

## QUANTITATION OF HUMAN VISUAL INTERPOLATION ABILITY AND ITS APPLICATION TO BRAIN HEALTH CHECK

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**ABSTRACT.** *Object recognition based on its separate visible portions, defined as visual interpolation, is an important characteristic of the visual system, allowing a clue for elucidating mechanisms of visual recognition in the brain. In the present study, an incomplete-letter recognition experiment is designed to measure the human visual interpolation ability (VIA). The experiment results indicate that features and correlations between features significantly influenced the letter identification. Therefore, it is necessary to consider the importance of letter features in the experiment. An algorithm is proposed to quantitatively evaluate the importance of letter features and the human visual interpolation ability for partially erased letters. Furthermore, the relationship between VIA and age is measured with this algorithm. The results show that VIA decreases with aging, indicating the feasibility to check the health of the brain with the proposed algorithm.*

**Keywords:** Visual interpolation, Quantitation, Brain health check, Aging

**1. Introduction.** Daily health check and therapy have been available with the development of medical science and technology [1]. However, the existing methods to check brain functions are still not convenient to use in daily life. Functional brain imaging such as electroencephalography, magnetic resonance imaging [2], and computed tomography can not be performed outside medical facilities. Neuropsychological tests such as Benton visual retention test [3], mini-mental state examination [4], and frontal assessment at bedside [5] require high-level professional knowledge and are difficult to carry out in daily life. In this study a convenient method, which utilizes visual cognition, is being developed for early check of brain function deficits. Of all the senses, vision provides the most information that we get from surroundings to the brain. In order to process and respond to visual information, most parts of the cerebral cortex, such as visual cortex, parietal association area and frontal association area, are engaged. It is therefore possible to measure the brain's processing ability of visual information and check the health of brain parts associated with vision through proper visual stimuli, regarding the visual system as a "black box".

Object recognition based on its separate visible portions, defined as visual interpolation or visual completion, is an important characteristic of visual system. In both natural and man-made environments, it is required to recognize objects from only incomplete portions when it is impossible to visualize complete details of an object due to factors such as occlusion and darkness. This ability confers a time-saving advantage and an easy understanding of the whole images with regards to survival. Visual interpolation ability (VIA), is therefore a fundamental ability of the visual system. Psychological studies have divided visual interpolation into two types according to differences in phenomenology: modal interpolation and amodal interpolation [6]. In modal interpolation, objects that