

Brain Dominance Using Brainwave Signal

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Abstract— The study of brain dominance in human-computer interaction has increased in recent years in an attempt to address the need of users especially who cannot read or write. The objective of this paper is to determine the brain dominance from brainwave signal that are measured using Emotive device and to analyse the pattern of brain dominance brainwave signal by using signal processing. The result of Power Spectral Density (PSD) and Energy Spectral Density (ESD) from brainwave will be validated with Hermann Brain Dominance Instrumentation (HBDI) questionnaire. The result shows that most sample are left brain dominance. The result also shows that Beta and Delta indicate the left-brain dominance whereas Beta indicates right-brain dominance.

Index Terms—Brain dominance, Brainwave, PSD, ESD, HBDI

I. INTRODUCTION

Brain dominance, refers to a preference for using one hemisphere of the brain over the other. Most people use one side of the brain more than the other side. However, there are also some people have a mixed dominance which is known as bilateral. Each hemisphere has its own separate and private sensation, its own perception, and its own impulses to act. There are differences between left-side and right-side. For example, left-side person made a decision based on logic proof while right-side person made a decision based on feelings.

According to the theory of left-brain dominance and right-brain dominance, each side of the brain has controls different types of thinking. The right brain is better at copying of designs, discrimination of shapes, understanding geometric properties, reading faces, global holistic processing, music, understanding metaphors, expressing emotions and reading emotions while the left brain dominance is better at language skills, skilled movement, and analytical time sequence processing [1]. Other than that, left-brain learners prefer to use their logic instead of their intuition and are more detailed oriented meanwhile the right brain learners are intuition based on work with their hunches, they are prefer fantasy based, and more use their imagination [2].

The Herrmann Brain Dominance Instrumentation (HBDI) is an assessment that measure thinking preferences. It is designed with four quadrants which is A (blue), B (green), C (red), and D (yellow) as shown in the Figure 1 [3]. A and B quadrants represent the left side of the brain and the C and D

quadrants represent the right side of the brain. There are certain characteristics of each quadrant and it depends on the level of preference and the scores will be different in each quadrant.

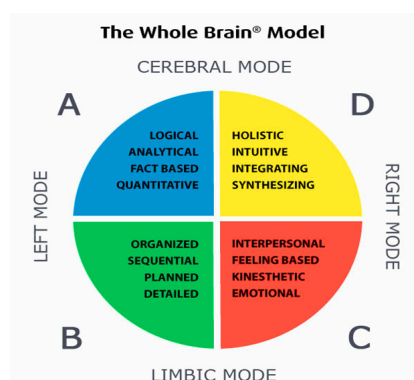


Fig. 1. Hermann Brain Dominance Instrumentation

In Malaysia, reading is one of the skills that are required in the study of language [4]. Besides in achieving success in other learning processes, the reading skill is proven to be the factor of success from primary to higher institution level [4]. Along with reading, expressing oneself in writing is an essential accomplishment of childhood that facilitates the necessary and rewarding tasks of adult life. Malaysia also has faced a dyslexia problem. Dyslexia is a language-based learning disability resulting in people experiencing difficulties in reading, spelling, writing, and speaking due to inability to differentiate sound components [5]. Sometimes, these problems are accompanied by short-term memory difficulties, a lack of organizational skills and time management issues and this entire have an impact on learning [5]. Most of the traditional educators give lessons without considering the different interests of the learners in homogeneous learning group [1].

Commonly the brain patterns form wave shapes are sinusoidal and they are measured from peak to peak, normally range from 0.5 μ V to 100 μ V in amplitude [6]. By means of Fourier transform power spectrum from the raw EEG signal is derived and in power spectrum contribution sine waves with different frequencies are visible [6]. The brain waves have