

HUMAN VISUAL RECOGNITION ABILITY FOR PARTIALLY ERASED LETTERS

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ABSTRACT. *The human visual system has high-level recognition abilities and can efficiently and accurately identify an object based on object parts. In the present study, a letter recognition experiment, in which an algorithm was proposed to create incomplete letters in three levels, was designed to evaluate the human visual recognition ability for partially erased objects. Five subjects were asked to identify partially erased English letters displayed for short time periods (200 ms, 150 ms and 100 ms). The results suggested that features and correlations between features significantly influence letter identification. Based on the experiment, an algorithm is proposed to quantitatively evaluate the importance of letter features and the similarities between letters with information entropy.*

Keywords: Letter recognition, Human visual recognition, Similarity between letters

1. **Introduction.** Advances in life sciences over the last fifty years have lead to the elucidation of the many functions of the human body, and to gains in the field of artificial intelligence [1]. Artificial intelligence is the capability of a device to perform functions, such as reasoning and optimization through experience, that are normally associated with human intelligence [2,3]. Visual pattern recognition is an important aspect of artificial intelligence, and many advanced algorithms have been reported [4]. However, compared with the human visual system, computer vision is still much less efficient and effective and most of the visual pattern recognition algorithms are proposed for specific objectives [5,6]. In order to improve the visual pattern recognition algorithms, some studies which simulate the human visual system have been carried out [7,8]. The human vision system has high-level recognition abilities and the mechanism of human vision is still under research [9]. In this paper, the human visual recognition ability for incomplete objects is studied. In the visual world, there are mainly two kinds of incomplete objects, partially occluded and erased objects, as shown in Figure 1. For the partially occluded objects, it has been verified that cells in the primary visual cortex have the computational power to make inferences about the nature of partially invisible forms seen behind occluding structures [10,11]. Infants under 1 month of age have possessed the ability to perceive the continuation of the grating behind the occluder [12]. As for partially erased objects, they are more difficult to recognize than partially occluded objects because when recognizing the occluded objects, observers can assume it as a matter of course that the information is hidden behind the veil while when recognizing the erased objects they do not know where the information