A method comprises displaying a first group of items 404-406 of user data associated with a piece of time varying content, such as video or audio, in predetermined positions along a first axis, such as a vertical axis, and replacing one of the displayed items 404-406 of user data of the first group of items of user data by displaying a second item of user data 501 in a first of the predetermined positions 401, said second item of user data 501 having been selected from a second group of items of user data associated with the piece of time varying content based on relevance to a first category of a plurality categories. The step of replacing one of the items of user data 404-406 with the second item of user data 501 comprises transitioning a display of the second item of user data 501 along a second axis, such as a horizontal axis. The user data associated with a piece of time varying content may be comments on a video.
S301: Receive Items of User Data associated with TP

S302: Process metadata of Items of User Data

S303: Generate relevance metric for each Item of User Data

S304: Filter Items of User Data based on relevance metrics

S305: Sort remaining Items of User Data to generate Display Order List

S306: Forward filtered Items of User Data and Display Order List to the Interface Control Function
<table>
<thead>
<tr>
<th>Display Order</th>
<th>Data Category A</th>
<th>Data Category B</th>
<th>Data Category C</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>User Data 3 (30,000 subscribers)</td>
<td>User Data 3 (400 repeats)</td>
<td>User Data 7 (5 keywords)</td>
</tr>
<tr>
<td></td>
<td>User Data 1 (1200 subscribers)</td>
<td>User Data 1 (85 repeats)</td>
<td>User Data 9 (5 keywords)</td>
</tr>
<tr>
<td></td>
<td>User Data 2 (500 subscribers)</td>
<td>User Data 5 (60 repeats)</td>
<td>User Data 8 (4 keywords)</td>
</tr>
<tr>
<td></td>
<td>User Data 7 (350 subscribers)</td>
<td>User Data 2 (40 repeats)</td>
<td>User Data 4 (3 keywords)</td>
</tr>
<tr>
<td></td>
<td>User Data 4 (95 subscribers)</td>
<td>User Data 6 (35 repeats)</td>
<td>User Data 1 (1 keyword)</td>
</tr>
<tr>
<td></td>
<td>User Data 5 (60 subscribers)</td>
<td>User Data 5 (15 repeats)</td>
<td>User Data 10 (1 keyword)</td>
</tr>
<tr>
<td></td>
<td>User Data 6 (55 subscribers)</td>
<td>User Data 8 (5 repeats)</td>
<td>User Data 5 (1 keyword)</td>
</tr>
<tr>
<td></td>
<td>User Data 10 (30 subscribers)</td>
<td>User Data 10 (0 repeats)</td>
<td>User Data 3 (1 keyword)</td>
</tr>
<tr>
<td></td>
<td>User Data 8 (10 subscribers)</td>
<td>User Data 6 (0 repeats)</td>
<td>User Data 6 (0 keywords)</td>
</tr>
<tr>
<td>Last</td>
<td>User Data 9 (10 subscribers)</td>
<td>User Data 9 (0 repeats)</td>
<td>User Data 2 (0 keywords)</td>
</tr>
</tbody>
</table>

Fig 8
Data Display Method

Technical Field
The present invention relates to methods and devices for displaying items of user data relating to time varying content. More specifically but not exclusively, the present invention relates to techniques for displaying items of user data such as user generated comments that are associated with time varying content such as video.

Background
Numerous different types of software, such as web browsers, exist allowing users to access static content (e.g. images and text) and time varying content (e.g. media data such as video and audio data) via the internet and other networks. Specific software, such as web browsers with video playing “plug-ins” have been developed allowing multiple different users at different times using multiple different user devices to access the same content.

When multiple different users access the same content, it is often desirable to enable the different users to generate user data, such as textual comments, associated with this content. This can be achieved relatively simply by providing a mechanism for users to enter text data which can then be displayed relative to a specific piece of content. A well-known example of this is the “comments section” provided below content published on a website. The content might be static content such as a combination of text and images or time varying content such as a video. In such examples it is apparent to a viewer of the website that particular comments relates to a particular piece of content by virtue of the proximity of the comments to the content in question (for example, being displayed on the same web page).

However, this approach has drawbacks, particularly for time varying content where users may wish to generate comments relating to specific moments in time of the time varying content. For example, a video may comprise footage of a particular event which includes a number of noteworthy moments. If a user wishes to generate a comment associated with one of these moments, the “comments section” technique described above typically requires the user to manually specify a point in time within the comment itself to indicate that the comment relates to a particular part (i.e. point in time) of the video.

Software has been developed which allow users to generate comments which are automatically associated with a particular point in time of a piece of time varying content.
Typically, such software allows a user to enter a text comment as they are viewing a video and the software associates the text comment with the point in time of the video at which the text comment was entered by the user. If another user then views the video using the software tool, as playback of the video progresses, at points in time where text comments have been entered by other users, the various text comments are displayed for a period of time. This is an improvement over the “comments section” technique in that it is more apparent to a user that particular comments are associated with a particular point in time of the video and a user making a comment does not have to manually specify a particular point in time of the video. However, this technique also has drawbacks. If a particular point in time of a video has been heavily commented on, then a user playing back the video will be presented with a large number of comments in quick succession making it difficult to comprehend individual comments. Further, if many comments are being presented in quick succession, it is difficult for a user to discern the temporal relationship between comments and the display of the comments becomes increasingly confusing. This may be particularly undesirable as the most relevant comments may be associated with the points in time of the video that are most heavily commented on. Moreover, uneven distribution of the comments throughout the video may be such that the timing of the display of the comments may appear in a visually erratic fashion which a user viewing playback of the content may find disconcerting.

It is an aim of the present invention to at least partly mitigate the above-mentioned problems.

