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Feature Vector Construction of 2D Images using Local and Global Features

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Abstract— Object recognition is a process of understanding, design, development and creation of methods to recognize the objects in the image. In this paper the main focus is to create feature vector of 2D images using local and global features of images. Feature extraction is a complex phase in image processing and computer visualization. In proposed method, color image is used as an input image. It transformed into gray-scale image. For feature vector information, local and global features are extracted. Local features are extracted using SIFT method in which key points are identified. Global features are extracted based on the intensity values of images. After that create feature vector using local and global features is high-dimensional. The proposed method is experimented using MATLAB R2012b.

Keywords- *Local features, Global Features, Feature Vector, SIFT.*

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I. INTRODUCTION

Object recognition from an image is a difficult task in computer vision. Human beings are capable in recognizing an object by seeing the image or certain part of the image. The process of recognizing the entire image is referred as global feature, or recognizing certain part of image is referred as local feature. Human beings recognize objects through global and local features of image. Image features are commonly categorized into two categories local features and global features. Local features are computed based on the interest point in the image. Global features are computed based on intensity value of the entire image [3].

Image features describes global or local properties of an image. Generally, average gray level, shape, saturation and color features comes under the category of global properties. And circles, lines and texture features come under the category of local properties [1].

In this paper, first the color image converts into Gray-scale image. For Feature vector construction local features are computed using SIFT algorithm and global features such as are computed based on the intensity value of images. After extracting features vector is constructed using local and global features of images [3]. This proposed method is applied on set of six 2D images.

Img. 1

Img. 2

Img. 3

Img. 4

Img. 5

Img. 6

II.PRE-PROCESSING

Pre-processing is a process of removing noise, color conversion, background subtraction, edge detection etc. Pre-processing is the first stage of object recognition. In this phase the given color image is converted into gray-scale image and resized into the standard resolution 128 x 128. After converting into gray-scale image noise reduction technique is applied to remove noise.

RGB to Gray-scale conversion: In this phase, first color image is taken as input image and converted into gray-scale image.

Original Image

Gray-scale Image

III. FEATURE EXTRACTION

Feature extraction is a process of computing important features from the image used in recognition. The main objective of the feature extraction is to extract the important and optimal features for the recognition process and the classification accuracy is based on the features extracted from the image [6].

1. Local Feature Extraction: A local feature describes patches, corners, blobs within an image which is robust. There are various methods such as SIFT, SURF FAST, Harris, corner detector, GLCM, MSER, BRISK, FREAK, HOG descriptors are used to extracts local properties. In object recognition, the interest point, corrners, blobs are considered as local feature [5]. In this paper SIFT method is used to extract local features of image. The SIFT (Scale Invariant Feature Transform) features proposed by Lowe, uses local maxima of the difference-of-Gaussians function

as interest points and histograms of gradient orientations calculated as the descriptors[1]. SIFT computes key points of images.

Local features that are computed from the image are given below:

Magnitude of Key Points: Magnitude of key points describes dimension of key points. SIFT computes key points of images and then calculate magnitude of key points.

Orientation of Key Points: Orientation of key points describes location of key points. After finding key points SIFT computes the location of key points.

2. Global Feature Extraction: The global features describe the whole image. The global features should be insensitive to shift changes and noise, easy to calculate, and take a small intra-class variance and a large inter-class variance. Generally human beings recognize real world object by their shapes. Shape feature extraction can be broadly divided into two groups: Contour based and Region based.

The contour based method calculates shape features only from the boundary of the shape and region method extracts features from the whole image [1]. Texture is an important feature that is measured from a group of pixels. Texture feature is classified into spatial texture feature extraction methods and spectral texture feature extraction methods. In contour based approach, texture features are extracted by calculating the pixel values whereas in region based approach, an image is transformed and calculate features from transformed image.

Global features that are extracted from images are given below:

Mean: The mean is defined as the average of the numbers.

Variance: Variance is calculated by taking the differences between each number in the set and the mean, squaring the differences (to make them positive) and dividing the sum of the squares by the number of values in the set. It is the square root of the Variance.

