Journal of Cardiovascular Magnetic Resonance

Poster presentation

MR Harmonic Phase surface for tracking cardiac motion

Abraam S Soliman*[1], William S Kerwin[2] and Nael F Osman[3]

Address: [1]Nile University, Cairo, Egypt, [2]University of Washington, Seattle, WA, USA and [3]The Johns Hopkins University, Baltimore, USA
* Corresponding author

from 13th Annual SCMR Scientific Sessions
Phoenix, AZ, USA. 21-24 January 2010

Published: 21 January 2010

Journal of Cardiovascular Magnetic Resonance 2010, **12**(Suppl 1):P245 doi:10.1186/1532-429X-12-S1-P245

This abstract is available from: http://jcmr-online.com/content/12/S1/P245

Introduction

Magnetic resonance tagging is an imaging technique that inserts non-invasive features, called tag lines, inside the heart muscle. Each tag line on an image corresponds to a 3D tag surface that cuts the heart and deforms with the heart's motion.

Purpose

Quantitative analysis of left ventricle motion can be performed by tracking the tag surfaces motion, where the intersection of orthogonal tag surfaces resolves the 3D motion of the heart tissue. Although, previous work was done to construct tag surfaces between image slices, it was restricted to the specific tag lines and not between them. The reconstruction of the tag surfaces, based on their harmonic phase value, enables an accurate tracking of 3D motion of the cardiac tissue, which will enable an objective and accurate assessment of cardiac function.

Methods

In this work, we propose a method for tag surface reconstruction and tracking using the harmonic phase (HARP) technique. Cubic-splines were used for the interpolation of the phase tag lines - which correspond to a specific harmonic phase value - and build the 3D surface of that phase value. Surfaces can be generated from short- and long-axis views of the heart in order to obtain tag surfaces of different orientations.

Results

The method was tested on real images obtained for normal subjects. The proposed method showed the deformation of phase surfaces with the 3D motion of the left ventricle.

Conclusion

The advantage of this technique, versus other similar methods, is the ability to generate arbitrary tag surface, not necessarily the ones corresponding to the tag lines. For continuous choices of phase values, corresponding surfaces are continuously generated and parameterized by the harmonic phase values. The use of HARP also provides a rapid and fast way to identify the tag lines, and hence, generate the surfaces.

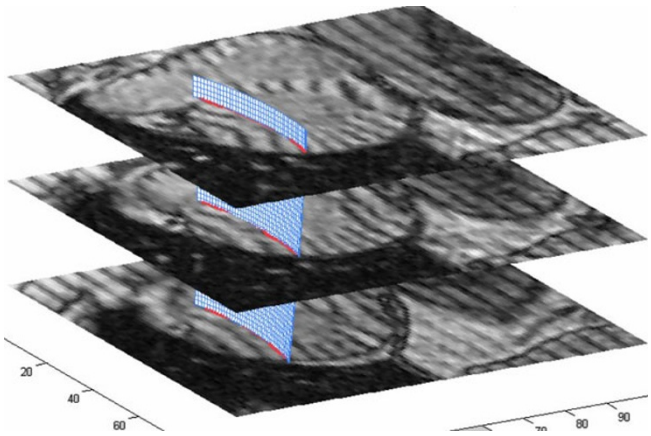

Figure 1

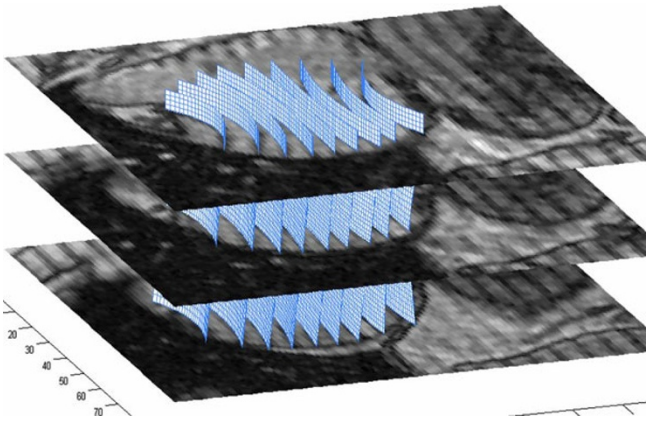

Figure 2

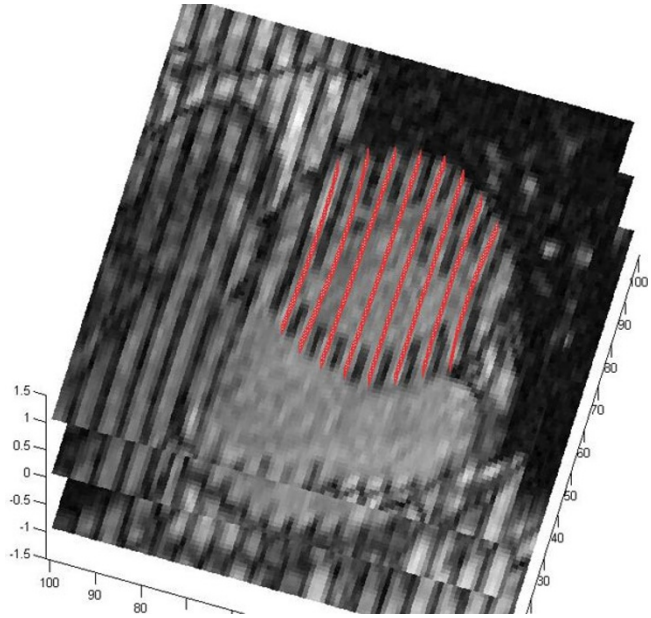

Figure 3

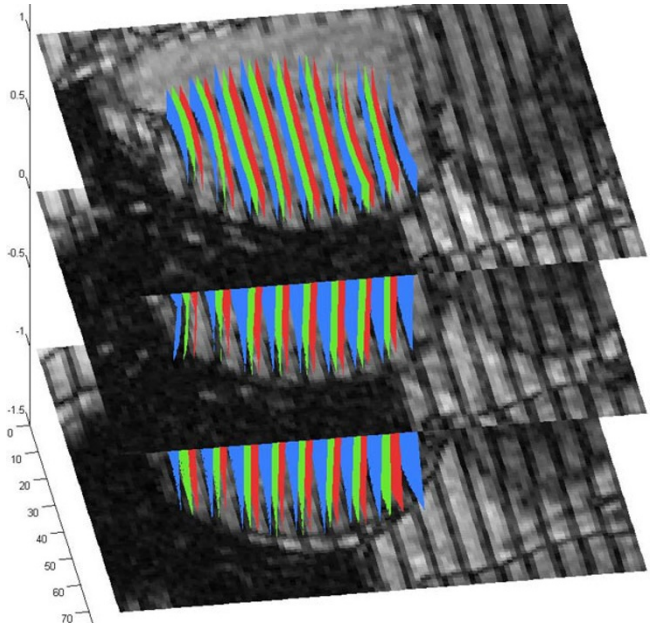

Figure 4