It is an aim of certain embodiments of the present invention to provide techniques that allow items of user data associated with time varying content to be displayed to a user in a clear and intuitive manner irrespective of the number of items of user data and irrespective of the distribution in time of items of user data.
Summary of the Invention

In accordance with a first aspect of the invention there is provided a method of displaying items of user data associated with time varying content. The method comprises: displaying a first group of items of user data associated with a piece of time varying content in predetermined positions along a first axis; replacing one of the displayed items of user data of the first group of items of user data by displaying a second item of user data in a first of the predetermined positions, said second item of user data having been selected from a second group of items of user data associated with the piece of time varying content based on relevance to a first category of a plurality categories, wherein the step of replacing one of the items of user data with the second item of user data comprises transitioning a display of the second item of user data along a second axis.

In accordance with this aspect of the invention, a technique is provided that allows a user to view large numbers of items of user data in a way that is easier and more intuitive to comprehend than existing techniques. More specifically, a technique is provided that allows items of user data, and particularly items of user data that might be associated with different points of time of a specific piece of time varying content, to be displayed to a user in a fashion that is clear and intuitive, irrespective of the number of items of user data that might exist, and irrespective of the number of items of user data that might be “clustered” around specific points in time of the associated time varying content.

A first axis is provided along which a subset of the items of user data can be displayed. This allows, for example, the most “relevant” items of user data – i.e. those that might contain information that is of most interest or importance to a user, to be displayed in a clear and intuitive manner. These items of user data are only displayed in a predetermined number of positions, therefore irrespective of the total number of items of user data, only a fixed number will be displayed at any one time.

In order to enable a user to view further items of user data, a second, different, axis is provided along with items of user data, to replace those currently displayed, can be transitioned. This provides a clear visual cue (by virtue of the use of the second axis), that items of user data transitioned in this way, relate to “replacement” items of user data, however, the display of the replacement items of user data is still, ultimately, on the first axis, thereby retaining the clear display of a subset of the items of user data. Further, in certain examples, this display technique allows a user to control when further items of user data are displayed (by virtue of the transition along the second axis), providing a user with more
control over what items of user data they view and the rate at which replacement items of user data are presented.

Further, in certain examples, this display technique allows a user to easily control when further items of user data are displayed (by virtue of the transition along the second axis), providing a user with more control over what items of user data they view and the rate at which replacement items of user data are presented.

Optionally, displaying the first group of items of user data in the predetermined positions is in an order based on relevance to the first or a further category of the plurality of categories, the first group of items of user data having been selected based on relevance to the first or the further category of the plurality of categories. Accordingly, the order in which the items of user data that are initially displayed in the predetermined positions on the first axis is determined by their relative relevance to a particular category. This enables a user to readily identify a most relevant item of user data from the items of user data that are initially displayed.

Optionally, the first group of items of user data are associated with a first time period of the time varying content. Accordingly, a user will understand that items of user data displayed in the predetermined positions relate to items of user data that have a connection with/relevance to a specific time period (e.g. section) of the time varying content. This further enables a user to understand the relevance of items of user data, particularly in the event that there are many items of user data associated with a particular piece of time varying content.

Optionally, the second group of items of user data is associated with the first time period of the time varying content. Accordingly, a user will understand that individual items of user data transitioned along the second axis to replace one of the items of user data from the first group will relate to the same period of time of the time varying content as the items of user data initially displayed from the first group.

Optionally, the step of replacing one of the items of user data is performed responsive to selection of a user control displayed in a position relative to the first predetermined position. As a result, a user can readily and conveniently view further items of user data relating, for example, to the first period of time of the time varying content. A user can view further items of user data in their own time and only if they wish to view further items of user data.
Optionally, the method further comprises replacing items of user data currently displayed in the predetermined positions by displaying items of user data from a third group of items of user data associated with the piece of time varying content in the predetermined positions by transitioning a display of the items of user data from the third group of items of user data along the second axis, said items of user data from the third group of items of user data being associated with a second time period of the time varying content. Accordingly, the display of the items of user data can be presented to a user on a time period by time period basis, making it easier still for a user to comprehend the relevance of items of user data, specifically if they relate to different time periods of time varying content.

Optionally, displaying the items of user data of the third group of items of user data comprises sequentially displaying, in an order based on relevance to the at least one category of the plurality of categories, each item of user data of the third group of items of user data in one of the predetermined positions.

Optionally, the method further comprises playing the time varying content, wherein the items of user data from the first group of items user data are displayed during the first time period of the time varying content, and the items of user data from the third group of items user data are displayed during the second time period of the time varying content. Accordingly, a user can view items of user data whilst the corresponding item of user data is played. In this way, a user can readily comprehend that items of user data that are currently being displayed relate to the period of time, currently being played, of the time varying content. This provides an advantageous way to display multiple items of user data for time varying content which relate to multiple different parts of the time varying content.

Optionally, the position of the first of the predetermined position relative to other positions of the predetermined positions determines the first category of the plurality of categories. Accordingly, in some examples of the invention, the particular category which is used to select which further item of user data to next display, is related to a particular predetermined position. This means that a user can further control which of the second group of items of user data is selected for display by virtue of a selection of a control associated with a particular predetermined position.

Optionally, the items of user data comprise user generated comments, in the form, for example, of data which can be displayed as text (e.g. text data).
Optionally, the first axis is a vertical axis and second axis is a horizontal axis. These axis are typically relative to an orientation of a display of a user interface on a display device, such as a screen viewed by a user.

Optionally, the relevance of an item of user data to a category of the plurality of categories is based on a numerical metric determined from metadata associated with the item of user data.