Median: The median is also the number that is halfway into the set. The median of a finite list of numbers is calculated by arranging all the observations from lowest value to highest value and picking the middle one.

Standard Deviation: The Standard Deviation is used to quantify the amount of dispersion of data set values. It is the square root of the Variance.

IV. FEATURE VECTOR CONSTRUCTION

Generally features are categorized into two categories: local features and global features. The local features are extracted from a part of the image and global features are calculated from the entire image. Feature vector is defined as a collection of important features extracted from an object. The feature vector contains number of values calculated from the entire image or from a patch of the image (i.e., region of interest) [5].

V. PROPOSED ALGORITHM

The proposed method basically works to construct the feature vector using local and global features of an image used in object recognition. It reduces dimensionality reduction. The steps of presented algorithm are:

1. The color image is used as an input image.
2. First, the color image is converted into a gray-scale image.
3. Extract local features of Gray-scale image by SIFT feature extraction method.
4. Extract global features of gray-scale image based on intensity values of Gray-scale image.
5. Construct feature vector using local and global features of gray-scale image.

VI. EXPERIMENT AND RESULT DISCUSSION

To experiment the proposed Feature Extraction Technique, 6 images are taken. The local and global feature extraction of 6 sample images namely 1gray, 2gray, 3gray, 4gray, 5gray and 6gray are shown in figures. The following figures show the step by step procedure and the results of proposed feature extraction method.

Figure 1. Original Image

Figure 2. Gray-scale Image

Fig. 2 shows a gray-scale image obtained from the original image. After converting into gray image compute local and global features of an image. First, apply SIFT to compute local features.

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Figure 3. Image with Key Points mapped on to it

Fig.3 shows local features of gray image. It shows the key points of an image mapped on to it and compute magnitude and orientation of key points as local features of gray image. Then, compute global features such as mean, median, variance, standard deviation of gray image. Fig.4 shows the values of global features of gray image.

```
Command Window
>> Var_std_mean_med

totmean =

   19.2456


totvar =

   62.9619


totstd =

    7.9349


totmedian =

    1
```

Figure 4. Global feature extraction

```
Command Window
>> FV

V =

  Columns 1 through 4

  -0.1098            -0.3779 + 0.1827i  -0.3779 - 0.1827i  -0.0166
  -0.4776             0.0706 - 0.1153i   0.0706 + 0.1153i  -0.1337
  -0.3905             0.3434 - 0.2904i   0.3434 + 0.2904i   0.8826
  -0.4508             0.4740 - 0.0757i   0.4740 + 0.0757i   0.1084
  -0.4261            -0.0627 - 0.2954i  -0.0627 + 0.2954i   0.4140
  -0.4718             0.5307             0.5307            -0.1407

  Columns 5 through 6

   0.0473            -0.0001
   0.0106            -0.0003
  -0.6285             0.0056
  -0.0481             0.0002
   0.7606            -0.7091
  -0.1477             0.7051
```

Figure 5. Feature Vector

```
D =

  1.0e+02 *

  Columns 1 through 4

   3.7072         0                  0                  0
        0   -0.1443 + 0.1357i         0                  0
        0         0            -0.1443 - 0.1357i         0
        0         0                  0             0.0635
        0         0                  0                  0
        0         0                  0                  0

  Columns 5 through 6

        0         0
        0         0
        0         0
        0         0
  -0.0108         0
        0   -0.0000
```

Figure 6. Feature Vector

Table 1. Local Features for different 2D images using SIFT Technique

Image Name	Local Features(Using SIFT Technique)	
	Magnitude of Key Points	Orientation of key Points
1gray	5.5575	5.5575
2gray	4.4300	4.4381
3gray	4.7339	4.7343
4gray	3.2504	3.2509
5gray	3.8660	3.8660
6gray	3.1323	3.1324

