CUMC Radiology Computational Image Analysis (CIA) Lab

Published date: Dec. 4, 2013

Technology description

Summary

This technology describes an algorithm and graphical user interface-based software for efficiently and accurately separating liver right and left lobes in images generated by MRI, CT, and other medical imaging technologies. Currently available technologies achieve lobe separation either by manual drawing on each slice (which is time consuming and tedious) or by finding markers on the surface of the liver (which yields poor accuracy). This technology relies on more accurate landmarks within the liver anatomy and an algorithm to automatically segment the liver into its left and right lobes based on the landmarks. The landmarks can be obtained either semi-automatically or automatically and yield real-time separation of the lobes. Refinement of the separation result can be achieved using the graphical user interface in a real-time fashion.

CU13005 Lymph Node Segmentation and Change Analysis

Monitoring of lymph nodes is a common approach for detection of cancer metastasis. Current approaches are dependent on the subjective analysis of the radiologist measuring lymph node dimensions. This technology describes a three-fold approach to automatically identify lymph nodes in chest, abdomen and pelvis and to monitor them over time: 1) Detection of Lymph Nodes on Baseline CT Images, 2) Segmentation of Lymph Nodes on CT Images, 3) Matching of Lymph Nodes between two longitudinal CT images and segmentation of lymph nodes on one or more follow-up images.

CU13270 A Method and Apparatus for Brain Tumor Segmentation

Brain tumors are irregular, asymmetric and infiltrative. Standard measures of treatment response using diameter(s) are too simplistic, as information on tumor composition, its effects on surrounding tissue, and volume of tumor burden are not utilized. This invention builds on the previous technology (IR 2906) by adding new methods to automatically detect necrosis boundary inside a segmented brain tumor.

CU14058 A Method and Apparatus for Breast, Breast Lesion and Fibroglandular Segmentation

Prevention of breast cancer, the most common malignancy among women in the U.S., is a major public health issue. Breast density may serve as a useful intermediate biomarker for breast cancer risk assessment in investigations of potential chemopreventive agents for this disease. This invention

provides an efficient tool to quantify changes in breast and fabric granular volumes on longitudinal MRI. This technology is fast and less affected by image noise. The software is semi-automatic and requires an operator to first loosely identify a breast region-of-interest. It can simultaneously segment several objects (i.e., the two breasts, multiple lesions and Fibroglandular tissues in breasts) on volumetric MRI and can analyze both axial and sagittal view breast images as well.

CU14167 Automatic detection of lung nodules on CT scan images based on a multi-classifier method

Lung cancer is the leading cause of cancer-related deaths in America. Early detection and treatment are key to reducing the mortality rate of lung cancer. Computer-aided detection of lung nodules on non-contrast-enhanced CT is helpful during the screening process. The present invention has an advantage over existing detection algorithms, especially in dealing with small ground glass opacity lung nodules and nodules attached to surrounding structures of similar density. Furthermore, the present invention is robust for a wide variety of CT imaging protocols used in both routine diagnosis and screening studies. This method has been tested on 294 CT scans in The Lung Image Database Consortium (LIDC) dataset. The sensitivity and false positive per scan for the training set (196/294) is 87% and 2.79. The sensitivity and false positive per scan for the testing set (98/294) is 85.2% and 3.22.

Application area

1) radiation and surgical treatment planning and 2) patient selection and follow-up checkups for liver transplantations.

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