Looking for the Lost

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Abstract: This paper presents an artwork that enables the audience to 'meet themselves' by finding a look-alike from the audience's face using local binary pattern (LBP) feature extraction. The process consists of three steps: i) Haar-like feature and AdaBoost-based facial detection, ii) LBP feature extraction, and iii) look-alike detection and display based on similarity measurement. Through this artwork, the audience can find their lost alter ego by means of a similarity principle, with the look-alike appearing on a screen. Moreover, the artwork shows different results according to the unique characteristics of the audience, using interactive media art.

Keywords: Face Detection, Look-alike, Own Self, Interactive

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1. Introduction

In the modern world, people often conceal their confidence to protect their social status and avoid criticism. Therefore, various artworks that enable self-realization have been studied.

Holmes proposed an interactive artwork that displays complex images on a screen, but when an audience comes closer to the screen, it acts as a mirror and reflects the audience [1]. As suggested by the title 'Know yourself', this artwork offers the audience an opportunity to observe confidence through gradually revealing their face from changes that take place in chaotic reality.

The proposed artwork makes it possible for audiences to face themselves by showing them a look-alike using a local binary pattern (LBP) features based on similar face detection methods. As a result, a person who is tired of their busy life and indifferent to themself can focus on who they are while watching this artwork.

2. Purpose of Artwork

People tend to prefer a person who looks like them, due to the comfort and satisfaction of familiarity. For this reason, we set the artwork values through familiar characteristics. This is a principle of similarity that can also be applied to relationships with other people, such as friends, colleagues, and neighbors. The face is the most noticeable feature that determines resemblance. Therefore, this paper proposes an artwork that finds a look-alike based on similarity with the audience's face. To determine similarity, the proposed method detects audience faces from images captured by the camera, and then extracts the features of the detected face. To find the look-alike, the distance between the extracted face and a pre-stored facial image is calculated. As a result, the audience can identify the look-alike who is probabilistically preferred by them. In addition, the audience may realize a side of their own self they have not known before.

3. Design and Implementation

Fig. 1 shows the design of the proposed artwork for exhibition. Fig. 1 (a) and (b) illustrate the top and side views of the proposed artwork, respectively.

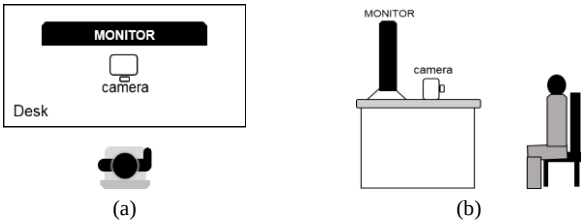


Fig. 1. Design of the proposed artwork.

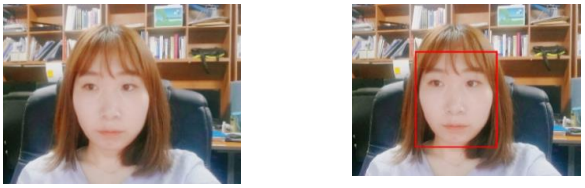
To find the look-alike, the proposed artwork detects the audience's face and uses similarity of their facial features.

A. Face Detection and Feature Extraction

The proposed artwork detects the audience's face to find the look-alike. For the face detection, we use a previously defined detection region and then detect the audience's face when it appears in a pre-defined region, using a representative face detection algorithm based on Haar-like features and AdaBoost [2]. Fig. 2 shows the proposed face detection result, where (a) and (b) represent the input image and the result of the face detection, respectively.

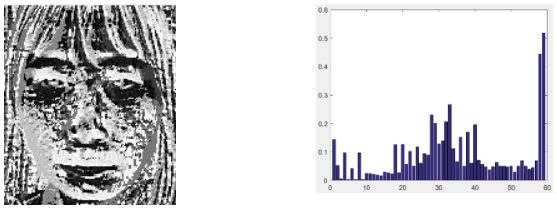
To find the look-alike, LBP features of the detected audience face are used. Generally, a human face consists of a combination of fine textures in an image. One way to express the texture of the face is with an LBP features

histogram [3]. LBP is an index of binary coded difference in brightness between a center pixel and adjacent pixels in a local area. After obtaining the histogram of indexes calculated for each pixel, a vector connecting the histogram in a line is utilized as the features of the face. The LBP histogram has a relatively low computational time, and is robust to changes in posture and illumination. For these reasons, it can represent the textures of a face despite the effects of illumination in the exhibition room. Fig. 3 (a) and (b) show the texture and LBP feature histogram of the detected audience face, respectively.



(a) (b)

Fig. 2. Result of the face detection.



(a) (b)

Fig. 3. Result of the LBP feature extraction.

B. Face Similarity Measurement and Display

We previously stored candidate face images from which to select a look-alike for the audience. For the similarity measurement between the audience face and a candidate face, distance is calculated using the Bhattacharyya distance as in [4]:

$$d(L_t, L_c) = \sqrt{1 - \sum_i \sqrt{L_t(i) L_c(i)}}\,, \qquad (1)$$

where $d(L_t, L_c)$ represents the distance between the audience face and the candidate face, $L_t(i)$ is the i-th bin of the LBP feature histogram of the audience face, and $L_c(i)$ is the i-th bin of the LBP feature histogram of the candidate face. Using these distances, the candidate face with a minimum distance is selected as the look-alike of the audience face. Fig. 4 shows the proposed look-alike detection result. Using the audience face on the right of Fig. 4, the look-alike face as shown on the left is detected.

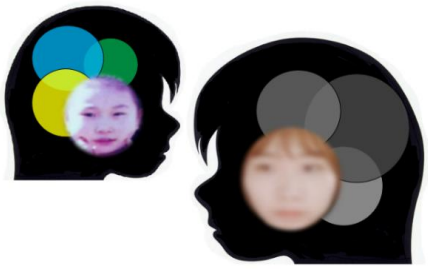


Fig. 4. Result of the look-alike detection.

4. Conclusion

We ran the algorithm on an Intel® Core™ i7-4790 3.6GHz CPU computer with 8 GB memory. A total of 100 face images were pre-registered and then the look-alike of an input audience was found. The process has a frame rate of 1 fps. This is because 100 facial LBP features are extracted for comparison every time one of the audience faces is entered. For real-time application in exhibition, 100 facial LBP features were extracted in advance and stored. As a result, we can improve the frame rate to 40 fps for finding the look-alike of the audience face. The proposed artwork found the look-alike of the audience using the LBP features histogram and showed the look-alike to the audience. As a result, the artwork enables people who have lost themselves in their busy life to meet themselves indirectly through other similar people. In addition, the audience has time to look back on themselves for a while and find their lost selves.

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Biographies

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