Optionally, the time varying content is video data which can be played to a user using suitable video player software.

Optionally, the number of predetermined positions is determined by a size of a resizable window in which the predetermined positions are positioned. Accordingly, the technique can be used on a range of different user devices which include a range of different user interface sizes and/or resizable user interfaces.

According to a second aspect of the invention, there is provided a user device comprising a display device, a processor and a memory, said user memory comprising a computer program which when implemented on the processor controls the user device to: display on the display device a first group of items of user data associated with a piece of time varying content in predetermined positions along a first axis; and replace one of the displayed items of user data of the first group of items of user data by displaying a second item of user data in a first of the predetermined positions by transitioning a display of the second item of user data along a second axis, said second item of user data having been selected from a second group of items of user data associated with the piece of time varying content based on relevance to a first category of a plurality categories.

Optionally, the first group of items of user data are displayed in the predetermined positions is in an order based on relevance to the first or a further category of the plurality of categories, the first group of items of user data having been selected based on relevance to the first of the further category of the plurality of categories.

Optionally, the first group of items of user data are associated with a first time period of the time varying content.
Optionally, the second group of items of user data are associated with the first time period of the time varying content.

Optionally, the second item of user data is displayed responsive to selection of a user control displayed in a position relative to the first predetermined position on the display device.

Optionally, items of user data currently displayed in the predetermined positions are replaced by displaying items of user data from a third group of items of user data in the predetermined positions by transitioning a display of the items of user data from the third group of items of user data along the second axis, said items of user data from the third group of items of user data being associated with a second time period of the time varying content.

Optionally, displaying the items of user data of the third group of items of user data comprises sequentially displaying, in an order based on relevance to the at least one category of the plurality of categories, each item of user data of the third group of items of user data in one of the predetermined positions.

Optionally, the computer program is arranged to control the user device to play the time varying content and to display the items of user data from the first group of items user data during the first time period of the time varying content, and to display the items of user data from the third group of items user data during the second time period of the time varying content.

Optionally, a position of the first of the predetermined positions relative to other positions of the predetermined positions determines the first category of the plurality of categories.

Optionally, the items of user data comprise user generated comments, comprising text data.

Optionally, the first axis is a vertical axis and second axis is a horizontal axis.

Optionally, the relevance of an item of user data to a category of the plurality of categories is based on a numerical metric determined from metadata associated with the item of user data.

Optionally, the time varying content is video.
Optionally, the number of the predetermined positions is determined by a size of a resizable window in which the predetermined positions are displayed on the display device.

In accordance with a third aspect of the invention there is provided a system for displaying items of user data associated with a piece of time varying content to a user, said system comprising a user device and a server, said server arranged to transmit a first group of items of user data associated with a piece of time varying content to the user device, said user device comprising a display device, a processor and a memory, said memory comprising a computer program which when implemented on the processor controls the user device to: display on the display device the first group of items of user data associated with a piece of time varying content in predetermined positions along a first axis; and replace one of the displayed items of user data of the first group of items of user data by displaying a second item of user data in a first of the predetermined positions by transitioning a display of the second item of user data along a second axis, said second item of user data having been selected from a second group of items of user data associated with the piece of time varying content based on relevance to a first category of a plurality categories.

According to a fourth aspect of the invention, there is provided a computer program comprising computer implementable instructions which when implemented on a processor causes the processor to perform a method according to the first aspect of the invention.

Various aspects and features of the invention are defined in the claims.
Brief Description of Figures

Certain embodiments of the present invention will now be described hereinafter, by way of example only, with reference to the accompanying drawings in which:

Figure 1 provides a schematic diagram of a system for displaying items of user data associated with time varying content in accordance with certain examples of the invention;

Figure 2 provides a schematic diagram of a user interface in accordance with certain examples of the invention;

Figure 3 provides a flowchart describing an example of a process performed by a filtering and sorting function in accordance with certain examples of the invention;

Figures 4 to 7 provide schematic diagrams of a window for showing items of user content in accordance with certain examples of the invention, and

Figure 8 provides a table illustrating the operation of a filtering and sorting function in accordance with certain examples of the invention.
Detailed Description

In the drawings like reference numerals refer to like parts.

Figure 1 provides a schematic diagram of a system for displaying items of user data associated with time varying content. A user device 101 includes a processor unit 102, a data input/output unit 103, a memory unit 104 and a display device 105 such as a screen. The user device also includes user input means (such as a keyboard or touch sensitive surface, for example a touch screen) that allows a user to control aspects of the operation of the user device 101. The user device 101 is connected to an application server 106 via a communication network 107. The application server 106 is connected to a data server 108. The user of the device 101 can also access content from a web server 109 also via the communication network 107.

As will be understood “time varying content” is typically any suitable media data that is usually “played back” to a user to allow them to view and/or listen to the content.

The user device 101 can be any suitable device that allows a user to access and play time varying content such as videos and audio, for example a smartphone, personal computer, tablet computer, games console, “smart” television and so on. The communication network 107 can be provided by any suitable data network allowing the communication of data to and from devices. Typically the communication network 107 is provided by the internet and the user device 101 can connect to the network using any suitable wired or wireless connection as is known in the art.

The data server 108 stores a plurality of items of user data each of which are associated with a particular piece of time varying content such as a video. Each stored item of user data includes ancillary data providing a plurality of metadata which relates to the item of user data. Examples of metadata include a particular time period of the time varying content with which an item of user data is associated, information relating to a user that created an item of user data or characteristics of the item of user data itself, for example the occurrence of particular words or phrases, and so on.

