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Automatic Style Matching For External Content Inserted In Documents

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ABSTRACT

Insertion of external content such as equations, graphs, images, etc. that have a different style from that of a document can result in documents with an inconsistent appearance. Users often spend significant time adjusting such content to ensure visual consistency. The described techniques automatically improve the style consistency of a document even when the document includes content inserted from other applications such as equation editors, image editors, etc. having styles different from those in the target document. Automatic style adjustments are applied to the inserted content which reduces the user burden of ensuring style consistency. Automatic style adjustments, with user controls, can be included as a feature in word processors, spreadsheets, presentation software, etc.

KEYWORDS

- Style transfer
- Document style
- Style template
- Copy paste
- Image classifier

BACKGROUND

Most digital documents, such as text documents, presentations, spreadsheets, etc., have a specific style that is consistent within the document. Consistency can be achieved by manually enforcing a particular style or by applying a template or theme to the digital document. Many such templates have non-white backgrounds. Inserting images or equations typeset in an external equation editor (which typically have a white background) into documents with a different style

requires significant human effort for the user to change the image or equation to conform to the document style. While making the background transparent is an option, many image or equation editing tools do not support this well, and this does not address the issue of the text color not matching that in the target document.

DESCRIPTION

The techniques of this disclosure analyze the style of an image (or other content) that a user inserts in a digital document being edited in a word processor, presentation software, spreadsheet, or other software to determine whether the style of the image fits into the visual style of the document. Upon detection of style mismatch, the style of the image is adjusted automatically to fit the visual style of the target document. Fig. 1 below shows a presentation slide (100) being edited in a software application. The presentation slide is part of a deck of slides of a specific color theme, as seen in Fig. 1. The user inserts an externally created bar chart (102) into the slide. As seen in Fig. 1, the color scheme of the added chart does not match the color scheme of the slide.
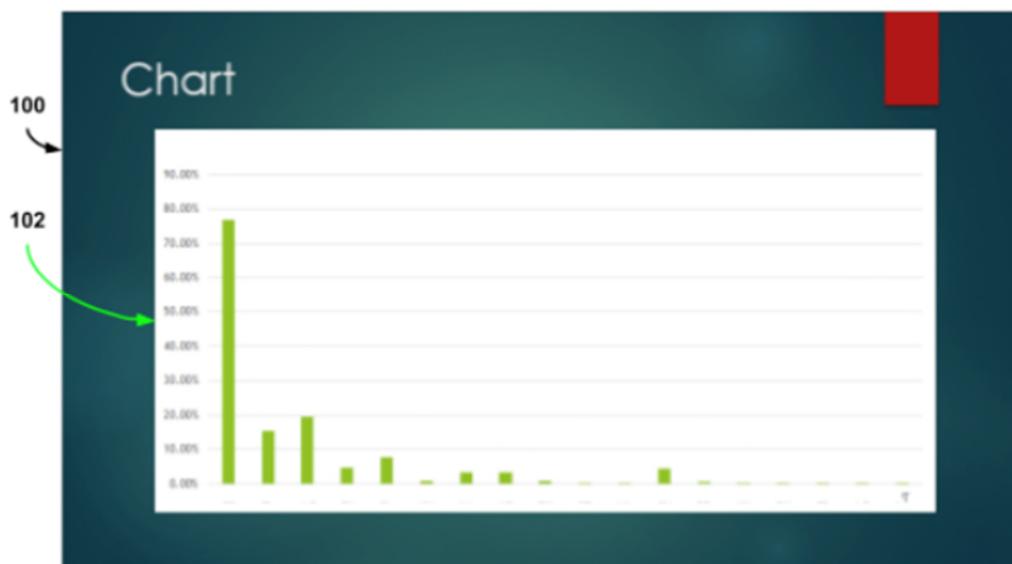
Fig. 1: Chart inserted into a slide without matching theme

