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June 2020

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Recommended Citation

Sharifi, Matthew and Carbune, Victor, "Automatic Content Bookmarking and Summarization for Resuming Paused Content", Technical Disclosure Commons, (June 16, 2020)

https://www.tdcommons.org/dpubs_series/3338



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Automatic Content Bookmarking and Summarization for Resuming Paused Content

ABSTRACT

Depending on the content and the context, users can require several pauses before being able to completely consume content such as online articles, books, audio/video, or multimedia content. When returning to the content after a break, it can be difficult for users to pick up seamlessly where they left off. These difficulties are exacerbated if a long period has passed after the last pause as the users might not remember details of the content that they've already viewed. This disclosure describes techniques to automatically add bookmarks within multimedia content when a user pauses consumption. At a later time when the user resumes the content, an automatically generated summary of the previously consumed portions of the content is presented.

KEYWORDS

- Online content
- Pause and resume
- Media bookmark
- Content summarization
- Dynamic content summary
- Adaptive summary
- Virtual assistant
- Smart display

BACKGROUND

People consume a variety of content such as books, music, movies, TV shows, etc. via various devices such as smart speakers, smart displays and televisions, e-readers, tablets, laptops, etc. During content consumption, users often pause and resume at a later time. While such pauses are more likely for longer content, users can encounter the need to pause and return even when consuming shorter content, such as an online article. Depending on the content and the context, users can require several pauses before being able to finish consuming the content, especially when the content is long. When returning to the content after a pause, it can be difficult for a user to pick up seamlessly where they left off. These difficulties are exacerbated if a long period of time has passed after the last pause, as the user might not remember the details of the portion of the content that was consumed prior to pausing.

DESCRIPTION

This disclosure describes techniques that provide users with the ability to add bookmarks within multimedia content. Further, with user permission, users can be presented with an automatically generated summary of the previously consumed portions of the content when they resume content consumption at a bookmarked location. The described techniques can be provided via a virtual assistant or other program that is available to the user. With user permission, content resumption on a different device can also be supported.

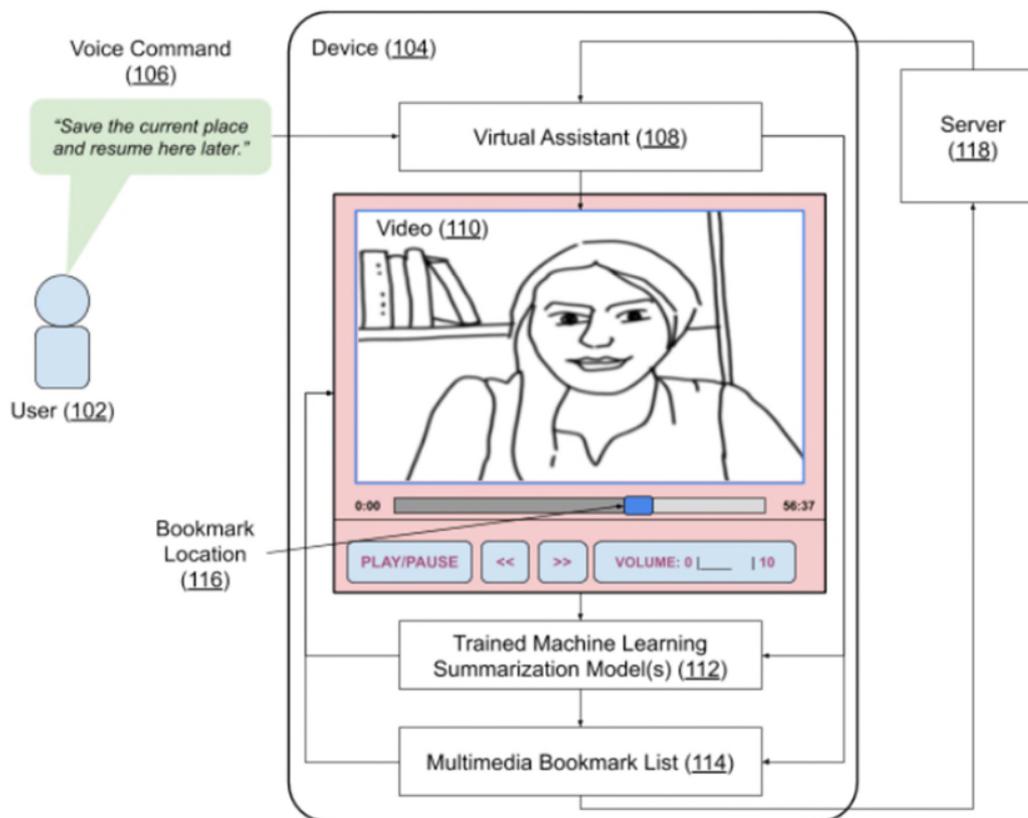


Fig. 1: Bookmarking a place in multimedia content for later resumption

Fig. 1 shows an operational implementation of the techniques described in this disclosure. A user (102) wishes to pause watching a video (110) on a device (104) and return to it later. The user issues a voice command (106) to a virtual assistant (108) to bookmark the location (116) at which the playback is to be paused. With user permission, the bookmark is added to an on-device list of multimedia bookmarks (114) and optionally, stored on an external server (118).

