Curriculum Vitáe

NAME: SARIF KUMAR NAIK

CORRESPONDING ADDRESS:
C/O : Prof. C. A. Murthy,
Machine Intelligence Unit,
Indian Statistical Institute,
203 B. T. Road,
Kolkata -700108, INDIA

E-MAIL: sarif_r [AT] isical.ac.in, sarifnaik [AT] gmail.com

PHONE: +91-9980117100 (M)

EDUCATION:

- Ph. D. (Computer Science), (thesis submitted to Indian Statistical Institute, 2006)
  Title of the thesis : *"On Edge Detection and Object Recognition in Color Images"*.
  Thsis advisor : Prof. C. A. Murthy
- M. Phil. (Mathematics) 1998
  Department Of Mathematics, Sambalpur University, Jyoti Vihar, Burla-768019
- M. Sc. (Mathematics), 1997
  Department Of Mathematics, Sambalpur University, Jyoti Vihar, Burla-768019

AREAS OF REASEARCH INTEREST: Image Processing, Computer Vision, Pattern Recognition.

TECHNICAL EXPERTISE:

- OPERATING SYSTEMS: Solaris, IRIX, Unix, Linux, Windows.
- PROGRAMMING SKILLS : C, C++, Java, Perl.
- SPECIAL TOOLS: Matlab

CURRENT POSITION:

Senior Research Specialist, Philips-Research, Bangalore, India.

RESEARCH EXPERIENCE:

- Aug. 2002 - Mar. 2006 : Senior Research Fellow, Machine Intelligence Unit, Indian Statistical Institute, Kolkata-700108.
- Aug. 2000 - Aug. 2002: Junior Research Fellow, Machine Intelligence Unit, Indian Statistical Institute, Kolkata-700108, India.

PUBLICATIONS:

- JOURNALS:
  1. S. K. Naik and C. A. Murthy : Distinct Multi-Colored Region Descriptor for Object Recognition, *IEEE Trans. on Pattern Analysis and Machine Intelligence*, Sep. 2006. (Accepted for Pulication)
  2. S. K. Naik and C. A. Murthy : Standardization of Edge Magnitude in Color Images, *IEEE Trans. on Image Processing*, vol. 15, no. 9, pp. 2588-2595, Sep. 2006.
  3. S. K. Naik and C. A. Murthy : Hue-preserving Color Image Enhancement Without Gamut Problem, *IEEE Trans. on Image Processing, vol. 12, no. 12, pp.1591-1598, Dec. 2003*.
- CONFERENCE :
  1. S. K. Naik and C. A. Murthy : Hough Transform for Region Extraction in Color Images, *Proc. of Indian Conf. on Computer Vis. Graphics and Image Processing (ICVGIP'04), Kolkata, India, Dec. 16-18, pp. 252–257, 2004.*

REFERENCES:

- Prof. C. A. Murthy
  Head, Machine Intelligence Unit
  Indian Statistical Institute
  203 B. T. Road, Calcutta 700108, India
  Phone: +91-33-2575 3104
  Fax : +91-33-2578 3357
  EMail: murthy@isical.ac.in
  http://www.isical.ac.in/∼murthy
- Prof. Sankar K. Pal, Fellow IEEE
  Director and Distinguished Scientist
  Indian Statistical Institute
  203 B. T. Road, Calcutta 700108, India
  Phone: +91-33-2575 3101
  Fax : +91-33-2578 3357
  E-Mail: sankar@isical.ac.in
  http://www.isical.ac.in/∼sankar
- Prof. Malay K. Kundu
  Machine Intelligence Unit
  Indian Statistical Institute
  203 B. T. Road, Calcutta 700108, India
  Phone: +91-33-2575 3108
  Fax : +91-33-2578 3357
  E-Mail: malay@isical.ac.in
  http://www.isical.ac.in/∼malay

SUMMARY OF RESEARCH WORKS :

My research experience includes works on object recognition, edge detection, region extraction and image enhancement in color images. A short summary of the works is as follows :

- OBJECT RECOGNITION :
  S. K. Naik and C. A. Murthy : "Distinct Multi-Colored Region Descriptor for Object Recognition",*IEEE Trans. on Pattern Analysis and Machine Intelligence*, Sep. 2006. (Accepted for Publication).

