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Robust Eye Detection using Deeply-learned Gaze Shifting Path

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Abstract: Eye detection is a very useful technique in many intelligent applications. Since the importance of eyes to human beings, eye detection technique is an indispensable component in intelligent systems, e.g., emotional analysis, iris detection and gaze estimation. Recently, there have been proposed a large number of methods for eye detection, wherein good performances have been achieved. But these methods cannot take human visual perception into account, that is to say, human beings will first pay attention to the eyes when they are communicating with each other, and then nose, then mouth. In addition, their geometric positions are almost fixed, i.e., eyes are above the nose and mouth, and eyes are on both sides of the nose. So in our work, a novel method for eye detection is proposed using human visual perception. More specifically, we first derive object patches from a large quantity of training images. Then, a geometry-preserved object patches ranking method is designed to effectively mimic human visual mechanism when human beings are communicating with each other. After that, these ordered object patches will be fed into CNN to extract patch-level deep features, then patch-level deep features will be represented by deep representations. Finally, eye detection can be achieved using learned deep representation. Experimental results on different database show that our method can achieve high efficiency and accuracy of eye detection.

Keywords: Eye detection, Gaze shifting path, Deep feature.

1. Introduction

Eye detection is a key technique in modern intelligent applications [13-16] [22-26]. For example, we may firstly pay attention to others' eyes when we communicate with others, one may be happy or surprised when his eyes wild open while one may be tired when his eyes almost close. That is to say, the state of eyes can reflect one's emotion, i.e., eye detection can be leveraged for emotional analysis. Besides, in the field of video surveillance, a more advanced entrance guard system is iris detection system, since the iris feature of each person is unique, iris feature can be used to identify each person's identity. Gaze estimation is also a useful technique in computer vision, for those who are disabled, gaze estimation system can be used to take the place of mouse, so it is possible to operate the computer conveniently.

Eye detection is the basis of these intelligent systems. Recently, a great number of

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