Alphabet Collage Art Generation

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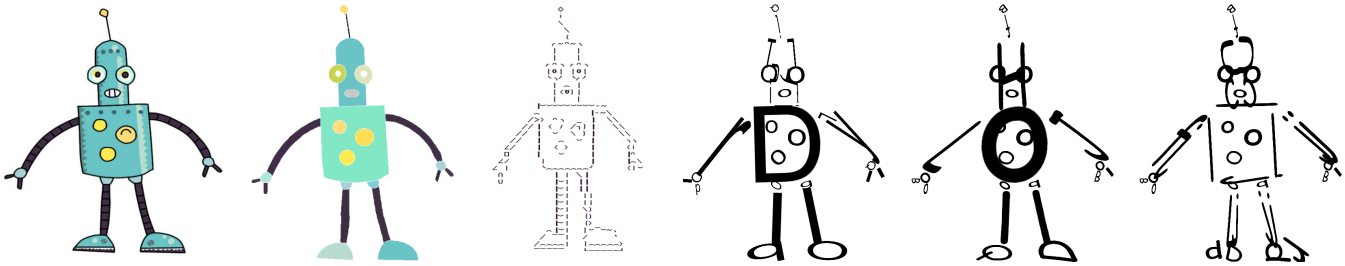

(a) (b) (c) (d) (e) (f)

Figure 1: Working process and results. (a) input image. (b) region map. (c) ASCII art by [Xu et al. 2010]. (d) our result using Arial font. (e) result using Comics Sans with coarse detail. (f) result using Comics Sans with fine detail.

ABSTRACT

We propose a novel method to generate alphabet collage art from a single input image by replacing the partial curves of the image with the best-matched shape of alphabet letters. The salient structure of the image is preserved, and the contour is reconstructed with letters. In our framework, we first segment the input image into regions and extract the primary curve from each letter. Second, we analyze the structure of the region contour and the curve of a letter for finding the relationship between the salient contour in the image and the structure of the glyph of letters. We propose a modified partial curve matching to generate a stylized collage result with alphabet letters.

CCS CONCEPTS

• **Computing methodologies** → Non-photorealistic rendering;

KEYWORDS

collage art, curve matching, non-photorealistic rendering

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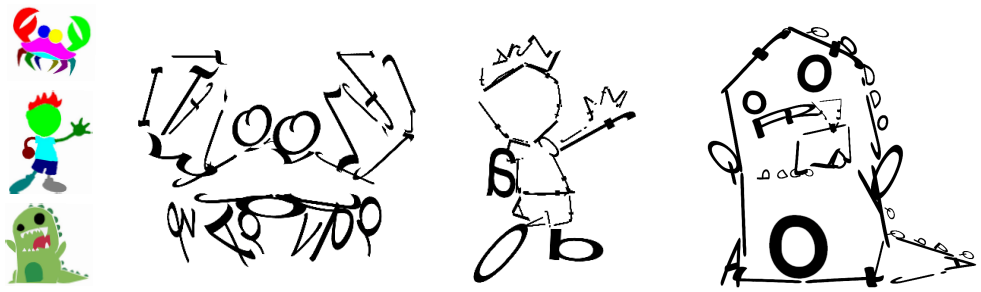
1 INTRODUCTION

Words are an essential medium for communication. When words are combined with visualization, the result becomes word art. In computer area, one famous example of word art is word cloud. A word cloud starts by analyzing keyword frequency in an input article. Wordle [Viegas et al. 2009] packs words inside images according to their frequency, resulting in a new medium for summarizing text information. Word art has another expression in literature, and it is Calligram. Calligram uses words, proverb, or poem to compose an image; it generates word art different from a word cloud. Our research is similar to calligram, but we focus more on the correlation between alphabet letters and the contours of the input image. This type of art exploits techniques to modify the scale, rotation, and reflection of letters to reconstruct the final result. It retains the main features of the original image, and keeps the readability of the letters.

2 OUR APPROACH

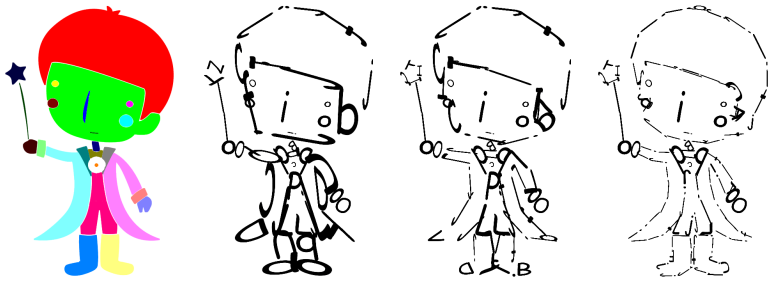
This study aims to replace the contours of an input image with letters while preserving the features of the original image and the clarity of the letters. Based on two points, we divide our system into three core steps: preprocessing, matching, and stylization.

Preprocessing. For an input image, we divide the image into several regions and sort the regions by area size in descending order. Then we extract line segments from the contour of each region. Therefore, we build a series of regions with the contour curve. The thinning method [Zhang and Suen 1984] is applied to extract the skeleton of each letter. We treat the letter replacement as a partial curve matching problem. The extracted curve will be the key to find the best fit between letters and the image contour.



(a) (b) (c) (d)

Figure 2: Results. (a) region map. (b)(c)(d) Font type: Lucida Handwriting, Arial, and Comic Sans.



(a) (b) (c) (d)

Figure 3: Results. (a) region map. (b)(c)(d) coarse to fine of results using Arial font.

Matching. Next, we find the best matching between the line segments from a region contour and the skeleton of a letter. For this purpose, we apply IS-match for partial curve matching [Donoser et al. 2010], and iterative closest point (ICP) [Besl and McKay 1992] to minimize the transformation between two point clouds. We use a weighted average of the score of IS-match, ICP, and the overlapping area to evaluate each matching pair.

Stylization. In the final stage, we consider several options to exploit the possibility and variety for the arrangement of letters. It will incur a huge computation cost when finding the best matching of every letter and contour combination. We allow non-uniform scaling and reflection of the letter to reduce the number of the letters in the final result. We also introduce a user-specified parameter to determine the length of sub-curve in the region contour. When the length is large, fewer letters will replace the region contour, and be resulting in a coarse collage art style as in Fig. 1(e). Otherwise, a small length of sub-curve will lead to more letters to form the contour as in Fig. 1(f), and more detail will be preserved.

3 RESULT AND FUTURE WORK

In this paper, we proposed an alphabet letter placement method to represent the salient feature of an input image. Our result combines the glyph of letters and the contour of a given image to produce a collage art style image. Our system can reduce the labor to arrange the letters manually and also can apply the pluralism of shape to entice children to learn to read. In Fig. 1, we respectively demonstrate the input image, region map and final results generated by the proposed method. Compared to the ASCII art [Xu et al. 2010], ours preserve more detail of the original image and can express various styles by tuning the matching constraints. Fig. 2 and 3 shows various results generated by our system.

In the future, we expect to further improve the aesthetic by considering the hierarchy of regions. We also hope to include more glyphs from a different language (ex: CJK unified ideographs) and more complex arrangements.

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