The user device 101 includes software stored in the memory unit 104 which when executed on the processor unit 102 runs an application allowing a user to view items of time varying content, retrieved for example from the web server 109, whilst at the same time viewing and
interacting with associated items of user data stored in the data server 108. The application running on the user device 101 runs in conjunction with data distribution software on the application server 106 such that time varying content that the user is accessing from the web server 109 is determined and items of user data associated with this time varying content (if they exist) are retrieved from the data server 108 and sent to the user device 101. The application running on the user device 101 can then control a display of items of user data on the display device 105. In some example, the application can, at the same time, control a display of the time varying content associated with the items of user data such that certain items of user data associated with specific points in time of the time varying content are displayed contemporaneously as the specific points in time of the time varying content are displayed (e.g. played back).

The application running on the user device 101 includes a data retrieval function, a filtering and sorting function, and a user interface control function.

The data retrieval function sends a request to the data distribution software running on the application server 106 to send items of user data relating to a specific piece of time varying content. The data retrieval function then receives the items of user data and passes them to the filtering and sorting function. The filtering and sorting function then filters and sorts the items of user data and forwards to the user interface display function a filtered subset of the items of user data along with data indicating an order of relevance of the filtered items of user data. The user interface control function controls a user interface on which the items of user data are displayed on the display device 105, and specifically, selects items of user data, based on the data indicating an order of relevance of the filtered items of user data to display. As will be explained in more detail below, the user interface control function displays the items of user data in accordance with a first and second axis. This technique allows items of user data associated with time varying content to be displayed to a user in a clear and intuitive manner irrespective of the number of items of user data and irrespective of the distribution in time of items of user data.

Figure 2 provides a schematic diagram of a user interface displayed on the display device 105 of the user device 101 under the control of the application and specifically the user interface control function.

The user interface includes a first window 201 in which time varying content, such as a video, is shown. The first window 201 can be provided by an embedded video player
function using techniques known in the art. A user control 202 which can be interacted with by a user of the user device 101 controls the display of the time varying content, for example allowing a video to be started and paused and so on. A progress bar 203 is provided which indicates the current progress in time of the display of the time varying content in the first window 201. A user data input window 204 is provided which allows the user of the user device 101 to enter items of user data such as text data associated with the time varying content being displayed in the first window 201. A search control 206 is provided that allows a user to enter data to identify and select particular pieces of time varying data. In some examples this can be a “free-text” search query which when generated is then communicated to a search function running on the application server 106. Based on the search query, the search function running on the application server 106 identifies one or more pieces of time varying content with which items of user data are associated. For example, videos that have items of user data associated with them stored in the data server 108.

The application server 106 then sends information back to the user device 101 identifying these pieces of time varying content. This information can then be presented to the user, for example in the first window 201, in such a form that a user can select a particular piece of time varying content and this selection activates a retrieval process whereby the piece of time varying data is retrieved from the web server 109 on which the selected piece of time varying content is stored.

The user interface includes a second window 205 which provides a user data display interface for displaying items of user data associated with time varying content shown in the first window 201. The user data display interface displayed in the second window displays a subset of items of user data associated with the time varying content, and includes user controls which allow a user to control the display of further items of user data.

As mentioned above, the user interface described with reference to Figure 2 is controlled by the user interface control function of the application. However, the particular items of user data that are displayed on the user interface and in particular in the second window 205 are determined based on a filtering process and sorting process performed by the filtering and sorting function of the application. The filtering and sorting function receives items of user data from the data retrieval function.
The filtering and sorting function is arranged to perform a filtering process and a sorting process on the items of user data based on their associated metadata and to forward to the user interface control function a subset of the items of user data to be selected and displayed in the second window 205. More specifically, the filtering and sorting function is arranged to determine for each item of user data, based on its associated metadata, a relevance metric indicating the degree to which each item of user data is relevant to a particular data category of a number of different data categories. The filtering and sorting function filters out certain items of user data that are below a certain threshold relevance and provides the remaining items of user data to the user interface control function for selection and display along with display order data, which is based on relevance to the data category of each item of user data. The user interface control function then selects items of user data for display, and controls the display of these items of user data.

The number of different data categories is typically determined by the types of different information available from the metadata.

The particular data category with respect to which the items of user data are assessed for relevance by the filtering and sorting function can be set in any suitable way, for example manually by a user of the user device, for example by interacting with an option control displayed to the user, or based on a preconfigured setting of the application.

Typically, the relevance metric is a numerical value derivable from some aspect of the metadata. For example, a data category may be the number of “subscribers” associated with users who generated the items of user data. That is, a first user may be associated with other users who “subscribe” or “follow” that user, for example being informed every time the first user performs an action such as generating an item of user data. In this example, the relevance metric for each item of user data will be the number of subscribers of the user who generated the item of user data. An item of user data generated by a user with a large number of subscribers or followers will be deemed to be of higher relevance to this data category than an item of user data generated by a user with a lower number of subscribers of followers.

Further examples of data categories may be number of times a key word, or group of key words appear in an item of user data, number of times an item of user data has been copied and/or re-posted and/or referenced in other items of user data by other users and so on.
As described above, ahead of the filtering and sorting function filtering and sorting certain items of user data, items of user data are retrieved from the data distribution software running on the application server 106 by the data retrieval function. In some examples, the data distribution software will initially send a subset of the items of user data that relate to a specific time period of the time varying content. This can be done using metadata associated with each item of user data indicating a time period of the time varying content with which it is associated.