Per techniques of this disclosure, the inserted chart image is automatically modified to match the color scheme of the presentation slide. As seen in Fig. 2 below, the background of the chart is rendered transparent (recolored) to match the background of the presentation slide. Further, the bars and text labels are recolored to match the style of the slide.
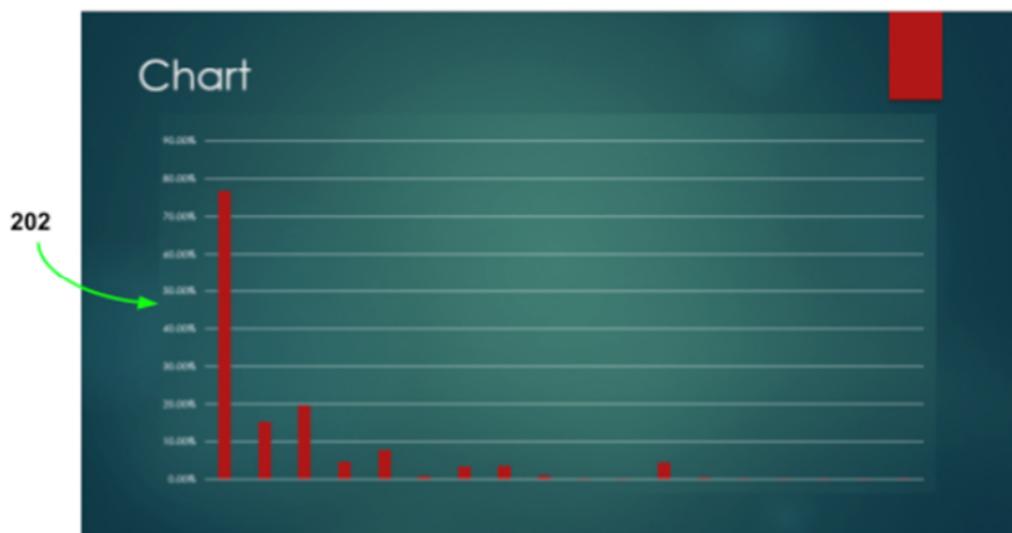
Fig. 2: Chart inserted into the slide and theme matched automatically

To perform the style adjustment, image classification techniques are applied to determine the type of image that is pasted into the document. Based on the detected image features, various adjustments are performed to match the image style to that of the document. Some examples are listed below:

- An image that is being copied can be detected as including text. The text portion of the image is recognized and automatically recolored (with font style adjustments, if necessary) to match the text style of the target document. Further, the background is made transparent or recolored to be the same color as the document background.

- If a clipart image (e.g., a sketch of a human in black color) is inserted into a digital

document, the image is recolored to match the color scheme of the target document.

- If an image that contains a photograph (e.g., stock photo), e.g., a photograph of a single object in front of a homogeneous background, is imported or copied into another digital document, the background of the image is made transparent, but the object is not recolored. Further, depending on the kind of photograph, the image may not be modified at all.

Users are provided with controls over the adjustment process. For example, the user can undo some of the automatic edits, or revert the automatic changes in color scheme and pick another style, e.g., pick a different color for text within the image in order to highlight it.

While the foregoing description refers to images being inserted into a document, the described techniques also apply to the transfer of structured data with formatting. For example, when a user performs a copy-paste operation to transfer text from one document to another, sometimes the style attributes of the text from the original document persist, leading to bad looking pastes. The techniques of this disclosure enable the user to transfer data that automatically matches the target style.

The detection of style of the source content and that of the target document can be performed as follows:

- A classifier that distinguishes between the different types of images that are inserted into a document, e.g., photographs, charts, tables, line drawings, clipart, equations, etc.
- A classifier that groups individual pixels in the image into groups corresponding to different target colors (or styles), e.g., background, text, line drawing, content, etc.
- A set of rules that apply different color themes to the different pixel groups based on the styles in the target document. The collection of rules can be specified manually and can

be configurable by the user, or a dynamic set of rules, e.g., obtained via application of machine learning techniques that can learn additional rules based on user-permitted training data that includes prior user edits to inserted content.

For applying target styles to transferred text, automated techniques are used to detect the different formatting styles in the copied text and a set of rules are applied to modify these into formatting styles in the target document.

The described techniques automatically improve the style consistency of a document even when the document includes content inserted from other applications such as equation editors, image editors, etc. having styles different from those in the target document. Automatic style adjustments are applied to the inserted content which reduces the user burden of ensuring style consistency. Automatic style adjustments, with user controls, can be included as a feature in word processors, spreadsheets, presentation software, etc.

CONCLUSION

Insertion of external content such as equations, graphs, images, etc. that have a different style from that of a document can result in documents with an inconsistent appearance. Users often spend significant time adjusting such content to ensure visual consistency. The described techniques automatically improve the style consistency of a document even when the document includes content inserted from other applications such as equation editors, image editors, etc. having styles different from those in the target document. Automatic style adjustments are applied to the inserted content which reduces the user burden of ensuring style consistency. Automatic style adjustments, with user controls, can be included as a feature in word processors, spreadsheets, presentation software, etc.