Biologically-Inspired Modeling for Filtering Noise in Signals Sound

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Abstract – *Sound is one of the media that brings information to human but it is also distracted by noises that surround us. Human listens to the noise through the ear and the brain learns and recognizes the sound signal. The process to filter the noise is done in the middle ear, to be precise the cochlea. However, to focus on a desired resonance from the noises to obtain the desired signal sound, the process to decide on this signal is made in the brain, and then the brain generates the result. In addition to that matter, there are certain processes encountered before the result is produced such as, learning and recognizing the sound. As for that reason, this research creates a new idea of gaining data using signal sound. The main objective of this research is to develop a process to remove signal noise using a concurrent algorithm. This process is inspired by the human biological body parts which are; the human ear as the filtering mechanism, and the human brain as the processing mechanism. Hence, this research elaborates the development of noise signal removal model inspired by the human ear and human brain.*

Keywords: Biologically-inspired, signal sound, noise filtering, information retrieval.

1 Introduction

Everyday we listen to many kinds of sounds and noises. We can hear the high volume of noise such as a flying jet or an F1 racing car. We also hear the normal volume of sound such as the conversation between two persons. Moreover, we can also hear the low volume of resonance such as the sound of a clock ticking on the wall. But that's not all; the main purpose of this research is to study how human filters the distracting noise and only focus to the desired sound that we want to listen. For instance, a recorded song is played; for example the national anthem, "Negaraku". We can hear the voice of the lyrics as well as the sound of the music such as the piano and the drums from the playback. The question is what if a person asked another person to imitate the sound of the drums from the playback. So, when the person listens once again to the playback, he will try to recognize the drums and learn it before he can make the sound.

Practically, this paper solves the problem of how to develop a signal noise removal process using concurrent algorithm by producing a signal noise elimination model. The human ear by means of the cochlea is suited for the noise filtering mechanism. Then, the brain recognizes the filtered signals, make decision, and focus on the desired signal frequency to produce the result. All these processes are concurrently executed to optimize the time and space factors in computing. And as for that reason, this study solves the problem of how to develop a signal noise removal process using a concurrent algorithm. This paper explores the creation of an effective algorithm for signal noise filtering.

2 Research Methods

The research methodology for this paper analyzes the human ear as the filtering mechanism and the human brain as the processing mechanism for the signal noise removal. The details description is explained in the subsections below.

2.1 The Analysis of Human Ear and Human Brain

Sound goes through the ear and then hits the eardrum. The eardrum then sends signals which go to the cochlea. The cochlea will try to capture the sound signals and divides it into different signal frequencies. These signal frequencies then set off to the brain and brain will attempt to recognize each signals. At the same time, concurrently, the brain also will try to detect specific signals and then it will try to produce the result for each signal. Finally, the brain will accumulate the volume of the data. But if there were any new signal detected, the brain will keep it and try to learn to identify the particular signal frequency.

The ear is divided into three sections: the external, middle and inner ear. The external ear consists of the pinna (or auricle), the external auditory canal (or ear canal), and the tympanic membrane (or eardrum). The