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Intelligent phonocardiograph, automated screening of congenital heart diseases

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Heart defects are the most common type of birth defects. Statistical analysis shows that around one percent of children are born with congenital heart diseases (CHD and CCHD), accounting for about 10 percent of all congenital anomalies and for more than 30 percent of all infant deaths due to birth defects. In Doppler echocardiography, disease diagnosis is based on direct and indirect measurements as well as the 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 as it not only limits the applications to the expert clinicians but also access to such expert clinicians especially in the rural areas. Heart sound auscultation is therefore employed in all medical settings as the first screening approach which is by far 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 at the Johns Hopkins University, USA, has shown that screening accuracy in pediatric cases is as low as 40 percent by 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, known as 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 percent 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.

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