SELF-SIMILARITY MEASURMENT USING PERCENTAGE OF ANGLE SIMILARITY ON CORRELATIONS OF FACE OBJECTS

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Abstract: A 2D face image can be used to search the self-similar images in the criminal database. This self-similar search can assist the human user to make the final decision among the retrieved images. In previous self-similar search, a 2D face image comprises of objects and object correlations. The attribute values of objects and their correlations are measured and stored in the face image database. The similarity percentage is specified to retrieve the self-similar images from the database. The problem of previous self-similar search is that the percentage of the angle differentiation among the objects in different part is different although their angle differentiation is exactly the same. The proposed model is introduced to improve the stability of the similarity percentage by reducing the number of face objects, object correlations, and the degree calculation. After testing over 100 samples, the proposed method illustrated that the stability of similarity percentage is improved especially for the left side objects of the face image.

1 INTRODUCTION

The face image is two dimensional, vertical and horizontal. For each image, there are 10 objects – Face, Right Eyebrow, Left Eyebrow, Right Eye, Left Eye, Right Ear, Left Ear, Nose, Mouth, and Scar that are identified and the size from the center toward the 0, 90, 180, and 270 degrees of each object are recorded in the database. The Face object is used as the reference object. There are 9 object correlations – Face against Right Eyebrow, Face against Left Eyebrow, Face against Right Eye, Face against Left Eye, Face against Right Ear, Face against Left Ear, Face against Nose, Face against Mouth, and Face against Scar – in which their distance and angle toward the Face object are recorded in the database as well. The self-similar images in which all the attribute values of objects and object correlations are not exceed the specified similarity percentage will be retrieved from the database by using the following formula (P. Porntrakoon, 1999; V. Srisarkun, 2001 & 2002).

$$angle\_similarity\_percentage \geq \frac{|q_i - r_i|}{\max(q, r)} \times 100 \quad (1)$$

where q is an attribute value of the object of the key image and r is an attribute value of the object of stored image.

It is obvious that the degree calculation of each object – in different part of the face – toward the reference object is unstable. Therefore the percentage of the angle differentiation among the objects in different part will be different although their angle differentiation is exactly the same – e.g., 2 degrees on the face.

The proposed mothod reduces the number of objects to 8 objects, reduces number of object correlations to 7 correlations, and introduces the new calculations of the object correlations. The proposed method presents a more stable ratio of angle similarity among objects in different part of the face although their angle differentiation is exactly the same. Moreover, the proposed method requires less attributes to represent the content of the face image. The attribute number is adequate to retrieve the similar face images from the database. The space required to store the attribute values is less and the search time is much improved.