

Diagnosis of Hearing Impairment Based on Wavelet Transformation and Machine Learning Approach



Md. Nahidul Islam, Norizam Sulaiman, and Mahfuzah Mustafa

Abstract Hearing impairment has become the most widespread sensory disorder in the world, obstructing human-to-human communication and comprehension. The EEG-based brain-computer interface (BCI) technology may be an important solution to rehabilitating their hearing capacity for people who are unable to sustain verbal contact and behavioral response by sound stimulation. Auditory evoked potentials (AEPs) are a kind of EEG signal produced by an acoustic stimulus from the brain scalp. This study aims to develop an intelligent hearing level assessment technique using AEP signals to address these concerns. First, we convert the raw AEP signals into the time–frequency image using the continuous wavelet transform (CWT). Then, the Support vector machine (SVM) approach is used for classifying the time–frequency images. This study uses the reputed publicly available dataset to check the validation of the proposed approach. This approach achieves a maximum of 95.21% classification accuracy, which clearly indicates that the approach provides a very encouraging performance for detecting the AEPs responses in determining human auditory level.

Keywords Electroencephalogram (EEG) · Brain-computer interface (BCI) · Auditory evoked potential (AEP) · Machine learning

1 Introduction

Hearing impairment affects about 466 million people worldwide, with 34 million of those being children. By 2050, it's projected that 900 million people will be deafened [1]. Traditional hearing tests required sufficient clinical time and effort to test the human auditory conditions. Early hearing condition detection is essential to reduce the hearing impairment; it helps in taking an appropriate step at a proper time. One of the best ways to meet these problems is to use brain-computer interfaces (BCI), which link the human brain to external devices. Electroencephalogram (EEG) is

Md. N. Islam (✉) · N. Sulaiman · M. Mustafa
Faculty of Electrical and Electronics Engineering Technology, Universiti Malaysia Pahang,
26600 Pekan, Pahang, Malaysia