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(54) **LONGITUDINAL IMAGE REGISTRATION ALGORITHM FOR INFRARED IMAGES FOR CHEMOTHERAPY RESPONSE MONITORING AND EARLY DETECTION OF BREAST CANCERS**

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(57) **ABSTRACT**

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G06K 9/00 (2006.01)

This algorithm provides a marker-free approach to establishing the pixel correspondence among the IR images taken at different times, which is the basis for quantitatively characterizing the variation of the heat energy and patterns pixel-wise on a breast surface. The idea is to use the corner points of the heat pattern and the branch points of the skeletons of the heat pattern on the body surface as the initial fiducial points for the longitudinal IR image registration. The Thin-Plate Spline technique is used to model the nonlinear deformation between two IR images taken at two different times. Mutual information between the TPS-transformed image and the target image is employed as the metric quantifying the quality of the longitudinal IR image registration. To optimize the registration, Nelder-Mead simplex method is used to locally modify the pairings of the fiducial points in the source and target IR images to maximize the mutual information.

(52) **U.S. Cl.**
USPC 382/128; 128/922; 250/316.1

(58) **Field of Classification Search**
USPC 382/100, 128, 129, 130, 131, 132; 128/922; 378/4-27; 250/316.1, 330, 250/339.08, 339.11, 493.1, 495.1; 702/127, 702/130, 134, 135

See application file for complete search history.

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11 Claims, 6 Drawing Sheets

