

Sounding out heart problems automatically

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Sounding the chest with a cold stethoscope is probably one of the most commonly used diagnostics in the medical room after peering down the back of the throat while the patient says, "Aaaah". But, research published in the inaugural issue of the *International Journal of Medical Engineering and Informatics* looks set to add an information-age approach to diagnosing heart problems. The technique could circumvent the problem of the failing stethoscope skills of medical graduates and reduce errors of judgment

Listening closely to the sound of the beating heart can reveal a lot about its health. Healthcare workers can identify murmurs, palpitations, and other anomalies quickly and then carry out in-depth tests as appropriate. Now, Samit Ari and Goutam Saha of the Indian Institute of Technology in Kharagpur have developed an analytical method that can automatically classify a much wider range of heart sounds than is possible even by the most skilled stethoscope-wielding physician.

Their approach is based on a mathematical analysis of the sound waves produced by the beating heart known as Empirical Mode Decomposition (EMD). This method breaks down the sounds of each heart cycle into its component parts. This allows them to isolate the sound of interest from background noise, such as the movements of the patient, internal body gurgles, and ambient sounds.

The analysis thus produces a signal based on twenty five different sound qualities and variables, which can then be fed into a computer-based classification system. The classification uses an Artificial Neural

Network (ANN) and a Grow and Learn (GAL) network. These are trained with standardized sounds associated with a specific diagnosis.

The team then tested the trained networks using more than 100 different recordings of normal heart sounds, sounds from hearts with a variety of valve problems, and different background noises. They found that the EMD system performs more effectively in all cases than conventional electronic, wavelet-based, approaches to heart sound classification.

A disturbing percentage of medical graduates cannot properly diagnose heart conditions using a stethoscope, the researchers explain, and the poor sensitivity of the human ear to low frequency heart sounds makes this task even more difficult. The automatic classification of heart sounds based on Ari and Saha's technique could remedy these failings.

Source: Inderscience Publishers

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