LA-SS Project Week 3-4
22nd September 2015

Various Image Compression Techniques

• Lossy Compression : Lossy compression creates smaller files by discarding some information about the original image.
• Lossless Compression : Lossless compression is a method of data compression algorithms that allows the original data to be perfectly reconstructed from the compressed data.

Methods of Lossy Compression

-Quantization(Uniform, NonUniform and Vector)
-Discrete Cosine Transform Used in JPEG
-Discrete Fourier transform

Methods of Lossless Compression

-Huffman Coding: The data that occur more frequently are assign a smaller bits while the data that occur less frequently are assign the larger bit.
-Run Length Encoding: RLE is a very simple form of data compression in which runs of data that is, sequences in which the same data value occurs in many consecutive data elements are stored as a single data value and count, rather than as the original run.
-LZW Coding:It replaces string of character with single code.In this compression method we replaces the string of character by a single code.

Techniques For Foreground And Background Separation

We can separate out foreground and background with help of histogram of that image.We can identify object and background by pixel intensity.By selecting proper threshold value we give corresponding label to object and background and convert the gray scale image into binary image.

Thresholding Algorithms

•Multiple Threshold: In this method we take threshold value based on local property of each pixel.
•Local Thresholding: In this method we take taking threshold value based on pixel location and pixel intensity
•Basic Global Thresholding:In this method we take taking threshold value based on pixel location

$$g(x,y) = \begin{cases} 1 & \text{if } f(x,y) > T \\ 0 & \text{if } f(x,y) \leq T \end{cases}$$

1.Select an initial estimate for the global threshold value T.
2.Segment the image using T in previous equation.This will produce two groups of pixels:$G1$ consisting of all pixels with intensity values > T. and $G2$ consisting of pixels with values ≤ T.
3.Compute the average intensity values $m1$ and $m2$ for the pixels in $G1$ and $G2$ respectively.
4.Compute a new threshold value:

$$Tnew = 1/2(m1 + m2)$$

5.Repeat step through until the difference between values of T in successive iteration is smaller then predefined parameter $T - Tnew$
•Methods for Improve Global Thresholding
-Optimum Global Thresholding Using Otsu's Methods
-Global Thesholding Using Image Smoothing
-Global Thesholding Using Image Detection

Segmentation

• **Definition**: Segmentation subdivides an image into its constituent regions or objects.They can be edge, point, object, line, background or object.Segmentation should stop when the objects of interest in an application have been isolated.
Image segmentation algorithms generally are based on one of two basic properties of intensity values: **discontinuity and similarity**
•**Discontinuity based approach**: Partition an image based on abrupt changes in intensity.Techniques based on discontinuity attempt to partition the image by detecting abrupt changes in gray level
-Using Point detection
-Using line detection
-Using edge detection
•**Similarity based approach**: Partition an image based on regions that are similar according to a set of predefined criteria.Techniques based on similarity attempt to create the uniform regions by grouping together connected pixels that satisfy predefined similarity criteria.
- Thresholding: Thresholding groups together pixels according to some global attribute, such as grey level.
- Region splitting:Divide an image into smaller and smaller regions until all the pixels in the different regions satisfy the predefined uniformity predicate or uniformity measure for that region.
-Region merging:Region merging is same as region splitting but we merge its adjacent regions if they are uniform.

Connected Components Labeling

Connected components labeling scans an image and groups its pixels into components based on pixel connectivity, i.e. all pixels in a connected component share similar pixel intensity values and are in some way connected with each other. Once all groups have been determined, each pixel is labeled with a graylevel or a color according to the component it was assigned to.

Connected component labeling works by scanning an image, pixel-by-pixel (from top to bottom and left to right) in order to identify connected pixel regions, i.e. regions of adjacent pixels which share the same set of intensity values V.

Connected component labeling works on binary or graylevel images and different measures of connectivity are possible. However, for the following we assume binary input images and 8-connectivity. The connected components labeling operator scans the image by moving along a row until it comes to a point p where p denotes the pixel to be labeled at any stage in the scanning process for which $V = 1$. When this is true, it examines the four neighbors of p which have already been encountered in the scan (i.e. the neighbors (i) to the left of p, (ii) above it, and (iii and iv) the two upper diagonal terms). Based on this information, the labeling of p occurs as follows:
If all four neighbors are 0, assign a new label to p, else
if only one neighbor has V=1, assign its label to p, else
if more than one of the neighbors have V=1, assign one of the labels to p and make a note of the equivalences.