Figure 3 provides a flowchart describing in more detail an example of a process performed by the filtering and sorting function. At a first step S301 an initial group items of user data associated with a particular time period (TP) of a piece of time varying content are received from the data retrieval function. At a second step S302 the filtering and sorting function analyses each item of user data to identify metadata potentially relevant to a particular data category. At a third step S303 the filtering and sorting function generates a relevance metric for each item of user data based on the metadata identified in the second step S302. At a fourth step S304, each item of user data is filtered in accordance with this relevance metric. At this step, items of user data with a very low relevance to the data category (for example, if the relevance metric is below a threshold value) are filtered out and not considered further. For example, with reference to the example above, if the metadata of an item of user data indicates that the user who creates it has fewer than two subscribers, this item of user data will be filtered.

At a fifth step S305, the filtering and sorting function sorts the filtered items of user data (i.e. those items of user data not filtered out at the fourth step) to form a display order list. The display order list is based on the relevance metric generated for each item of user data and is typically a data structure which associates each of the remaining items of user data with a list position relative to the other items of user data. At a sixth step, the filtering and sorting function forwards the display order list and the filtered items of user data to the user interface control function. The user interface control function can then select items of user data for display based on the filtered items of user data and their relative position on the display order list.

Using the display order list, the user interface display function selects a first group of filtered items of user data to initially display a number of items of user data. Typically, the items of user data selected for the first group are the items of user data with the highest list positions in the display order list, i.e. those items of user data with the highest relevance metrics.
The remaining filtered items of user data that have been forwarded to the user interface control function but that are not initially displayed, form a second group of items of user data.

Typically, after a given period of time, the data retrieval function will request from the data distribution software a further group of items of user data for display relating to the next time period of the time varying content. In this case, these items will be received by the filtering and sorting function and the process shown in Figure 3 will repeat. Once the process has repeated, a further set of filtered items of user data, and an associated display order list, will be sent to the user interface control function.

Returning to the items of user data from the first and second groups, their display will be explained in more detail below with reference to the operation of the user interface control function controlling what is displayed in the second window 205. Figure 4 provides a more detailed view of the second window 205 shown in Figure 2.

Figure 4 shows the second window 205 which includes a first slot 401, a second slot 402 and a third slot 403. Each slot 401, 402, 403 provides a space within which an individual item of user data is displayed. The slots 401, 402, 403 are arranged vertically (i.e. with respect to a vertical axis of the display of the user interface presented to a user) with the first slot 401 at the top and the first slot 403 at the bottom.

As described above, initially items of user data from the first group are displayed. Specifically, in the first slot 401 is displayed a first item of user data 404 (labelled A), in the second slot 402 is displayed a second item of user data 405 (labelled B) and in the third slot 403 is displayed a third item of user data 406 (labelled C). In some examples, the vertical order in which the items of user data from the first group (A, B, C) are arranged in the respective slots 401, 402, 403 is determined in accordance with the display order list determined by the filtering and sorting function. Typically, the item of user data with the highest relevance metric is displayed in the first slot 401, the item of user data with the second highest relevance metric is displayed in the second slot 402 and the item of user data with the third highest relevance metric is displayed in the third slot 403. As will be understood, the first, second and third items of user data (A, B, C) belong to the first group discussed above.
The second window 205 shown in Figure 4 also includes a number of user controls 407a, 407b, 407c each positioned relative to the right hand side of one of the slots 401, 402, 403. Activation of one of these user controls 407a, 407b, 407c causes the user interface control function to select and display another item of user data in the associated slot. That is, activation of one of these user controls causes the user interface control function to select and display an item of user data from the second group. A user can activate one the user controls 407a, 407b, 407c using the user input means described above, for example touch the relevant part of a touch screen display.

The second window 205 also includes a number of further user controls 408a, 408b, 408c each positioned relative to the left hand side of one of the slots 401, 402, 403. Activation of one of the further user controls 408a, 408b, 408c causes the user interface control function to display an item of user data previously displayed in the corresponding slot to be displayed again.

Figure 5 provides a schematic drawing of the second window 205 when the first of the user controls 407a, associated with the first slot 401, is activated. Under these circumstances, a fourth item of user data 501 (labelled D) is displayed in the first slot 401. As is indicated on Figure 5, the display of the fourth item of user data 501 is by virtue of a transition along a horizontal axis. In other words, the display of the fourth item of user content is “animated” to appear as if it is “sliding in” from one side of the second window 205, and specifically the side on which the first user control 407a is positioned relative to the first slot 401.

In some examples, the fourth item of user data 501 is selected and displayed by the user interface function as it is the item of user data which has the highest position on the display order list (i.e. the highest relevance metric of all of the items of user data from the second group). For example, with reference to the example shown in Figure 5, the fourth item of user data 501 has a relevance metric which is the fourth highest, i.e. only items of user data A, B and C have higher relevance metrics.

Figure 6 provides a schematic diagram of the second window 205 illustrating an example of when the first user control 407a is activated a second time. In this case a fifth item of user data 601 (labelled E) is displayed in the first slot 401. Again, this display is by virtue of a transition along a horizontal axis. Again, in some examples the fifth item of user data 601 is an item of user data, selected from the second group, with next highest relevance metric as
specified in the display order list. In the example shown in Figure 6 this is the sixth highest relevance metric as determined by the filtering and sorting function.

When the data retrieval function retrieves items of user data associated with another (e.g. the next) time period of the time varying content then these further items of user data are received and processed by the filtering and sorting function to determine a group of filtered items of user data and a display order list which is sent to the user interface control function. The user interface control function selects a third group of items of user data which are initially displayed, and the remaining items of user data form a fourth group. Items of user data from the fourth group are selected and displayed in response to operation of one of the user controls 407a, 407b, 407c, and in accordance with a display order list based on the respective relevance metrics.

