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INTELLIGENT PRESENTATION SLIDE ASSISTANT

A document editing application such as a presentation application enables users to create and edit documents such as slides of a presentation. For example, a user can insert text or an image onto a slide of the presentation using a presentation application. Numerous options have been added to the presentation application to enhance usability in inserting and manipulating slide objects (e.g., a text object or an image object) to create a presentation slide. Despite the added functionality, creating presentation slides still remains a time consuming process. In particular, a manual process of polishing the slide objects (e.g., adjusting colors, a layout, or a format of the text or image object for overall look and feel (or tone of the presentation)) and propagating any changes to all the objects in the presentation slide for consistency requires a substantial amount of time. Moreover, ensuring consistency in the content of the presentation (e.g., determining whether there is any expression (e.g., words or images) that may not be appropriate for the tone of the presentation) requires a great deal of attention by a user.

Accordingly, a technique is proposed for assisting a user in creating and polishing documents of the user. The following description uses a slide presentation as an example document type to which the proposed technique can be applied. It should be noted, however, that the proposed technique can be applied to various other types of documents, including for example text documents, spreadsheets, etc.

The proposed technique can be implemented by a document editing application (e.g., a presentation application) provided by a cloud-based content management platform. The document editing application can be a web application accessible via a web browser hosted by a user device, a mobile application hosted by a user device or a desktop application hosted by a user device. The document editing application enables a user to access and collaboratively edit

documents, including presentation slides. The cloud-based content management platform can provide a designated component that allows the user to insert objects like a text box or an image object including a graph, a table, and etc. in a document, including slides of a presentation. Each object can include content (e.g., text or an image) and be associated with attributes for style (e.g., a color, a font, a size, an animation effect) and layout (i.e., an arrangement of text and/or images on the document at a particular location or in a specific order). The designated component can be added (e.g., as a plugin) to the document editing application such a presentation application. In the illustrative example of a slide presentation, the designated component is referred to as a slide assistant service.

The slide assistant service can utilize a trained machine learning model to assist the user in creating and polishing a slide for presentation. Specifically, the slide assistant service can use the trained machine learning model to determine a level of seriousness of the presentation (e.g., a tone of the presentation, technical depth of the presentation, etc.) based on content of the presentation of the user, and optionally contextual information associated with the presentation and/or the user (e.g., the folder where the presentation is stored, the role of the user in the organization, the date of the presentation, etc.). Then, the slide assistant service can present a slide having slide objects for the content that are formatted, styled and arranged to suit the determined level of seriousness. The slide assistant service can also identify content that may not be suitable for the determined level of seriousness of the presentation.

Figure 1 illustrates a flow diagram of a method for intelligently assisting a user in creating and polishing a slide of a presentation. First, at block 110, the slide assistant service can receive content to be included in a slide for a presentation. For example, the slide assistant service can receive a plain slide (e.g., a slide with a white background and no preset layout) with

text and/or an image. The text and the image can be included in the plain slide as slide objects. In another example, the slide assistant service can receive a plain slide with the text and/or image slide objects with a particular style attribute(s) (different from the default setting) applied (e.g., the text can have a specific font and size and the image can be arranged in a particular layout, dimension, and location within the plain slide).

Next, at block 120, the slide assistant service can determine a level of seriousness of the presentation based on the content (e.g., the text or image provided in the plain slide). The slide assistant service can set the level of seriousness of the presentation to be “low,” “medium,” “high” or use any other scale measures. The slide assistant service can also associate the level of seriousness with a subject matter of the presentation (e.g., a “sales presentation – high” vs. “sales presentation – low”). The slide assistant service can provide the content as input to a trained machine learning model that can determine a level of seriousness of the presentation.

The slide assistant service can use a trained machine learning model that adopts sentiment analysis on the text of the presentation in order to determine a level of seriousness (i.e., a general tone of the presentation). For example, the slide assistant service can determine the level of seriousness of a presentation for corporate executives to be “high” based on keywords such as “board consent”, “corporate initiative”, etc. For a presentation of family vacation photos, the slide assistant service can determine the level of seriousness to be “low” based on keywords such as “You rock”, “it was fun”, etc.

In another example, the slide assistant service can use a trained machine learning model that adopts semantic image analysis to determine a level of seriousness in terms of how technical and detailed the presentation is. The model can determine the level of seriousness based on a subject matter of the presentation and complexity and/or amount of information in diagrams

and/or graphs from the images of the presentation. For example, the slide assistant service can determine the level of seriousness to be “high” for a graph image with multiple axes and/or dimensions with numerous data points regarding properties of cancer cells. As such, the more technical and/or detailed the presentation is, the higher the level of seriousness would be.

