

Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Measuring Heart Filling Propagation Velocity using the Cross Wavelet Transform CASANDRA NIEBEL, Virginia Tech, TAKAHIRO OHARA, Wake Forest University Baptist Medical Center, PAVLOS VLACHOS, Virginia Tech, WILLIAM LITTLE, Wake Forest University Baptist Medical Center — During early diastole, a pressure gradient is formed across the mitral valve as the left ventricle (LV) relaxes, forcing blood from the left atrium into the LV. This process generates a rapid filling wave and creates an unsteady flow environment within the LV. A continuous wavelet transform is capable of dealing with non-stationary and noisy signals and is therefore ideal for measuring the wave speed of the early diastole rapid filling wave. This wave speed, or propagation velocity (V_p), is used clinically to evaluate diastolic function and is conventionally measured from a Color M-Mode (CMM) echocardiogram. A CMM scan gives a spatiotemporal map of the blood velocity in the left ventricle and is used to visualize flow patterns and manually measure the V_p . In this work, a moving cross wavelet transform is used to measure the phase shift between consecutive time steps in a CMM echocardiogram, providing a more robust and repeatable measurement of V_p , less sensitive to noise, aliasing boundaries, and user inputs.

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Date submitted: 15 Aug 2011

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