Ischemic Stroke Detection System with Computer Aided Diagnostic Capability

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Abstract

Ischemic stroke is caused by an occurrence of emboli which travels along the blood vessel in cerebral arteries that eventually trapped near the vessel wall and become stenosis. Transcranial Doppler (TCD) Ultrasound has been used as tool for manual detection of emboli, but the monitoring process is time-consuming and it requires human expert to perform the task. Due to the limited number of experts, this makes manual emboli detection becomes a challenging task. Recently, many researches has devoted to the development of automated emboli detection. In this paper, we investigate the use of frequency and time domain calculations to automatically detect the emboli. In the first method, sinusoidal modelling (SM) is employed to inspect the spectrum of high magnitude frequency component. The second method uses the energy and zero crossing rate (E+ZCR) method. While, the third method is short time energy and short time average zero crossing rate (STE+STAZCR). The experimental results reveal that the sinusoidal modelling gives the best results with genuine acceptance rate is achieved at 84.2%. However, this study also exposes that each approach has its own advantage hence this investigation spurs many rooms of future investigation.

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1. Introduction

Stroke is a global health issue. It is one of the top five leading causes of death in Malaysia. According to the World Health Organization data published in May 2014, stroke deaths in Malaysia reached 12.19% of total deaths [1]. There are two major types of stroke i.e. hemorrhagic and ischemic. Hemorrhagic stroke occurs when the blood vessel in the brain ruptures whereas ischemic stroke happens when the blood vessel carrying blood to the brain is blocked by an obstruction. An ischemic stroke can occur in two ways: cerebral thrombosis and cerebral embolism. Cerebral thrombosis is formation of a blood clot within the brain while cerebral embolism is a clot that forms somewhere in

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