Image retrieval model based on weighted visual features determined by relevance feedback

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ABSTRACT

An accurate and rapid method is required to retrieve the overwhelming majority of digital images. To date, image retrieval methods include content-based retrieval and keyword-based retrieval, the former utilizing visual features such as color and brightness, and the latter utilizing keywords that describe the image. However, the effectiveness of these methods in providing the exact images the user wants has been under scrutiny. Hence, many researchers have been working on relevance feedback, a process in which responses from the user are given as feedback during the retrieval session in order to define a user's need and provide an improved result. Methods that employ relevance feedback, however, do have drawbacks because several pieces of feedback are necessary to produce an appropriate result, and the feedback information cannot be reused. In this paper, a novel retrieval model is proposed, which annotates an image with keywords and modifies the confidence level of the keywords in response to the user's feedback. In the proposed model, not only the images that have been given feedback, but also other images with visual features similar to the features used to distinguish the positive images are subjected to confidence modification. This allows for modification of a large number of images with relatively little feedback, ultimately leading to faster and more accurate retrieval results. An experiment was performed to verify the effectiveness of the proposed model, and the result demonstrated a rapid increase in recall and precision using the same amount of feedback.

1. Introduction

Information on the internet is shifting from text-based to multimedia-based with large amounts of visual and audio data. The development of tools such as digital cameras and scanners, which convert analog data into digital data, has accelerated the increase in multimedia information on the internet, and widened internet bandwidth has dramatically improved access. These changes have demonstrated the need for current internet search systems to improve their search engines to include multimedia data such as images, music, and videos. Among these, images are most numerous, requiring a more efficient searching technique.

The current image search technology is keyword-based. Keyword-based searching uses the file name by which the image has been stored or keywords describing the image. The limitation of this method is that if no keyword has been associated with an image or if the keyword associated with an image does not describe the image properly, the accuracy of the search result is poor. Entering a keyword(s) for each image manually is a short-term solution, but considering the rapid increase in the number of images, this cannot be an ultimate solution.

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