ORIGINAL ARTICLE

Face recognition using elastic grid matching through photoshop: A new approach

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Abstract: Computing grids propose to be a very efficacious, economic and ascendable way of image identification. In this paper, we propose a grid based face recognition overture employing a general template matching method to solve the timeconsuming face recognition problem. A new approach has been employed in which the grid was prepared for a specific individual over his photograph using Adobe Photoshop CS5 software. The background was later removed and the grid prepared by merging layers was used as a template for image matching or comparison. This overture is computationally efficient, has high recognition rates and is able to identify a person with minimal efforts and in short time even from photographs taken at different magnifications and from different distances.
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1. Introduction

Facial recognition is a task that humans perform routinely in their daily lives. Techniques used for facial recognition can be feature based (geometrical) or template based (photometric). Geometric methods rely on the shape and position of facial features, also known as nodal points, independently and generate the full picture of the face.[1] Expert witness utilising facial comparison techniques is regularly required to elucidate cases of disputed identity from the photographic evidences submitted to the court. The task is elusive because of image variation in terms of position, size, etc. The method used in this paper addresses some of the variance by extracting concise face descriptions in the form of image grids. Individual specific grid extraction is based on a novel approach, the bunch grid, which is constructed from a small set of lines connecting one landmark to another. The elastic grid method for the purpose of face recognition was earlier used by Wiskott et al.[2] and Ming et al.[3] Recognition is based on a straightforward comparison of image grids. This technique helped in positive and fast identification of individuals and may hence be used in forensic investigations.

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2. Materials and methods

In the present study, photographs of 100 males and 100 females ranging in age from 20 to 30 years were collected from the campus of the host institute. The photographs were collected in the frontal plane using a Nikon Coolpix L120 (14.1 megapixels) camera. For standard measurements, one photograph of each individual was collected without any magnification from a distance of 4 feet, keeping the camera parallel to the face of the individual. In addition to this, two photographs of each individual at different magnifications of 2× and 4× keeping the camera at a distance of 10 feet and two photographs from different distances – 6 feet and 10 feet without any magnification were collected for the purpose of verification of the methodology adopted. Individuals with any kind of head or neck trauma that could distort the normal facial appearance were excluded from the present study. Images of some of the individuals were deliberately distorted and then analysed to check the application of the methodology for identification from distorted images.

3. Preparing a grid

The grid or template was prepared using Adobe Photoshop CS5 software.

- After running the software, the image of an individual is opened and landmarks ectocanthion (Ec), endocanthion (En), alare (Al), cheilion (Ch), trichion (Tr) and gnathion (Gn) on that image are selected. Landmarks are selected for the present study and their description according to

Rastogi and Shukla (2003) is as follows:
- *Ectocanthion (Ec)* – This point is located on the outer/lateral corner of the eye or palpebral opening, where the upper and the lower lid margins meet.
- *Endocanthion (En)* – It is the point on the inner/medial corner of the eye or palpebral opening where the upper and lower lid margins meet.
- *Trichion (Tr)* – It is the point where the anterior line of the hair on the forehead is cut by the mid-sagittal plane.
- *Gnathion (Gn)* – It is the lowest point on the lower border of the mandible in the mid sagittal plane.
- *Alare (Al)* – It is the most lateral point on the wings of the nose.
- *Cheilion (Ch)* – It is the most lateral point at the termini of the mouth where the lateral margins of upper and lower lips meet and is located at the outer corners of the mouth.

Ectocanthion with ectocanthion, endocanthion with endocanthion, alare with alare, cheilion with cheilion and trichion with gnathion are joined with a straight line using the freeform pen tool. The points where the median line is cut by the lines joining ectocanthions (Ec–Ec), endocanthions (En–En), alares (Al–Al) and cheilions (Ch–Ch) are marked as A, B, C and D, respectively. The landmarks endocanthion (En) and ectocanthion (Ec) are then joined with points C, D and gnathion (Gn) on both left and right sides of the face. After joining all these points, a template for a specific individual is obtained over the image of the individual as shown in Fig. 1. Every single line joining the landmarks is registered in the software as a layer and is numbered consecutively. The same is shown in Fig. 2. Once
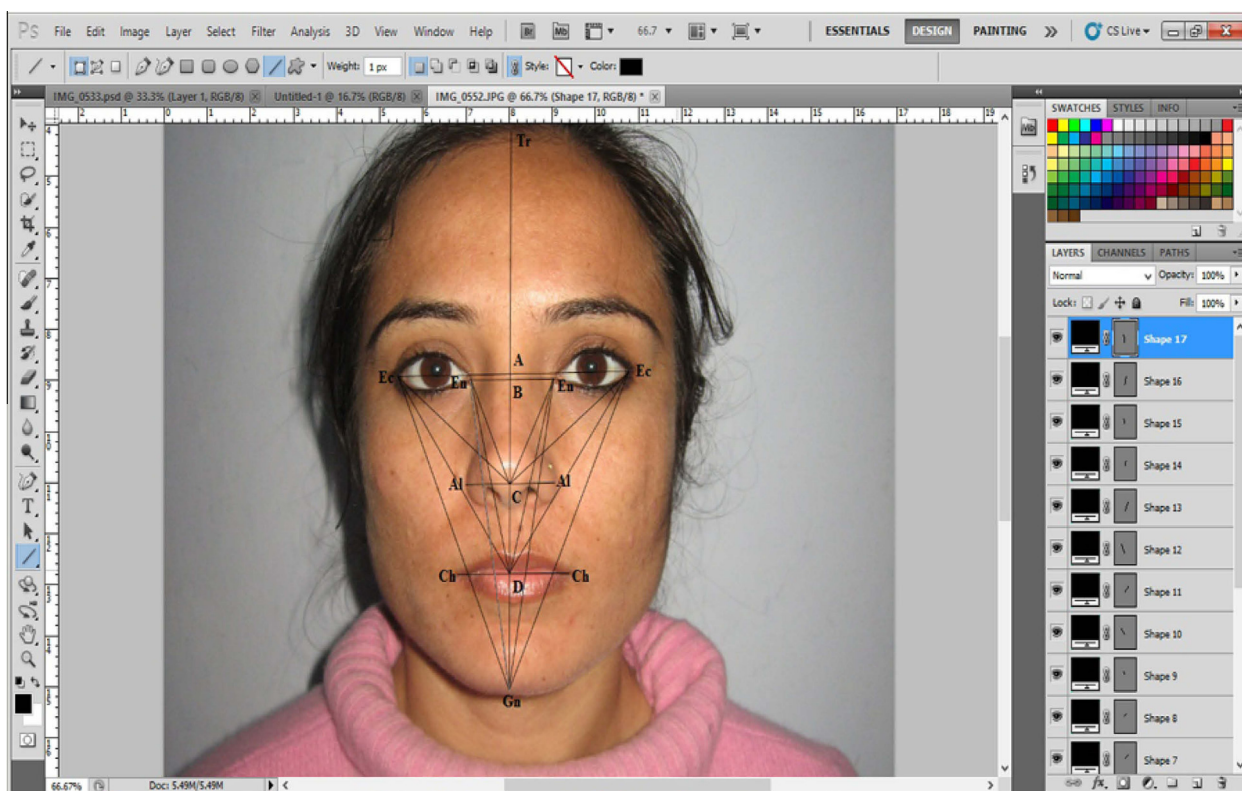

Figure 1 Shows the various landmarks and points considered in the present study.