  The challenges involved in object recognition are mainly the efficient representation and then the comparison of two objects through their representations. Broadly speaking, there are two types of approaches to object representation. One approach utilizes the knowledge gained from the spatial arrangements of the "shape features" such as the edge elements, boundaries, corners and junctions and the second uses the brightness or color features obtained more directly from the object images. There are limitations to any algorithm which uses either only shape features or only color features. There are many objects which are indistinguishable in terms of their shape. If only shape features are taken then the recognition system can't distinguish between a white car and a blue car. On the other hand, if only color features are considered a blue bird may be matched with blue car. But, to some extent, these type of objects can be distinguished from the patterns on them. Thus, there is a need of a scheme to describe an object which somehow contains shape information as well as color information or in other words the representation scheme should carry the patterns of color appearing on the object surface as well as the colors. This article proposes a scheme to describe an object in such a way that the description contains the color information as well as the pattern of colors on the object surface (certain shape information) giving minimal effort to feature extraction and its representation. Here color features are obtained from those portions of the image where the shape information is also present. These obtained features with the proposed representation carry the pattern information that indirectly keeps the shape information regarding the object partially.
  Two different methods have been proposed to identify the regions of interest for the proposed representation. For a quick and first way to do this is to check for regions having multiple colors. This has been done in method I(M-COD-Cluster), which uses a data condensation technique to identify the regions having multiple colors. Method II(M-COD-Edge) first identifies the edge pixels of the image and finds the regions where two or more segments of different colors merge. A suitable distance measure has been proposed to find the distance between two images using this representation.
  The methods have been implemented on COIL-100, SOIL-47 and ALOI-VIEW object datasets and good results are obtained. Proposed method have obtained excellent results on SOIL-47 and COIL-100 datasets. Specifically, proposed methods have obtained significant improvements over the existing methods in terms of recognition performance when one, two and four training views are considered in COIL-100 and better results are obtained when 18 and 36 training views are con-

sidered. The same techniques obtained significant recognition rate on 18000 image consisting of 250 objects from ALOI-VIEW datasets.

- EDGE DETECTION:
  S. K. Naik and C. A. Murthy : "Standardization of Edge Magnitude in Color Images", *IEEE Trans. on Image Processing.*, vol. 15, no. 9, Sep. 2006, pp. 2588-2595.

  Edge detection is a useful task in low-level image processing. The efficiency of many image processing and computer vision tasks depends on the perfection of detecting meaningful edges. To get a meaningful edge, thresholding is almost inevitable in many edge detection algorithm. Many algorithms reported in the literature adopt ad hoc schemes for this purpose. These algorithms require the threshold values to be supplied and tuned by the user. There are many high-level tasks in computer vision which are to be performed without human intervention. Thus there is a need to develop a scheme where a single set of threshold values would give acceptable results for many color images. An attempt has been made to device such an algorithm in this study. Statistical variability of partial derivatives at each pixel is used to obtain standardized edge magnitude and is thresholded using two threshold values. The advantage of standardization is evident from the results obtained.

- REGION EXTRACTION :
  S. K. Naik and C. A. Murthy : "Hough Transform for Region Extraction in Color Images", *Proc. of Indian Conf. on Computer Vis. Graphics and Image Processing (ICVGIP'04), Kolkata, India, Dec. 16-18, pp. 252–257, 2004.*.

  Hough transform is a widely used technique for line detection in the field of image processing. It is also used for various types of other feature extraction schemes. We have considered here the problem of region extraction using Hough transform in color and multi-spectral images. Hough transform is generally used in binary images and extension of these methods to grey scale images are existing in the literature. But, no Hough transformation technique is available which directly implements on color images. Here, an attempt is made to generalize an existing Hough transform technique for region extraction in grey scale images to color and multi-spectral image. As a possible application of the method, it is used to extract the homogeneous regions in the images taken from the Indian Remote Sensing Satellites and satisfactory results are obtained.

- IMAGE ENHANCEMENT:
  S. K. Naik and C. A. Murthy : "Hue-preserving Color Image Enhancement Without Gamut Problem", *IEEE Trans. on Image Processing, vol. 12, no. 12, pp.1591-1598, Dec. 2003*

  Color plays a critical and crucial role in color image enhancement which is a combination of both chrominance and luminance information. Chrominance information is the information regarding the hue and saturation of the color and luminance is the perceived intensity. From the image enhancement perspective chrominance information in the color needs careful attentions. Mainly, undesirable shift in hue

value may deteriorate the quality of the image drastically. Most of the image data available are in RGB color space. Thus a color image is available as three different channels(R, G and B) of information which can be viewed and seen as three gray scale images individually. This suggests that the direct application of usual gray level image enhancement techniques to individual channels independent of others and reunion of the enhanced channels would give enhancement. Unfortunately, reunion would not give satisfactory result and sometimes it may become worse, because, it is seen that the R, G and B channels are highly correlated with respect to the chrominance and luminance information in the color. Thus individual processing of the channels may shift the hue and saturation of a pixel considerably for some pixels. This generates visual artifacts. To avoid this problem most of the methods first transfer the image data to a color space which de-correlates the chrominance and luminance informations of the color. Then leaving the one or both the chrominance components intact luminance is modified to achieve good contrast. There are two notable problems in this approach. Not only these spaces require more complex computation, due to the non linear nature of the transformations involved in the conversions, these are noise prone. Secondly and most important is that after the enhancement, when the data is again transformed back to RGB space, many values go beyond the range of the RGB space. This problem is commonly known as gamut problem. Thus either it is rescaled or truncated to the bounds of the RGB space. Rescaling decreases the achieved contrast and truncation changes the hue component of the affected pixels.
A principle has been suggested to avoid these problems so that the existing knowledge of contrast enhancement in gray scale images can be used to color images. Using the principle the well known image enhancement techniques such as s-type enhancement and histogram equalization, are used to achieve hue preserving color image enhancement. The proposed method is also seen to be gamut problem free. The proposed method is compared with two different hue preserving color image contrast enhancement techniques and superiority of the proposed method over these methods are shown.