Sketch-to-Collage (sap_0333)

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1 Introduction

Using query-by-sketch we propose an application to efficiently create collages from image collections. Using rough color strokes that represent the target collage, images are automatically retrieved from a database and segmented to synthesize a new image. The database is indexed using simple geometrical and color features for each region, and histograms that represent these features for each image. The image collection is queried by means of rough strokes on a simple paint tool. The individual segments retrieved are added to the collage using Poisson image editing and alpha matting.

Compared to previous works [Johnson et al. 2006], our system: (1) does not require a labeled data set (although keywords can be used as well to filter queries); (2) the hues of the sketch are directly related to the hues of the resulting collage; (3) images and segments are retrieved on real time.

2 Image Retrieval and Synthesis

Our application is divided into three distinct parts: the segmentation module, the retrieval module, and the compositing module. Photographs are segmented in a few regions using K-means clustering, color categorization, and statistics order filtering. Then, images are stored in a database, storing separate properties for each region, which are used for retrieval. Each segment in the database is represented by its relative position in the image, its size, its average color in the L*a*b* color space, and its orientation. To represent the whole image, we use a histogram of these features [Gavilan et al. 2006]. As shown in Figure 1, the user draws a sketch with simple strokes that are used to retrieve particular segments that are passed to the compositing module. Given a set of strokes, similar images are also retrieved. The segmentation and compositing can also be done interactively, so the user can select different regions and create several arrangements in the composite.

Once an object is retrieved, it is added to the collage. We use hard-segmented regions computed offline to extract the object. Since we are considering only single strokes for every query, some parts of the objects may not be automatically extracted. To solve this, first, we fill the holes of the segment, and also let the user to interactively modify the region. We let the user to select between hard segments, drag-and-drop pasting [Jia et al. 2006], or band optimization. The second method has the advantage that also finds the optimum boundary for applying Poisson color blending [Pérez et al. 2003], given a target collage. The third one is a modification of drag-and-drop pasting to let the user set an arbitrary line, allowing the user to explicitly split objects in two or more parts, as in Figure 1 (1). Detailed usage description can be found at http://www.img.cs.titech.ac.jp/~david/sketch2collage.

3 Results and Conclusion

We have introduced an interactive way of making collages based on a query-by-sketch interface. Our tool works with rough color strokes that visually represent the idea of the final collage, and not just a collection of keywords. By using image retrieval, the user does not need to explore an entire image collection, but just a subset of relevant objects. Moreover, creativity is added to the process of making a collage, something that was not possible in collages made with automatic summarization techniques. Tested on an image collection of 3928 images, the average retrieval speed is 10.3 msec (on a MacBook CoreDuo 1.83GHz, JavaVM 1.5) for images, and 39.2 msec for segments. Our drag-and-drop pasting implementation, including the Poisson solver, takes an average of 5 seconds for objects no bigger than 320 × 320 pixels. Boundaries and colors are updated in separate threads, so the user can see the retrieved object in the collage canvas on real time.

References