

Mini Heartcatcher : Intelligent Mobile ECG classification

Abstract

According to WHO report 2004, the number of global death due to cardiovascular diseases is approximately 17 million (30%) people per annum. In Malaysia, 25.64% of death cases were due to cardiovascular problems. It is the number one cause of death in Malaysia, and in the world.

Many technologies and diagnostic tools have been developed to assist doctors in their diagnosis and to provide patient with suitable treatment such as electrocardiogram (ECG) Holter and cardiac event monitor. The ECG Holter is a portable heart rhythm monitoring device that is used to record heart rhythm while patients conduct their daily activities. This device can continuously monitor the heart rhythm up to 24 hours or more. Electrodes are attached to the patient's chest when monitoring their heart rhythm using ECG Holter. The ECG data is recorded in the memory card or cassette for further diagnosis and memory spaces are limited. When the storage is full, a patient has to replace it with a new one or with the current new technology; the patient could transfer the data via fixed telephone line in order to clear the storage. Next, patients need to report to their cardiologist to obtain feedback. This means the patient has to move in and out of the hospital routinely and this could be very troublesome and inconvenient for them, especially for those who have mobility problems. Most Holters are quite heavy and this may become a burden to the patients having to carry this load on their neck or around their waist for days. Due to the expensive prices of ECG Holters, patients typically rent the unit from hospitals. However, there is limited quantity available and not all hospitals provide this service. Patients who get hold of a unit could only rent them for one or two days and may have to pay rental fee to the hospitals. Patients who are unable to rent the device cannot be properly diagnosed. This is not efficient and risky for the patients. Even for patients who managed to rent the unit, they may not be successful in recording the symptoms during the rental period because cardiac events occur unpredictably. If patients can own a personal unit of ECG recording device, it is not only more hygienic but patients can record symptoms anytime they felt it to obtain more accurate diagnosis. Most importantly, more people can be screened early and take precautionary measures.

This project aims to use the telemedicine concept to create a Holter-like device that can record ECG data and transmit it via cloud for web-based assessment. This will reduce congestion at hospitals, reduce travel time of patients and their caregivers and speed up diagnosis leading to reduced medical costs and more efficient healthcare. With the Mini Heartcatcher system, we hope that more people can be screened early and take precautionary measures for their well-being.

This project aims to design and develop a tele-assessment system for electrocardiogram (ECG), using personalised ECG circuit and mobile application that records and transmit data.

An ECG acquisition circuit with suitable amplifiers and filters will be designed and assembled. A web database and assessment tools will be developed for online processing of data. The algorithms are tested offline before being scripted for web-based processing. This web application will allow patient-specific log-ins and dedicated clinicians to access the medical records. Finally, a mobile application will be developed to display, record and transmit the ECG data from patients to cloud storage.

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