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Sparse MRI Application of Compressed Sensing For Rapid Real Time 3d Image

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ABSTRACT:

In this paper Lung cancer is one of the most challenges diseases, the detection also is very difficult earlier the detection of lung cancer used chest radiographs (CXR) using VDE technique. This technique detects the lung cancer module in ribs and clavicle using MTANN (Massive training artificial neural network) algorithm. To detect the nodules that overlap with ribs or clavicles and to reduce the frequent false positives using chest radiography. Now we proposed new approach for real time 3D visualization of organ deformation based on optical imaging patches with limited field of view and a single pre-operating scan of magnetic resonance Imaging (MRI) or computed tomography (CT) from we improve the resolution of cancer detection parts.

Index Terms

Chest Radiography (CXR), Magnetic Resonance Image (MRI), Computed Tomography (CT), lung cancer, rib suppression, Deformation, Virtual Dual Energy (VDE), Surface Reconstruction.

1. INTRODUCTION

In cancer is the uncontrolled growth of abnormal cells in the body. The causes of cancer are diverse, complex, and only partially understood. The cancer may also spread to more distant parts of the body through the lymphatic system or bloodstream. There are over 200 different types of known cancer that affect humans.

The Cancer can be detected in a number of ways, including the presence of certain symptoms and signs, screening tests, or medical imaging. Cancer is usually treated with radiation therapy, chemotherapy and surgery. Approximately 5-10% of cancer can be traced directly to inherited genetic defects. Currently, the overall five-year survival rate for lung cancer patients is only 14%. Early treatment and detection of lung cancer can improve the survival rate by 50%.

Early stage detection of lung cancer, computed tomography (CT) is a more sensitive imaging modality. Preoperative magnetic resonance imaging (MRI) or computed tomography (CT) scans can provide critical information. Nevertheless, they cannot solve the problem of restricted visualization during MIS, because the actual intraoperative scene differs from the preoperative imagery due to several factors including body movements, gas insufflation and tool-tissue interactions. Various procedures have been proposed to address the problem of restricted field-of-view at the presence of anatomy deformations, including, but limited to, intraoperative imaging and model-based deformation tracking.

2. METHODOLOGY USED

2.1 Database of Chest Radiographys

To train our CADe scheme to collect 300 cases with nodules and 100 normal cases from the different institutions. This CADe scheme is used for the screen film systems, computed radiography system, and digital radiography systems. Each and every nodule was confirmed by the computed tomography and the locations of nodules are confirmed by the chest radiologists. The nodule size should be range from 5 to 40 mm. For the future enhancement using the JSRT database, this database is also publicly available in the website. By using the screen film systems the posteroanterior CXRs are collected from the database. All nodules in the CXRs confirmed by CT and the

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location of the nodules are confirmed by three chest radiologists. Here take the 12 bit CXRs with resolution of 2048×2048 pixels then each pixel of the size was 0.175×0.175 mm. Actually, To compare the 93 normal cases with the 154 cases to the confirmed lung nodules. Depend up on the degree of subtlety for detection the nodules are grouped into five categories.

Most modeling approaches are intrusive and require continuous measurements of organ motions using tracking sensors implanted or attached to organs to track organ deformations and correct preoperative imagery or intraoperative imagery between successive scans. Particularly, these approaches proposed for organs with periodic motions are promising but suffer from limited applicability for organs with nonrecurrent motions. Further, the computational complexity of the modeling methods is usually incompatible with the real time requirement for MIS. To alleviate this problem, systems typically use simpler but less accurate mathematical models, leading to reduced accuracy and resolution that is inadequate for safe surgical interventions.

2.2 Scheme for nodule detection

CADe scheme consists of three different phase approach there are initial nodule candidate selection, extraction of features, discrimination of nodule.

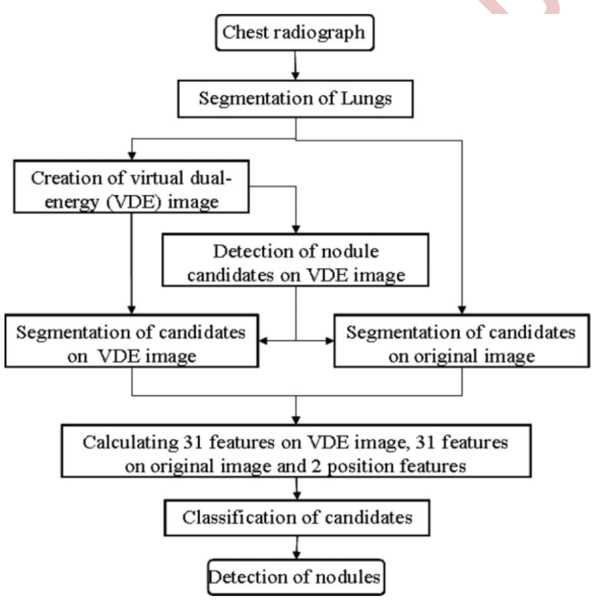

Fig1: CAD scheme with VDE technology

The Original CADe scheme of nodule detection is divided into four steps:

1) The segmentation of Lung fields based on the Multisegment Active Shape Model.
2) The Nodule candidate detection and two stage nodule enhancement.
3) Segmentation of nodule candidates by using Watershed algorithm
4) By using nonlinear support vector machine classifier the nodule candidate are converted into nodules or non-nodules and feature analysis and classification.

2.3 Creation and visualization of VDE images

By using MTANN technique ribs and clavicles are suppressed and lung nodules are maintained. Chest radiography has been developed by Multiresolution of MTANN technique. This technique is a highly nonlinear filter and it consists of linear output. In 3D visualization has the following contribution are:

1) To develop a novel algorithm for real time 3D visualization.
2) The proposed algorithm is extended two reconstruct the interior structures.
3) To provide an implementation frame work using MRI or CT scans.
4) Computational cost during the reconstruction and comparison with the PCA method are also addressed.

2.4 Combined VDE technique using CADe scheme

To reduce rib-induced FPs and detect nodules overlapping ribs and clavicles, we incorporated the VDE technology in our CADe scheme. The VDE-based CADe scheme detected nodule candidates on VDE images by use of the two stage nodule enhancement technique that was applied in our original CADe scheme. A watershed segmentation algorithm was employed to segment each candidate in both original and VDE CXRs. Sixty morphologic and gray-level- based features were extracted from each candidate from both original and VDE CXRs which were smaller than the number of nodules in the training database.

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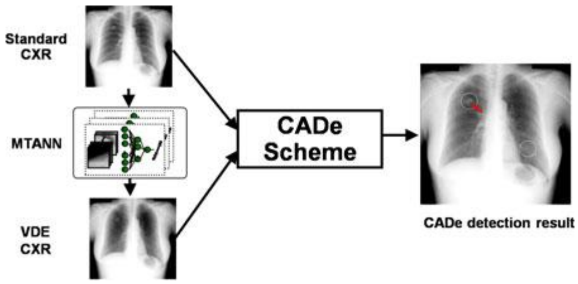

Fig 2: CADe Scheme

A nonlinear SVM was employed for classification of the nodule candidates into nodules or non-nodules. To detected nodule candidates in VDE images to improve the sensitivity for detection of nodule candidates. On the other hand, most of false nodule candidates were located in the rib crossing, clavicle regions in our original CAD scheme. Detected nodules in the nodule candidate detection step may be misclassified as non-nodules based on the features in the original image or VDE image and to improve the classification performance.

2.5 Representation of Sparse surface

Sparse surface representation is achieved via SHR and subspace identification. The upper block describes steps involved in the training stage. The training surfaces can be from various data sources, such as MRI/CT scans and realistic computer models. SHR is first performed to represent the deformable surfaces in the harmonic domain to decrease the length of surface descriptor and filter out the high frequency noise for achieving better homology among the training surfaces.

3. RESULTS AND DISCUSSIONS

To train the MTANN to create the VDE images for the CADe scheme. Next, the sensitivity for nodules candidate detection on VDE images with different rib contrast was presented and compared to that on the original image.

Then present the performance of the CADe scheme, which only used the VDE image to replace the original CXR for candidate detection, feature extraction, and classification. A comparison to our original scheme was also conducted. At last, the performance of the VDE-based CADe scheme was presented and compared with that of the original CADe scheme. The overall system performance was quantified using FROC curves. The SVM classifier and linear discrimination analysis (LDA) classifier were trained or tested with a leave-one-out cross validation test.

4. CONCLUSION

To develop an advanced computerized scheme for detection of lung nodules by incorporating VDE image in which ribs and clavicles were suppressed by an MTANN technique. In a novel approach for real time 3D visualization of organ deformation using a single preoperative MRI scan and optical patch imaging from a limited field-of-view.

5. FUTURE ENHANCEMENT

In future to recover the sparse surface from the sparse samples and this bears similarities to compressed sensing that seeks to acquire signals known to have sparse representations in a domain-using a minimal number of measurements. However, compressed sensing theory requires that measurements are random linear combinations of all signal samples.

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