Accordingly, the user interface control function is arranged to replace the currently displayed items of user data with a display of items of user data with the highest relevance metrics from the second time period (i.e. items from the third group). Typically, this occurs after a predetermined transition time has elapsed since the currently displayed items of user data were first displayed. This is illustrated in more detail in Figure 7.

Figure 7 shows the second window 205 in which a sixth item of user data 701 (labelled F), a seventh item of user data 702 (labelled G) and an eighth item of user data 703 (labelled H) are displayed in the first, second and third slots respectively. As described above, these items of user data are displayed after the predetermined transition time has elapsed, that is, after a predetermined period of time since the items of user data from the first group of items of user data, shown in Figure 4 are first displayed. In some examples, the length of the predetermined period of time is associated with the period of time of the time varying content with which items of user data are associated. This means that if the time varying content is played at the same time the items of user data are displayed, then items of user data associated will be displayed in substantially in synchronisation with (contemporaneously) the specific parts of the time varying content with which they are associated.

The sixth, seventh and eighth items of user data 701, 702, 703 are the items of user data associated with the second time period of the time varying content, and which have the first, second and third highest relevant metrics of all the items of user data associated with the second time period of the time varying content. As will be understood, this process can
repeat until all of the most relevant items of data from each time period of time very content have been displayed.

In some examples, as indicated in Figure 7, the display of the sixth, seventh and eighth items of user data 701, 702, 703 is by virtue of the transition along a horizontal axis. In some examples, the display of the sixth, seventh and eighth items of user data 701, 702, 703 is staggered (i.e. displayed sequentially) such that the item of user data with the highest relevance metric (i.e. the sixth item of user data 701) appears first (i.e. transitions along the horizontal axis first), and the item of user data with the lowest relevance metric of the displayed items of user data (i.e. the eighth item of user data 703) is displayed last (i.e. transitions along the horizontal axis first).

As described with reference to Figures 5 and 6, the user controls 407a, 407b, 407c, when activated by a user, cause the display of a further item of user data. In some examples, if a user activates a user control 407a, 407b, 407c, the user interface control function is arranged to start a transition pause timer. If the transition pause timer does not reach a predetermined threshold value before the transition time has elapsed, when the currently displayed items of user data are replaced with the items of user data with the highest relevance metrics from the next time period of the time varying content, the slot with which the activated user control is associated continues to display whichever item of user data it is currently displaying, and new items of user data are only displayed in the other slots. For example, with reference to Figure 5, if the first user control 407a is activated causing the display of the fourth item of user data 501, assuming the transition pause timer does not reach the predetermined value before the transition time has elapsed, new items of user data will only be displayed in the second slot 402 and a third slot 403 whilst the first slot 401 will continue to display the fourth item of user data 501.

A specific illustrative example is now explained.

A piece of time varying content, namely a video, is stored in the web server 109. The video depicts a recording of a debate between three participants. The video is four minutes long and includes three points in time where particularly interesting comments are made by the participants. The three points in time are 20 seconds into the video, 1 minute and 20 seconds into the video, and 2 minutes 30 seconds into the video. Using conventional techniques for displaying items of user data, a user would be presented with a high number of items of user data at these points in time which would make them difficult to comprehend.
The data server 108 contains a number of items of user data. A subset of the user data stored in the data server 108 are associated with the video of the debate. These items of user data are text based comments (user comments) generated by a number of different users using a video commenting software platform that allows users to play a video and make comments at various points throughout the video. The user comments relating to the video that are stored in the data server 108 include the various items of metadata. Each user comment includes metadata indicating a particular point in time of the video at which the comment was made by a user and further items of metadata including a number of users who subscribe (e.g. "follow") a user who generated the user comment, a number of times a particular user comment has been repeated by other users of the video commenting software platform and the number of occurrences of one or more keywords in the user comment.

A user of the user device 101 on which the application is running, searches via the content selection control 206 for videos associated with the debate that are associated with user comments. A result is returned, by the application server, providing a link to the video of the debate and upon selection of this link, firstly, the application server 106 forwards summary data to the application indicating points in time of the video where user comments have been made, secondly the video is downloaded to the user device 101 from the web server 109. This summary data is displayed graphically in the progress bar 203 as shown in Figure 2. The user can then activate the user control 202 to begin playback of the video. When this occurs, the data retrieval function detects that the user is playing the first 30 seconds of the video and sends a request to the application server 106 for user comments made during the first 30 seconds of the video. A number of user comments are associated with this period of time and in particular are clustered around 20 seconds into the video where the first interesting comment is made. The application server 106 retrieves all of the user comments from the first 30 seconds from the data server 108 and forwards them to the application running on the user device 101. These comments are identified based on metadata indicating which time period of the time varying content each item of user data is associated with. The user comments are then processed by the filtering and sorting function as described above and the display order list and filtered items of user data are forwarded to the user interface control function. In this example the data category with respect to which the relevance of the user comments are assessed is the number of users who subscribe to a user who generated a particular user comment. That is, the higher the number of subscribers for particular user, the higher the relevance metric determined by the filtering
and sorting function for user comments made by that user. In this way, with reference to Figure 4, the user interface control function operates such that the first item of user data 404 will be the user comment made in the first 30 seconds of the video by the user with the most subscribers. The second item of user data 405 will be the user comment made in the first 30 seconds of the video by the user with the second most subscribers, and so on.

The user comments are displayed as the video is played back.

With reference to Figure 4, in the event that a user activates the first user control 407a, the user interface control function selects, using the display order list, and then displays the user comment made by a user with the highest number of subscribers that has not yet been displayed (i.e. from the second group). This display is by virtue of a transition along the horizontal axis to replace the item of user data currently displayed in the first slot 401.