If the user permits, a summary of the previously viewed content is generated by employing any suitably trained machine learning summarization model (112). When resuming playback at the bookmarked location, the user is shown the summary as a memory refresher. If the user wishes to resume playback on another device, the corresponding bookmark can be retrieved from the server.

During the consumption of multimedia content, a user can invoke the bookmarking functionality by issuing an explicit command to save the current place within the content for later resumption. Users can issue the command using any suitable mechanism including voice-based instruction to a virtual assistant. For instance, users can ask a voice assistant to “save the current place and resume here later.” Alternatively, or in addition, users can permit a virtual assistant to store the current position within a piece of content automatically whenever they switch away from the content prior to completion.

With user permission, identifying the current place within a piece of content and creating the corresponding bookmark can be performed in various ways, such as:

- Application Programming Interfaces (APIs) of specific applications and platforms with functionality to query current state and restore a previous state: For instance, an API can return a Uniform Resource Identifier (URI) that includes state information, such that invoking the URI reopens the content at the position specified within the URI.
- Observation of relevant user interface (UI) elements: With user permission, the current state of content consumption can be determined based on inspecting the device screen for the status of various UI elements such as scroll bar, elapsed or remaining time indicators, etc.

The virtual assistant (or other application) can automatically offer to resume content at the place where a user left off whenever the user returns to consume content for which a bookmark exists. Alternatively, or in addition, the user can request resumption explicitly. For instance, the user can issue a voice command asking a virtual assistant to “resume reading where I left off.”

In addition, the user is provided the option to view a summary of the previously consumed content as a memory refresher. The summary can be generated by using any suitable

trained machine learning models appropriate for the specific type of content. For instance, text summarization models can be used for generating summaries for a book, video segment selection models can be employed for creating a highlight reel from videos, etc. The models can be implemented via suitable techniques such as deep neural networks, e.g., a sequence-to-sequence model for text summarization. The length of the summary can be selected based on the time since the user was last consuming the content, or on other factors.

To generate the summary, the underlying content is made accessible to the summarization model(s) with user permission. Such access can use any suitable mechanism, such as APIs, UI inspection, etc., to mark the portion of the content that needs to be summarized. If the user permits, the summarization model(s) can incorporate additional information, such as the time when the user last viewed the content, to determine the appropriate length and detail for the summary. For instance, if the user paused the content fairly recently, no summary may be shown and summary generation is skipped. In contrast, a longer and more detailed summary can be generated if the user is returning to the content after a long gap and/or after consuming other similar content in between.

With user permission, generated summaries can be shown automatically prior to the resumption of bookmarked content consumption, if appropriate. The user can also explicitly ask for a summary refresher via any suitable mechanism, such as a voice command asking a virtual assistant to “provide the highlights of what happened before I stopped watching.” Users can choose to skip the summary regardless of whether it is automatically shown or explicitly invoked. After the summary is shown or skipped, content consumption resumes at the bookmarked location.

Content bookmarks are stored locally on the device. Alternatively, or in addition, the bookmarks can be stored on an external server with user permission. Storage on an external server, such as a cloud-based platform, can make it possible for the bookmarks to be shared across multiple devices, thus enabling users to resume consuming content on another device regardless of the device on which the consumption was paused. Content summaries can be generated dynamically at the time of the resumption of consumption and/or created in advance immediately after a bookmark is added.

The techniques described in this disclosure can support the addition of bookmarks for any type of content. The techniques facilitate pausing and resuming content consumption in a seamless manner, thus enhancing the user experience (UX) of multimedia consumption, especially for long content that often requires multiple breaks. Further, the techniques can add to the utility of virtual assistants by adding content bookmarking and summarization to their supported capabilities.

Further to the descriptions above, a user may be provided with controls allowing the user to make an election as to both if and when systems, programs or features described herein may enable collection of user information (e.g., information about a user's social network, social actions or activities, profession, a user's preferences, or a user's current location), and if the user is sent content or communications from a server. In addition, certain data may be treated in one or more ways before it is stored or used, so that personally identifiable information is removed. For example, a user's identity may be treated so that no personally identifiable information can be determined for the user, or a user's geographic location may be generalized where location information is obtained (such as to a city, ZIP code, or state level), so that a particular location of

a user cannot be determined. Thus, the user may have control over what information is collected about the user, how that information is used, and what information is provided to the user.

CONCLUSION

This disclosure describes techniques to enable users to add bookmarks to locations within multimedia content. Identification of the current place within a piece of content and creation of the corresponding bookmark is performed via content provider APIs, via inspection of user interface, etc. Prior to resumption at a bookmark, users can be presented with an automatically generated summary of the previously consumed portions of the content. The summary can be generated by a suitably trained machine learning model appropriate for the specific type of content. Bookmarking and summarizing can take place automatically or upon specific user command, e.g., a spoken command to a virtual assistant. The described techniques support bookmarking any type of multimedia content and facilitate pausing and resuming content consumption in a seamless manner. In this manner, the user experience of content consumption is enhanced, especially for long content that often requires a user take multiple breaks.