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Intelligent phonocardiograph, automated screening of congenital heart diseases in children

Heart defects are the most common types of birth defects. Statistical analysis shows that around 1% of children are born with Congenital Heart Diseases (CHD and CCHD), accounting for about 10% of all congenital anomalies and for more than 30% of all infant deaths due to birth defects. In Doppler echocardiography, disease diagnosis is based on direct and indirect measurements and calculations of the operator. Therefore, subjectivity is attributed to the approach even though, it has been objectively accepted by cardiology community, which is considered as a drawback of the approach that limits its application to the expert clinicians and access to such expert clinicians is not easy specially in the rural areas. Heart sound auscultation is therefore, employed in all medical settings as the first screening approach which a less expensive method. Due to progress in signal processing and artificial intelligence, many studies aimed to associate intelligence with heart sound auscultation techniques for improving screening accuracy in cardiac auscultation, especially in children where the accuracy is substantially impaired by innocent murmurs. A study in Johns Hopkins University, USA has shown that screening accuracy in pediatrics cases is as low as 40% in family doctors, which can be rather improved by using computer-assisted auscultation. After 21 years of research and development, based on our unique and internationally patented processing method on murmur characterization, the Arash-Band method and its derivatives, we have developed an original intelligent phonocardiograph, known as POUYA-Heart. The intelligent phonocardiograph has proven to have a highly accurate diagnosis response in children with heart diseases and 100% diagnostic accuracy with normal hearts with or without innocent murmurs. POUYA-Heart exhibits superior performance than a pediatric cardiologist who relies on conventional or computer-assisted auscultation and drastically reduces unnecessary use of echocardiography.

Biography

Amir A Sepehri has received his B S E E from Auburn University, USA and his PhD from Mons University, Belgium on Digital Audio Signal Processing. He has worked on a special research program on 'Computerized Screening of Congenital Heart Disease for 16 years. He is currently the Director of CAPIS biomedical R&D department, with close R&D co-operation with scientific members of Innovation Design and Technology department of Mälardalen University in Sweden.

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