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RESEARCH ARTICLE

IDENTIFICATION OF HEAD AND NECK CANCER BY USING DECISION TREE CLASSIFIER

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Abstract—Coregisteredfluoro-deoxy-glucose(FDG)positronemission tomography/computed tomography (PET/CT) has shown potential to improve the accuracy of radiation targeting of head and neck cancer (HNC) when compared to the use of CT simulation alone. The objective is to identify textural features useful in distinguishing tumor from normal tissue in head and neck via quantitative texture analysis of coregistered 18F-FDG PET and CT images. Abnormal and typical normal tissues are segmented from PET/CT images with HNC . Texture features including some derived from spatial grey-level dependence matrices (SGLDM) and neighborhood gray-tone-difference matrices (NGTDM) are selected for characterization of these segmented regions of interest (ROIs). The decision tree classifier is used to discriminate images of abnormal and normal tissues. The leave-one-out technique is used to validate the results.

I. INTRODUTION

Precision conformal radiation therapy techniques such as intensity modulated radiation therapy (IMRT), which tightly conforms radiation dose to a target, can potentially improve local-regional tumor control, reduce normal tissue toxicity, and improve the quality of life for patients with head and neck cancer (HNC) [1]–[3]. The high degree of dose conformity to a target and sharp radiation dose gradient produced in IMRT suggest accurate delineation of tumor is essential. However, the current standard target localization method, manual definition of the target volume on X-ray computed tomography (CT) images by radiation oncologists, is potentially inaccurate and is subject to high observer variability [4] and [5]. CT has relatively poor soft tissue contrast resolution and since many malignant tumors arise from within soft tissue, there is little distinction between the CT numbers of tumor and the surrounding normal tissues. In contrast to anatomic imaging techniques, a functional imaging technique, positron emission tomography (PET) with the most commonly used imaging tracer, F-fluoro-deoxy-glucose (FDG), which elucidates metabolic activity.

Several studies have suggested that FDG PETcoregistered with CT is superior to CT or magnetic resonance imaging (MRI) in assessing involved lymph nodes, avoiding geographic miss of tumor, and reducing observer variability in target definition [6]–[8]. Although qualitative use of FDG PET/CT images may provide significant improvement, the variability of target localization is still high even with the addition of FDG PET [7]–[9]. Since PET images do not present well- defined tumor boundaries because of their relatively poor spatial resolution, it is unclear how best to incorporate PET information in defining a radiation target. Therefore, there is a need for a quantitative analysis of coregistered FDG PET/CT images which can provide information on how to segment tumor in order to improve the accuracy and consistency of target localization. A few studies [10]–[12] have proposed objective methods to characterize abnormal and normal tissues in the head and neck region using FDG PET. These have concentrated on primary features such as PET intensity which is defined as the tissue concentration of a tracer as measured by a PET scanner divided by the (decay corrected) activity injected divided by body mass.

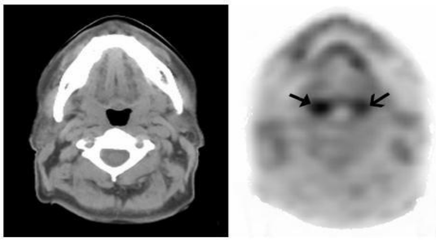
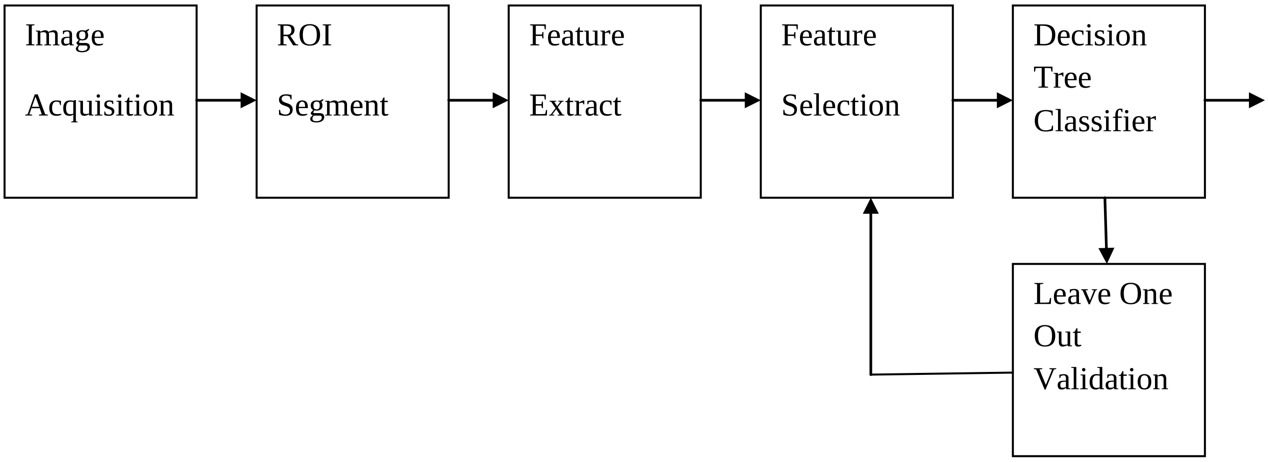


Fig1. CT image (left) and PET image (right) of a patient with head and neck cancer.

Figure. 1 shows one CT trans axial slice (left) and a corresponding trans axial PET slice (right) of a patient with HNC. High F-FDG uptake was observed both in tumor (solid arrow) and also in normal tonsil (open arrow).

II. IMAGE ACQUISITION AND PREPROCESSING

FLOWCHART OF TEXTURE CHARACTERIZATION OF HEAD AND NECK CANCER:



III. TISSUE CLASSIFICATION

Following feature selection, classifications of ROIs according to selected features are implemented to evaluate the ability of these features to distinguish between abnormal and normal ROIs. The decision tree classifier is used for classification.

Decision tree classifier:

A Decision tree is a classifier expressed as a recursive partition of the data space. It starts with a training set of tuples and their associated class labels. The training set is recursively partitioned into smaller subsets as the tree is being built[31].A variety of types of soft tissues are present in the head and neck region which have different anatomical and biological properties that show different patterns in PET/CT images. More partitions in this sophisticated dataset may be necessary [30].. To achieve better classification results, a top-down decision tree has to be built on our dataset The algorithm for Decision tree classifier.

IV. RESULT

It shows that the Decision Tree Classifier Is most advantages method to detect head and neck cancer.

	Decision Table	**Naive Bayes**	**Ada Boost**	**Decision Tree**
Precision	**0.02**	**0.667**	**0.667**	**0.7**
Recall	**0.03**	**1**	**1**	**1**
TP Rate	**0.04**	**1**	**1**	**1**
FP Rate	**0.5**	**0.333**	**0.333**	**0**

Table 1. Comparison results showing that Decision tree Classifier is better.

V. CONCLUSION

This study focuses on the problem of accurate radiation targeting for treatment of head and neck cancer. Through this we conclude that texture characterization of head and neck tissue with PET and CT images has potential to enhance the ability to discriminate normal and abnormal tissues. Texture features based on SGLDM and NGTDM are capable of describing the properties of abnormal and normal tissues of head and neck sufficiently well to allow ROI classification similar to that attainable by a human expert. Combining texture features from both PET and CT generates better discrimination results than using features from one modality alone.

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