

A QUANTITATIVE STUDY ON HUMAN VOICE SEPARATION ABILITY

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ABSTRACT. *Human brain is a well developed intelligent system which can process information with high efficiency. However, the brain mechanism of information processing has not been revealed clearly. As an example, people can separate and distinguish a minding voice easily from simultaneously spoken voices sea, while it is difficult to be realized by a computer system satisfactorily. This kind of voice separation intelligence depends on complicated brain neural network, and correlated to brain health status. If this kind of ability can be quantitatively measured, it is possible to evaluate human brain intelligence status, and even to find a convenient method to check brain cognitive function. Thus, this research had an integrated study on human voice separation ability in engineering and physiological views, and proposed a quantitative measurement and spectral calculation method on this ability. Based on large numbers of measurement experiments, the validity of this method was proved basically, and the relation between voice separation ability and human age was also found. Furthermore, through brain activation analysis and clinic validation, the voice separation ability measurement is possible to be applied in early-check of brain cognitive deficit and brain function enhancement. In this paper, parts of the results were reported.*

Keywords: Human brain cognitive function, Voice separation ability, Complex voice signal, NIRS, Brain function enhancement, Population aging

1. Introduction. Since the 21st Century, with the development requirement of artificial intelligent system, studies on brain science are noticed much, and the epoch-making discovery is expected to contribute to human-like intelligence. On the other hand, with the acceleration of global population aging, brain cognitive function researches are also paid much attention, and the brain enhancement methods are also expected to solve the aging problem. Human brain is a most evolving and complicated intelligent system, which possesses many wonderful intelligent abilities. As an example in auditory field, in a noisy environment, human brain can process complex voice signal, and separate the target voice from background voices. For another example, human can comprehend accelerated or part-missed voice signal to a certain extend. These kinds of abilities are not only related to conductive hearing, but tightly associated with brain information processing and cognitive functions. Actually, in a hospital or a clinic, an audiometer is utilized to give an auditory check. However, this kind of check only evaluates hearing loss of ears, but not reflects brain cognitive deficit towards voice signals. To check brain status and cognitive function, actually associated methods are mainly including physiological detection and psychological tests. Various medical instruments such as PET and fMRI are applied in clinical diagnosis of brain status. But these physiological methods can only detect pathological changes in brain tissues, and can not check brain cognitive function or give an