

Estimation of Coronary Blood Flow by Contrast Propagation Using Simulated X-Ray Angiography*

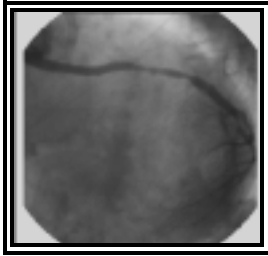
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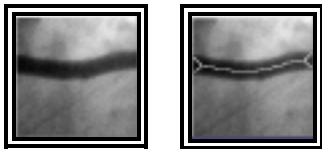
Abstract: Coronary blood flow measurements from X-ray angiography are useful for determining the functional status of coronary arteries. However this estimation presents several difficulties, due to the small dimension of vessels, the pulsatile nature of flow and strong motility. In this work, the estimation of coronary blood flow from simulated X-ray angiograms is based on contrast propagation and involves artery segmentation and motion removal.

Segmentation of Region of Interest

Original Image

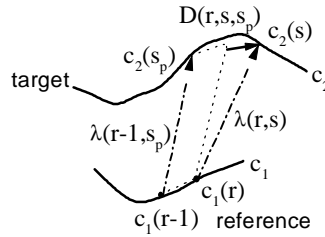
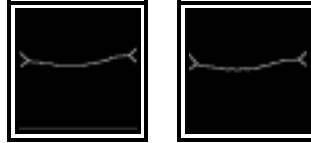


Artery sequence is segmented and thinned with morphological operators



Motion Estimation

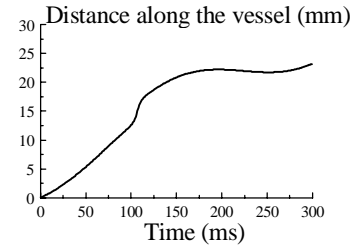
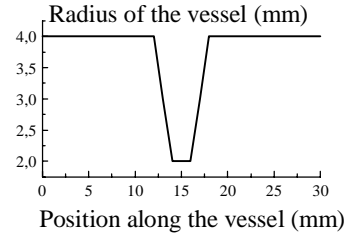
Elastic Matching of Skeletons



$$\text{cost}(r-1, s_p, r, s) = \|\vec{D}_r\| + \|\vec{c}_2(s) - \vec{c}_2(s_p)\| + \|\kappa(c_2) - \kappa(c_1)\|$$

$\kappa(c_i)$: curvature of the curve i .

Estimation of Blood Flow



$$\text{velocity}(t) = \frac{ds}{dt}$$

$$\text{flow}(t) = \text{area} \cdot \text{velocity}(t)$$

Preliminar Results: Evaluation using synthetic data presented error $< 2\%$ in the worst case

Future Works: Simulation with real and experimental X-ray angiography sequence

*This work has been supported by FAPESP number 96/02519-6