MODIFIED INTEGRAL PROJECTION METHOD FOR EYE DETECTION USING DYNAMIC TIME WARPING

SOMAYA ADWAN AND HAMZAH AROF

Department of Electrical Engineering
University Malaya
50603 Kuala Lumpur Malaysia
somi@siswa.um.edu.my; ahamzah@um.edu.my

ABSTRACT. *Face and facial pattern detection is an active research area that is useful for many practical applications. In this paper, we present an innovative technique for eye detection using Augmented Dynamic Time Warping (ADTW) algorithm. Dynamic Time Warping (DTW) is a reliable algorithm that can perform similarity matching between two sequences but it requires supplimnetry techniques to be effective and efficient when used as a pattern detection tool. Therefore, for template matching in a facial pattern detection, the DTW is augmented with proposed image processing strategy along with a proper weighting scheme to increase its efficiency and accuracy. Our proposed ADTW overcomes some of the shortcomings associated with the traditional dynamic time warping and hence improves the alignment of the warping path of the sequences. The results of the implementation of the ADTW to detect eyes in facial images of subject with and without glasses show a marked improvement in detection accuracy when compared with that of the traditional DTW.*
Keywords: Image processing, Features extraction, Eyes localization, Dynamic time warping

1. **Introduction.** Template based methods are a group of important methods for face and facial pattern detection [1-6]. In template based methods, extracted features from a template are matched to those extracted from an area in an image and a degree of match between the feature sets is computed [1,5]. The area that produces the highest degree of match is deemed to be the location where the shape (given by the template) is found within the image. Template matching methods are simple and easy to implement, and it performs very well in certain problems. However, its effectiveness is limited when applied to eye localization since it cannot effectively deal with variation in scale, pose and shape [1-6]. Templates have a fixed size and a rigid shape while the test images may contain variation in facial expression, poses and illumination. A solution to this issue is to use more than 1 template but this increases computation, complexity and training time. Cristinacce and Cootes proposed an automatic template model consisting of a shape model and a training set of possible feature templates [2]. This technique is able to cope with illumination changes but not pose changes. Deformable templates are developed to overcome the limitation of using many templates [3]. The geometry of the template is allowed to deform and thus provide a limited degree of invariance to shape and scale. However, it is computationally expensive, and requires good image contrast for the method to converge correctly. Additionally, many other associated issues like variations in pose and illumination are not addressed by this technique [24].

Appearance based methods is a group of methods that attempt to find optimal representations of face and facial patterns in an images. As an example, for eye detection,