

Image segmentation based on color and texture gradient

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ABSTRACT

An image segmentation scheme based on a model of human perception of color and texture is proposed. It consists of the following steps:

- Spatial segmentation of each RGB images using an edge detector, contour following and closing algorithms;
- Characterization: each intersection of the segments is now characterized by:
 - color: statistical parameters of the RGB values of pixels within the intersection;
 - shape: perimeter, area, compactness;
 - orientation;
 - topology: neighbor, inclusion.
- Merging of the elementary segments based on the selection of their attributes.
- Segmentation by texture gradient based on the window correlation technique to identify "coherent texture" regions.

RESUME

Nous proposons une méthode de segmentation d'image basée sur un modèle de vision de la couleur et de la texture qui consiste en les étapes suivantes:

- La segmentation spatiale des canaux Rouge, Vert et Blue par détection des contours avec un opérateur de gradient, le suivi et la fermeture des contours;
- La caractérisation de chaque intersection des segments par:
 - couleur: paramètres statistiques des valeurs des pixels à l'intérieur d'une même intersection;
 - forme: périmètre, surface, compacité;
 - orientation;
 - topologie: voisinage, inclusion.
- L'agrégation des segment élémentaires par la sélection de leurs attributs.
- La segmentation de l'image par le gradient de texture en utilisant la corrélation des fenêtres sur l'image pour identifier des régions avec des "textures cohérentes".

INTRODUCTION

The understanding of the human visual system and the photo-interpretation method adopted by human analyst does help in designing algorithms in image analysis. The approach is not so much to simulate or worst to imitate the human visual system but rather to understand the underlying mechanisms in order to deduce a few general criteria which could be implemented to extract pertinent features and to identify objects of different visual properties.

Different objects on images can be identified by either labelling pixels of similar properties or defining their boundaries.

The methods of region growing, split and merge, clustering are typical of the first approach. The second approach consists of methods which are based on the detection of contour. Most existing method of contour detection are based on the gradient in the gray level of a half tone image. We are proposing a method of image segmentation which is based on the integrated use of the three fundamental properties: color ,texture and geometrical properties of elementary segments on the image. Two methods of contour detection are developed one using a general Sobel operator to detect gradient in gray level and other using a correlation operator to detect texture gradient. These contours are followed to define elementary segments. The elementary segments are then aggregated using a clustering method. Elementary segments are then merged based on their geometrical and topological properties.

The method is applied to the SPOT simulation data taken over an area in the Southwest of Paris.

