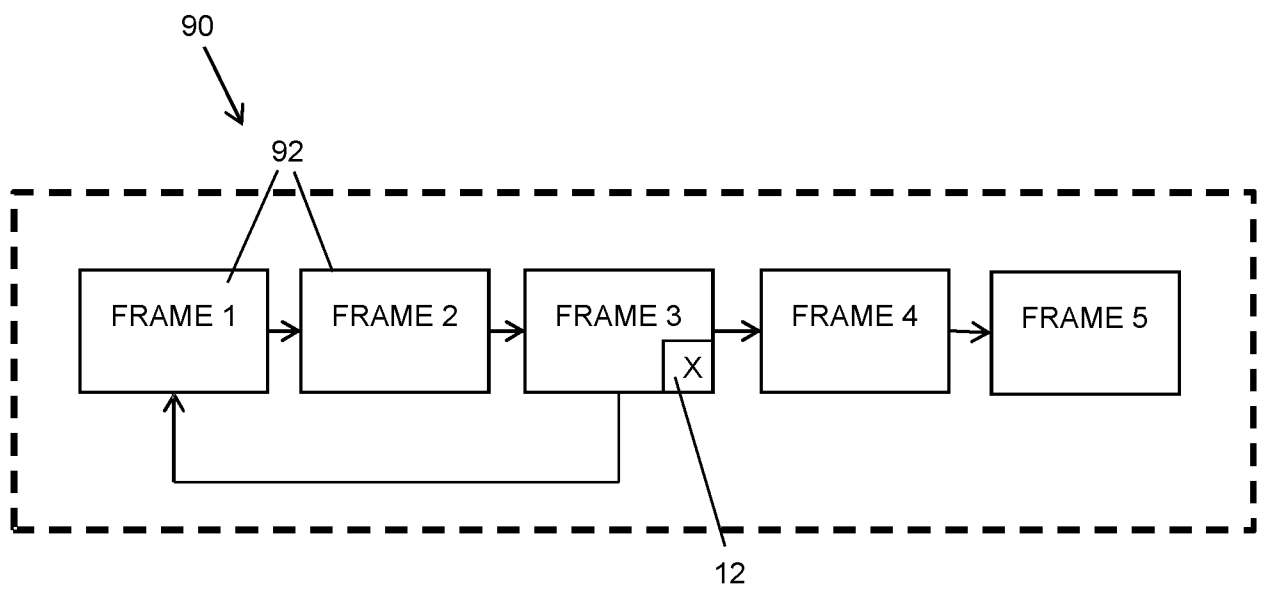
FIGURE 7

FIGURE 8

FIGURE 9

INTERNATIONAL SEARCH REPORT

	International application No.
	PCT/IB13/60998

A.   CLASSIFICATION OF SUBJECT MATTER

IPC(8) - G06F 3/00, 17/30 (2014.01)

USPC - 434/362; 715/234

According to International Patent Classification (IPC) or to both national classification and IPC

B.   FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC(8): G06F 3/00, 17/30 (2014.01)

USPC: 434/362, 322; 715/234, 243, 253

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

MicroPatent (US-G, US-A, EP-A, EP-B, WO, JP-bib, DE-C,B, DE-A, DE-T, DE-U, GB-A, FR-A); ProQuest; IEEE/IEEEXplore; Google/Google Scholar; KEYWORDS: document, interface, navigate, feedback, interact, control, elicit.

C.   DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ------- Y	US 2006/0228687 A1 (GOMERSALL, I) 12 October 2006; figures 3, 4, 9, 11, 12, 14, 15; paragraphs [0010], [0015], [0018], [0020], [0026]-[0028], [0030], [0031], [0036], [0055], [0062]-[0066], [0076], [0077], [0080], [0083], [0088]-[0090], [0096], [0100], [0102], [0105], [0107], [0108].	1-6, 8, 10-13, 19, 20 ---------------------------- 7, 9, 14-18
Y	US 2010/0167807 A1 (KANE, S et al.) 01 July 2010; figures 1-6; paragraphs [0011], [0040], [0069], [0073]-[0075], [0077], [0092], [0104]-[0107], [0117], [0143].	7, 9, 14-16
Y	US 2004/0014013 A1 (DIESEL, M et al.) 22 January 2004; figures 1, 8; paragraphs [0111], [0112].	17, 18

☐   Further documents are listed in the continuation of Box C.   ☐

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*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance		
"E"	earlier application or patent but published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed	"&"	document member of the same patent family

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Date of the actual completion of the international search	Date of mailing of the international search report
14 April 2014 (14.04.2014)	0 2 MAY 2014

Name and mailing address of the ISA/US	Authorized officer:
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450	Shane Thomas
Facsimile No. 571-273-3201	PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (July 2009)