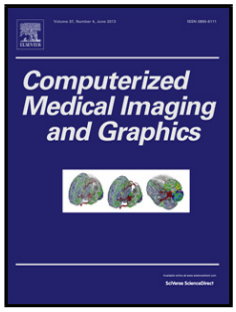

Title: heartBEATS: A hybrid energy approach for real-time B-spline explicit active tracking of surfaces

Author: Daniel Barbosa João Pedrosa Brecht Heyde Thomas Dietenbeck Denis Friboulet Olivier Bernard Jan D'hooge

PII: S0895-6111(17)30069-1
DOI: http://dx.doi.org/doi:10.1016/j.compmedimag.2017.07.004
Reference: CMIG 1526

To appear in: *Computerized Medical Imaging and Graphics*

Received date: 9-5-2016
Revised date: 24-7-2017
Accepted date: 25-7-2017

Please cite this article as: Daniel Barbosa, João Pedrosa, Brecht Heyde, Thomas Dietenbeck, Denis Friboulet, Olivier Bernard, Jan D'hooge, heartBEATS: A hybrid energy approach for real-time B-spline explicit active tracking of surfaces, *<![CDATA[Computerized Medical Imaging and Graphics]]>* (2017), http://dx.doi.org/10.1016/j.compmedimag.2017.07.004

heartBEATS: A Hybrid Energy Approach for Real-Time B-spline Explicit Active Tracking of Surfaces

Daniel Barbosa[a], João Pedrosa[a,*], Brecht Heyde[a], Thomas Dietenbeck[b], Denis Friboulet[b], Olivier Bernard[b], Jan D'hooge[a]

[a] *Laboratory on Cardiovascular Imaging and Dynamics, KU Leuven, Belgium*
[b] *Université de Lyon 1, CREATIS, CNRS UMR5220, INSERM U630; INSA-Lyon, France*

Abstract

In this manuscript a novel method is presented for left ventricle (LV) tracking in three-dimensional ultrasound data using a hybrid approach combining segmentation and tracking-based clues. This is accomplished by coupling an affine motion model to an existing LV segmentation framework and introducing an energy term that penalizes the deviation to the affine motion estimated using a global Lucas-Kanade algorithm. The hybrid nature of the proposed solution can be seen as using the estimated affine motion to enhance the temporal coherence of the segmented surfaces, by enforcing the tracking of consistent patterns, while the underlying segmentation algorithm allows to locally refine the estimated global motion. The proposed method was tested on a dataset composed of 24 4D ultrasound sequences from both healthy volunteers and diseased patients. The proposed hybrid tracking platform offers a competitive solution for fast assessment of relevant LV volumetric indices, by combining the robustness of affine motion tracking with the low computational burden of the underlying segmentation algorithm.

Keywords: real-time image segmentation, B-spline, left ventricle segmentation and tracking

*Corresponding Author: João Pedrosa, Medical Imaging Research Center, Herestraat 49, bus 7003, B-3000 Leuven, Belgium; Email: joao.pedrosa@kuleuven.be