Abstract

Texture analysis recognizes an image on the basis of textural property which in turn is used in texture segmentation for identifying the boundary between different textures. Among many methods of feature extraction, the signal processing method has got dominance over other methods due to its similarity with Human Visual System (HVS). It is difficult to segment some texture if it undergoes rotation. Watershed is frequently used in segmentation as it combines boundary based and region based concepts of image segmentation. Feature level fusion is also studied nowadays with great deal of interest on 'curse on dimensionality'. From these motivations the objective of the thesis can be outlined as follows:

(1) Study of rotational invariant textural features in signal processing domain.

(2) Study of the effect of addition of contextual information in filtering domain for texture segmentation.

(3) Application of Hybrid Segmentation Algorithm (HSA).

(4) Study of fusion of rotational invariant features, contextual features and statistical features extracted from region grown image obtained by region growing algorithm (RGA).

The thesis consists of six chapters where the first chapter gives an overview of the problem. In the Chapter 2 a rotational invariant technique with even symmetrical Gabor filter has been extended to non overlapping blocks. Rotational invariant features extracted from DCT have been proposed for texture analysis and segmentation. Effect of addition of contextual features for filtering aspect of texture segmentation in non overlapping blocks has been studied in Chapter 3. In Chapter 4, minimum inhibition of watershed segmentation is carried out through HSA invoking watershed implemented in the shortest path forest framework. In Chapter 5 feature level fusion of rotational invariant features based on DCT, contextual features and statistical features extracted from Region Grown Image has been studied.

The application area has been selected as the analysis and segmentation of natural and artificial texture images, natural scene images and Transmission Electron Microscopic (TEM) and Light Microscopic (LM) images of Oral Submucous Fibrosis (OSF).

The major advantage of the proposed technique is the simplicity and ease of implementation of rotational invariant features obtained from DCT. Moreover the addition of contextual information proves to be beneficial in terms of computational time and classification accuracy. Also HSA and feature level fusion are used for segmenting LM images of OSF into constituent layers.

Keywords: Unsupervised texture segmentation, Rotational invariance, Contextual feature, Hybrid segmentation, Feature level fusion