In determining the level of seriousness, the slide assistant service can also consider a storage location (e.g., a file folder) of the plain slide provided by the user. The slide assistant service can identify a name of the storage location and confirm or adjust the level of seriousness determined by the model because the name of the storage location (e.g., Team ABC vs. Client XYZ) usually indicates a subject matter of files stored (e.g., team project vs sales/marketing). Moreover, the slide assistant service can consider other presentation slides stored in the same storage location. For example, the slide assistant service can identify the level of seriousness of other presentation slides stored at the same location to confirm or change the level of seriousness determined for the current slide.

In some instances, the slide assistant service can access profile of a user account associated with the user and use information from the profile (e.g., job position at a company, a department the user belongs to) in determining the level of seriousness. For example, if the identified job position is a sales associate, the slide assistant service can determine that the level of seriousness is “high” because it is likely that the presentation is for a sales pitch to a client.

Subsequently, at block 130, the slide assistant service can predict a theme appropriate for the presentation based on the level of seriousness, as well as the content provided by the user. The theme can include a preset group of colors (i.e., a color scheme), fonts, backgrounds, and layouts for presentation slides suitable for the level of seriousness. For example, in case the level of seriousness is a “financial reporting - high,” the slide assistant service can predict a theme that

includes a layout that has a placeholder for a financial statement, a cyclical time period (e.g., Q1 of 2018) represented by the financial statement, a name of a client company for the financial statement, etc. with a conservative color scheme such as black or navy. As another example, in case the level of seriousness is a “food product sales pitch - high,” the slide assistant service can predict a theme that includes a red color scheme (as the color red is known in color psychology to stimulate appetite) with a formal font, such as Times New Roman font. Also, the slide assistant service can predict a theme that does not include a flashy color scheme such as a neon orange color scheme for such high level of seriousness.

The slide assistant service can utilize a generative model to predict the theme based on the level of seriousness and the content. A generative model can learn a pattern or data distribution of a training data set to generate an output data set similar to the training data set. A generative model is trained in an unsupervised setting and uses deep learning such as a Variational Auto Encoder (VAE) and Generative Adversarial Networks (GANs). Such generative model can generate a data set similar to the training data set with high accuracy.

To train the generative model, the slide assistant service can provide completed or finalized slides of presentations from general population (e.g., presentation slides stored via the cloud-based content management platform) as training data. The slide assistant service can train the model for each level of seriousness. Accordingly, the generative model can be used to generate a presentation slide that looks and feels like presentation slides in the training data set with the same or similar level of seriousness.

The slide assistant service can provide the received content and the determined level of seriousness as an input to the trained generative model. Then, the slide assistant service can obtain as an output from the trained generative model for the particular level of seriousness, a

theme appropriate for the given content and the level of seriousness. As will be described in more details with respect to block 140, the slide assistant service can receive as an output from the trained generative model, a presentation slide that looks and feels similar to other presentations with the same or similar level of seriousness in accordance with the theme.

For personalization (e.g., a preferred color scheme or expression (words or images)), the slide assistant service can provide presentation slides of a specific user account to train the model for the specific user account. In another example, the slide assistant service can also provide, as training input, user actions during creation of presentation slides (e.g., a user action changing a color of text from one to another) in order to learn preferences of the user. After the model is trained, the slide assistant service can reinforce the learning on the trained model by providing user feedbacks on outputs of the model (e.g., whether or not a user accepts or rejects suggestions (e.g., a color scheme) made based on outputs of the model) in order to fine-tune the model. The slide assistant service can use the positive and/or negative feedback (acceptance and/or rejection by the user) to adjust the model.

In addition, the slide assistant service can provide a theme that also includes a set of appropriate tone or expressions (words or images) for the given level of seriousness. As such, the slide assistant service can indicate any inconsistency in the text and/or images of the content that is not suitable based on the level of seriousness. For example, in case the level of seriousness is “sales presentation – high,” the theme can be business English theme. In such case, the slide assistant service can suggest that a smiley emoticon included by the user in the slide is not an appropriate expression based on the theme related to a business setting. Further, the slide assistant service can point out any text and/or images from the content that contains foreign language (e.g., German) inconsistent with the theme (e.g., English).

