Classification of Tissues in Computed Tomography using Decision Trees

David S. CHANNIN, Daniela S. RAICU, Jacob D. FURST, Dong-Hui XU, Lynette LILLY, Chanokporn LIMPSANGSRI

Intelligent Multimedia Processing Laboratory, School of Computer Science, Telecommunications, Information Systems, DePaul University, 243 S. Wabash Avenue, Chicago, Illinois, 60604 USA

Department of Radiology, Northwestern University Medical School, 448 E. Ontario Street, Ste. 300, Chicago, Illinois, 60611 USA

Motivation
This paper will demonstrate how co-occurrence and run-length texture information mined from computed tomography (CT) images can be used to automatically classify and annotate normal tissues from regions of interest (ROI) from a large and diverse set of CT images.

System Outline
Data: CT images
Segmentation: Active Contour Models (snake)
Texture Models: Co-occurrence matrices, Run-Length Matrices
Classification: CART Decision Tree

Data
344 CT-OID images

Segmentation algorithm:
- Active Contour Models (snake)
- Initial: input of 30-50 points

Texture Models:
- Co-occurrence matrices
- Run-Length Matrices

Classification algorithm:
- CART (Classification and Regression Trees)

Results:
- Classification accuracy: 89.5%

References:

Table 1: Classification of Tissues in Computed Tomography using Decision Trees

<table>
<thead>
<tr>
<th>Tissue Class</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Normal Tissue</td>
<td>89.5%</td>
</tr>
<tr>
<td>Adenoma</td>
<td>95%</td>
</tr>
<tr>
<td>Tumor</td>
<td>90%</td>
</tr>
<tr>
<td>Adenocarcinoma</td>
<td>92%</td>
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</tbody>
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The classification results show that the proposed method achieves high accuracy in the classification of normal tissue and adenoma, with the adenocarcinoma classification showing the highest accuracy of 92%.

Figure 1: System Diagram

The system diagram illustrates the workflow from segmentation to texture analysis and finally to classification using a decision tree.

Figure 2: Texture Feature Extraction

The texture feature extraction module calculates features derived from the co-occurrence and run-length matrices to classify the tissues appropriately and distinguish between different classes.