Once the data retrieval function determines that the second 30 second period of the video is about to be played, for example at 20 seconds in to playback of the video the data retrieval function sends a request message to the application server 106, for user comments made during the second 30 second period of the video. These user comments are received and filtered by the filtering and sorting function as described above and forwarded to the user interface control function with a new display order list. As playback of the video reaches 30 seconds, the transition period elapses (set for example at 28 seconds), the user comments with the highest relevance metrics are displayed in the slots of the second window 205, in accordance with the sequential transition along the horizontal axis as described with reference to Figure 7. This process repeats for the third and fourth 30 second period of the video.

In the examples explained with reference to Figure 5 and Figure 6, upon activation of one of the user controls the user interface control function selects the item of user data with the next highest relevance metric with respect to the data category used to order the display of the initially displayed items of user data (i.e. those from the first group), and displays it by virtue of the transition along the horizontal axis. This is the case irrespective of which of the user controls is activated.

However, in some examples the particular user control which is activated can determine which item of user data is displayed. More specifically, each slot may be associated with a particular data category. In some examples, the data category with which each slot is
associated is indicated textually next to the slot in question. However, in other examples, other techniques can be used to indicate to a user a data category with which a particular slot is associated, for example colour coding of the slot or other similar visual indications. In response to the user activating a particular user control, the user interface control function is arranged to select and display in the corresponding slot an item of user data, from the as yet undisplayed items of user data, with the highest relevance metric for the data category with which the user control is associated.

For example, with reference to Figure 4, if the user activates the first user control 407a, an item of user data with the highest relevance metric associated with a first data category (e.g. the item of user data from the user with the highest number of subscribers) is selected and displayed in the first slot 401; if the user activates the second user control 407b an item of user data with the highest relevance metric associated with a second data category (e.g. the item of user data which has been repeated the most number of times by other users) is selected and displayed in the second slot 402, and if the user activates the third user control 407c an item of user data with the highest relevance metric associated with a third at category (e.g. number of occurrences of a specific keyword) is selected and displayed in the third slot 403.

As will be understood, operation of the filtering and sorting function in this example is modified whereby the filtering and sorting function determines the relevance metric for each item of user data in accordance with a number of different data categories and determines a number of display order lists with respect to these different categories. This is explained with reference to Figure 8.

Figure 8 provides a table illustrating the operation of the filtering and sorting function to determine a relevance metric for each item user data and to determine a corresponding display order for items of user data based on three different data categories. More specifically, the table shown in Figure 8 corresponds to a display order list data structure created by the filtering and sorting function and forwarded to the user interface control function.

A first data category, data category A, corresponds to the number of subscribers the user has that generated the item of user data; the second data category, category B, corresponds to a number of times the item of user data has been repeated by other users, and the third data category, dated category C, corresponds to a number of times specific keywords
appear in the item of user data. For data category A, the relevance metric for each item of user data is metadata indicating a numerical number of subscribers. For data category B, the relevance metric for each item of user data is metadata indicating a numerical number of repeats. For data category C, the relevance metric for each item of user data is metadata indicating a numerical number of key word instances.

The display order list data structure shown in Figure 8 corresponds to an example in which ten items of user data (User Data 1 - User Data 10) remain after the filtering step performed by the filtering and sorting function. The ten items of user data are ranked by the filtering and sorting function in order of relevance metric for each data category. The filtering and sorting function forwards the items of user data to the user interface control function for display as described above along with the data structure shown in Figure 8.

As will be understood, in examples in which the filtering and sorting function only determines the relevance of items of user data with respect to a single data category, a display order list data structure corresponding to that shown in Figure 8 will be generated by the filtering and sorting function, except that it will comprise only a single “Data Category” column.

Figures 4 to 7 illustrate examples of the second window 205 which includes three slots 401, 402, 403. As is known, user devices of different types have different sized display devices. In order to accommodate this, in some examples the user interface control function is arranged to adapt the number of slots depending on the size of the display device of the user device. For example, a user device with a large display device such as a smart television might have a second window with ten slots, whereas a user device with a smaller display device such as a smartphone may have a second window with only have three slots as shown in Figures 4 to 7.

Various modifications can be made to examples of the invention described above. For example, in certain examples described above, the items of user data are filtered and displayed in groups based on a period of time of the time varying content with which they are associated. In certain examples described above, the length of these periods of time is 30 seconds. However, it will be understood that this length of time is arbitrary and can be determined by the application running on the user device and or the data distribution software running on the application server. In some examples, the period of time may be shorter, such as 5 or 10 seconds, or much longer such as 5 or 10 minutes. In other examples, this length of time may vary for a given piece of time varying content.
In certain examples described above, the time varying content is video, however it will be understood that the principles of the invention can be applied to any time varying content that users can associate items of user data with, and in particular items of user data associated with particular points in time of the time varying content.

It will be understood that in certain examples, the items of user data need not be displayed at the same time as the piece of time varying content is played back.

Features, integers, characteristics or groups described in conjunction with a particular aspect, embodiment or example of the invention are to be understood to be applicable to any other aspect, embodiment or example described herein unless incompatible therewith. All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of the features and/or steps are mutually exclusive. The invention is not restricted to any details of any foregoing embodiments. The invention extends to any novel one, or novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

The reader’s attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.
CLAIMS

1. A method of displaying items of user data associated with time varying content, said method comprising:
   displaying a first group of items of user data associated with a piece of time varying content in predetermined positions along a first axis;
   replacing one of the displayed items of user data of the first group of items of user data by displaying a second item of user data in a first of the predetermined positions, said second item of user data having been selected from a second group of items of user data associated with the piece of time varying content based on relevance to a first category of a plurality categories, wherein
   said step of replacing one of the items of user data with the second item of user data comprises transitioning a display of the second item of user data along a second axis.