Then, at block 140, the slide assistant service can provide a slide including slide objects arranged and formatted in accordance with the theme. The slide objects incorporate the content provided by the user for the presentation. The slide assistant service can determine slide objects (e.g., text box or an image object including a graph or a table) from the content provided by the user at block 110. The slide assistant service can then apply the theme by placing and formatting the slide objects in accordance with the theme predicted at block 130. For example, the slide assistant service, when providing the slide, can change a font or size of text objects or modify size or color of image objects to comply with the theme. Moreover, the slide assistant service can indicate whether there is any subject matter in the slide objects that is inconsistent with the theme (e.g., a smiley face emoticon for a “sales presentation – high” level of seriousness).

In another example, the slide assistant service can further predict a presentation delivery time based on a number of slides, a number of slide objects, content of slide objects (e.g., how technical and detailed each slide object is) in order to help a user to delete or add more content to complete the presentation within a given amount of presentation time.

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 user activities on the cloud-based content management platform, information about content of documents stored in the cloud storage, a user’s preferences, or a user’s current location), and if the user has 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. 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.

ABSTRACT

A technique is proposed for assisting a user with creating and polishing a document such as a presentation slide stored on a cloud-content based platform. A slide assistant service provided by the cloud-content based platform receives content to be included in a slide for a presentation. The slide assistant service can determine a level of seriousness of the presentation based on the content. Then, the slide assistant service can predict a theme appropriate for the presentation based on the level of seriousness and the content. Next, the slide assistant service can provide a slide that includes the slide objects arranged and formatted in accordance with the theme.

Keywords: presentation slide assistant, machine learning, sentiment analysis, generative model, semantic image understanding model.

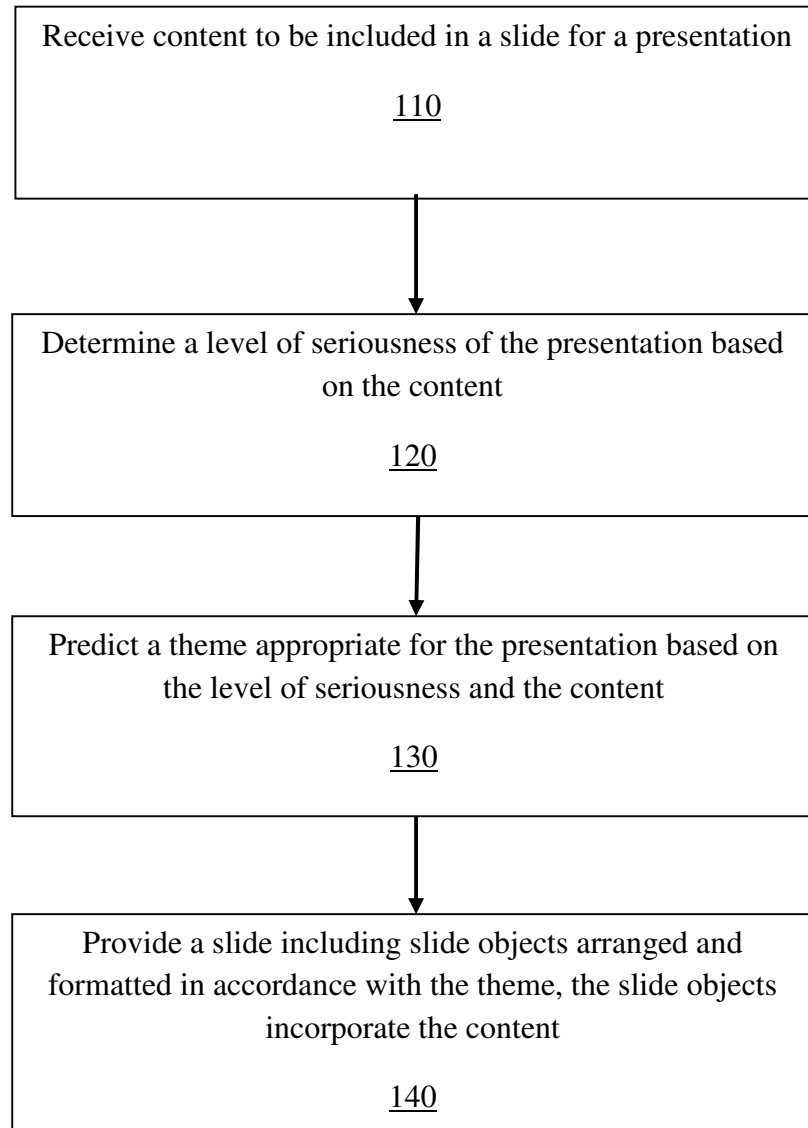


FIG. 1