Inter-subject modelling of liver deformation during radiation therapy

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This paper presents a statistical model of the liver deformation that occurs in addition to the quasi-periodic respiratory motion. Having an elastic but still compact model of this variability is an important step towards reliable targeting in radiation therapy. To build this model, the deformation of the liver at exhalation was determined for 12 volunteers over roughly one hour using 4DMRI and subsequent non-rigid registration. The correspondence between subjects was established based on mechanically relevant landmarks on the liver surface. Leave-one-out experiments were performed to evaluate the accuracy in predicting the liver deformation from partial information, such as a point tracked by ultrasound imaging. Already predictions from a single point strongly reduced the localisation errors, whilst the method is robust with respect to the exact choice of the measured predictor.

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