

Publication

A Bayesian Framework for Estimating Respiratory Liver Motion from Sparse Measurements

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Author(s) Preiswerk, Frank; Arnold, Patrik; Fasel, Beat; Cattin, Philippe Author(s) at UniBasel Cattin, Philippe Claude ; Year 2012 Title A Bayesian Framework for Estimating Respiratory Liver Motion from Sparse Measurements Editor(s) Yoshida, Hiroyuki; Sakas, Georgios; Linguraru, Marius George Book title Abdominal Imaging : Computational and Clinical Applications Publisher Springer Place of publication Berlin, Heidelberg Pages S. 207-214 ISSN/ISBN 978-3-642-28557-8 (E-Book) ; 978-3-642-28556-1 (Print) Series title Lecture Notes in Computer Science Number 7029 In this paper, we present an approach for modelling and predicting organ motion from partial information. We used 4D-MRI sequences of 12 subjects to build a statistical population model for respiratory motion

We used 4D-MRI sequences of 12 subjects to build a statistical population model for respiratory motion of the liver. Using a Bayesian reconstruction approach, a pre-operative CT scan and a few known surrogate markers, we are able to accurately predict the position of the entire liver at all times. The surrogates may, for example, come from ultrasound, portal images captured during radiotherapy or from implanted electromagnetic beacons. In leave-one-out experiments, we achieve an average prediction error of 1.2 mm over sequences of 20 min with only three surrogates. Our model is accurate enough for clinically relevant treatment intervals and has the potential to be used for adapting the gating window in tumour therapy or even for tracking a tumour continuously during irradiation.

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