

A new method for face detection in colour images for emotional bio-robots

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Emotional bio-robots have become a hot research topic in last two decades. Though there have been some progress in research, design and development of various emotional bio-robots, few of them can be used in practical applications. The study of emotional bio-robots demands multi-disciplinary co-operation. It involves computer science, artificial intelligence, 3D computation, engineering system modelling, analysis and simulation, bionics engineering, automatic control, image processing and pattern recognition etc. Among them, face detection belongs to image processing and pattern recognition. An emotional robot must have the ability to recognize various objects, particularly, it is very important for a bio-robot to be able to recognize human faces from an image. In this paper, a face detection method is proposed for identifying any human faces in colour images using human skin model and eye detection method. Firstly, this method can be used to detect skin regions from the input colour image after normalizing its luminance. Then, all face candidates are identified using an eye detection method. Comparing with existing algorithms, this method only relies on the colour and geometrical data of human face rather than using training data-sets. From experimental results, it is shown that this method is effective and fast and it can be applied to the development of an emotional bio-robot with further improvements of its speed and accuracy.

face detection, skin colour model, eye detection, bio-robots

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1 Introduction

For the last decade, study of emotional and intelligent bio-robots has been a hot topic [1–7]. It is essential that such a robot has the intelligence of detecting human face. So, human face detection is an important research topic for image processing and intelligent bio-robots research and applications. It was initially considered as a key problem of the automatic face recognition system. The incipient face detection problem is based on the hypothesis that a frontal “mug shot” picture with strong constraints has been ob-

tained [3]. In another word, it assumes there is only one face in the input image. However, in the real world pictures usually contain multiple human faces in a complex background. This raises new challenges to face detection technology.

Generally speaking, face detection is a pattern matching problem which includes two sub-problems: Firstly to determine if there are any faces within an input image; if the answer is yes, then to figure the face areas in the whole image [5]. Yang et al. [6] reviewed different face detection methods and classified them into two different catalogues: still image face detection and image sequence face detection. Actually, it is a unified problem if we notice that the video sequences are composed by a series of frames that can be considered as still images. Although some methods have

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