

Feasibility of Echocardiographic Particle Image Velocimetry for evaluation of cardiac left ventricular filling function

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partial fulfillment of the requirements for the degree of

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Figure 1.2: CMM scan contours (Left) provide a spatiotemporal map of blood velocity during diastolic filling of the ventricle. These velocities can be used to calculate the pressure gradient field (Middle) that motivates diastolic filling. This field can be integrated further to determine the relative pressure and obtain the pressure gradient (IVPG) that motivates proper filling of the ventricle. [9] 4

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Figure 1.3: Example of VFM through the approach by D. Garcia (2010). Axial velocity components of the flow are provide by the Color Doppler scan. Radial velocities are determined by using the continuity equation with tissue motion from STE used as boundary conditions. VFM is shown to produce comparable measurements to other methods. [25] 5

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Figure 1.6: Example of relative pressure derived from healthy patients taken from the baseline study performed by Cimino et al. Relative pressure fields during early filling show that lower cavity pressures near the Apex draw blood from the LA to the LV, resulting in volume expansion. Patient properties, such as LV geometry, will not affect the flow nature as long as individuals are not diseased. [44] 10

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