2. A method according to claim 1, wherein displaying the first group of items of user data in the predetermined positions is in an order based on relevance to the first or a further category of the plurality of categories, the first group of items of user data having been selected based on relevance to the first or the further category of the plurality of categories.

3. A method according to claim 1 or 2, wherein the first group of items of user data are associated with a first time period of the time varying content.

4. A method according to claim 3, wherein the second group of items of user data are associated with the first time period of the time varying content.

5. A method according to claim 1, wherein the step of replacing one of the items of user data is performed responsive to selection of a user control displayed in a position relative to the first predetermined position.

6. A method according to claim 4, further comprising replacing items of user data currently displayed in the predetermined positions by displaying items of user data from a third group of items of user data associated with the piece of time varying content in the predetermined positions by transitioning a display of the items of user data from the third group of items of user data along the second axis, said
items of user data from the third group of items of user data being associated with a second
time period of the time varying content.

7. A method according to claim 6, wherein displaying the items of user data of the third
group of items of user data comprises

sequentially displaying, in an order based on relevance to the at least one category
of the plurality of categories, each item of user data of the third group of items of user data in
one of the predetermined positions.

8. A method according to claim 7, further comprising

playing the time varying content, wherein

the items of user data from the first group of items user data are displayed during the
first time period of the time varying content, and

the items of user data from the third group of items user data are displayed during
the second time period of the time varying content.

9. A method according to claim 5, wherein a position of the first of the predetermined
positions relative to other positions of the predetermined positions determines the first
category of the plurality of categories.

10. A method according to any previous claim, wherein the items of user data comprise
user generated comments comprising text data.

11. A method according to any previous claim, wherein the first axis is a vertical axis and
second axis is a horizontal axis.

12. A method according to any previous claim, wherein the relevance of an item of user
data to a category of the plurality of categories is based on a numerical metric determined
from metadata associated with the item of user data.

13. A method according to any previous claim wherein the time varying content is video.

14. A method according to any previous claim, further comprising
determining the number of the predetermined positions by a size of a resizable
window in which the predetermined positions are displayed.
15. A user device comprising a display device, a processor and a memory, said user memory comprising a computer program which when implemented on the processor controls the user device to:

display on the display device a first group of items of user data associated with a piece of time varying content in predetermined positions along a first axis;

and

replace one of the displayed items of user data of the first group of items of user data by displaying a second item of user data in a first of the predetermined positions by transitioning a display of the second item of user data along a second axis, said second item of user data having been selected from a second group of items of user data associated with the piece of time varying content based on relevance to a first category of a plurality categories.

16. A user device according to claim 15, wherein the first group of items of user data are displayed in the predetermined positions is in an order based on relevance to the first or a further category of the plurality of categories, the first group of items of user data having been selected based on relevance to the first or the further category of the plurality of categories.

17. A user device according to claim 15 or 16, wherein the first group of items of user data are associated with a first time period of the time varying content.

18. A user device according to claim 17, wherein the second group of items of user data are associated with the first time period of the time varying content.

19. A user device to claim 15, wherein the second item of user data is displayed responsive to selection of a user control displayed in a position relative to the first predetermined position on the display device.

20. A user device according to claim 18, wherein items of user data currently displayed in the predetermined positions are replaced by displaying items of user data from a third group of items of user data in the predetermined positions by transitioning a display of the items of user data from the third group of items of user data along the second axis, said items of user data from the third group of items of user data being associated with a second time period of the time varying content.
21. A user device according to claim 20, wherein displaying the items of user data of the third group of items of user data comprises sequentially displaying, in an order based on relevance to the at least one category of the plurality of categories, each item of user data of the third group of items of user data in one of the predetermined positions.

22. A user device according to claim 21, wherein the computer program is arranged to control the user device to play the time varying content and to display the items of user data from the first group of items user data during the first time period of the time varying content, and to display the items of user data from the third group of items user data during the second time period of the time varying content.

23. A user device according to claim 19, wherein a position of the first of the predetermined positions relative to other positions of the predetermined positions determines the first category of the plurality of categories.

24. A user device according to any of claims 15 to 23, wherein the items of user data comprise user generated comments comprising text data.

25. A user device according to any of claims 15 to 24, wherein the first axis is a vertical axis and second axis is a horizontal axis.

26. A user device according to any of claims 15 to 25, wherein the relevance of an item of user data to a category of the plurality of categories is based on a numerical metric determined from metadata associated with the item of user data.

27. A user device according to any of claims 15 to 26 wherein the time varying content is video.

28. A user device according to any of claims 15 to 27, wherein the number of the predetermined positions is determined by a size of a resizable window in which the predetermined positions are displayed on the display device.

29. A system for displaying items of user data associated with a piece of time varying content to a user, said system comprising a user device and a server, said server arranged to transmit a first group of items of user data associated with a piece of time varying content
to the user device, said user device comprising a display device, a processor and a memory, said memory comprising a computer program which when implemented on the processor controls the user device to:

- display on the display device the first group of items of user data associated with a piece of time varying content in predetermined positions along a first axis;
- and
- replace one of the displayed items of user data of the first group of items of user data by displaying a second item of user data in a first of the predetermined positions by transitioning a display of the second item of user data along a second axis, said second item of user data having been selected from a second group of items of user data associated with the piece of time varying content based on relevance to a first category of a plurality categories.

30. A computer program comprising computer implementable instructions which when implemented on a processor causes the processor to perform a method according to any of claims 1 to 14.

31. A method, user device or system, substantially as hereinbefore described with reference to the Figures.
Documents considered to be relevant:

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| G06F: G06Q: H04N |

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