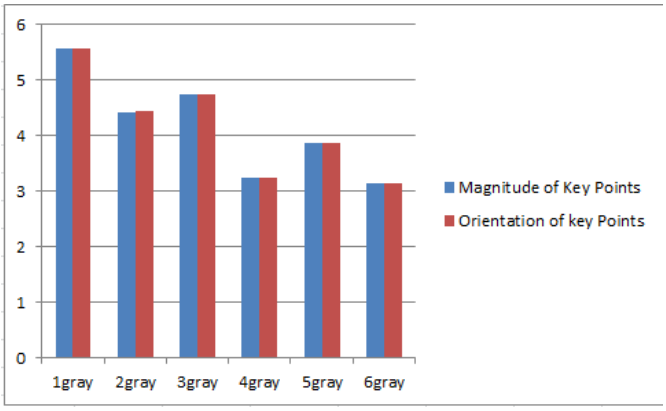

Figure 7. Bar graph of Table 1

Table 2. Global Features for different 2D images

Image Name	Global Features			
	Mean	Variance	Standard deviation	Median
1gray	19.2456	62.9619	7.9349	1
2gray	210.8753	182.0162	13.4913	128
3gray	201.0863	118.2829	10.8758	128
4gray	221.7125	161.6255	12.7132	128
5gray	191.2141	148.7275	12.1954	128
6gray	229.6059	175.8554	13.2610	128

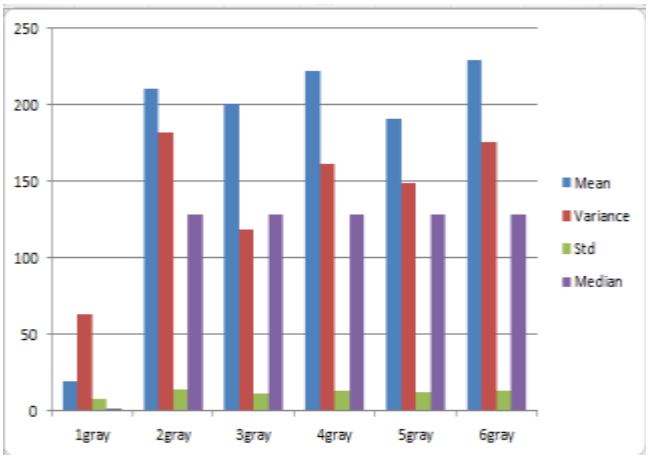

Figure 8. Bar graph of Table 2

VII. CONCLUSION AND FUTURE WORK

The main aim of this research paper is to construct feature vector using proposed method. Feature Vector also used as dimensionality reduction. It can further used in 2D object recognition. It can also use to improve the recognition accuracy by reducing dimensionality.

VIII. REFERENCES

[1] Pon Sangeetha S., "*Fusion of Local and Global Iris Features to Construct Feature Vector Using Genetic Algorithm*", International Journal of Computer Science and Information Technologies, Vol. 6 (2), 2015, 1486-1489.

[2] Dr. Muralidharan R., "*Object Recognition Using K-Nearest Neighbor Supported By Eigen Value Generated From the Features of an Image*", International Journal of Innovative Research in Computer and Communication Engineering, Vol. 2, Issue 8, August 2014.

[3] Murlidharan R., Chandrasekar C., "*Two-Dimensional Object Recognition using SVM_KNN Augmented by Local and Global feature*"International Journal of Computational Intelligence and Informatics. Vol. 1: No.4, January-March 2012.

[4] Muralidharan R., Dr. Chandrasekar C., "*Object Recognition using SVM-KNN based on Geometric Moment Invariant*", International Journal of Computer Trends and Technology- July to Aug Issue, 2011.

[5] Muralidharan R., Chandrasekar C., "*3D Object Recognition using Multiclass Support Vector Machine-K-Nearest Neighbor Supported by Local and Global Feature*", Journal of Computer Science 8 (8): 1380-1388, 2012.

[6] Dr. Muralidharan R., Uthiramoorthy A., "*Object Recognition from an Image through Features Extracted from Segmented Image*", International Journal of Advanced Research in Computer Science and Software Engineering, Vol. 4, Issue 12, December 2014.

[7] Ananthashayana V. K, Asha V., "*Appearance Based 3D Object Recognition Using IPCA-ICA*", The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences. Vol. XXXVII. Part B1, Beijing, pp. 1083 – 1089, 2008.

[8] Wenqing Chen, Leibo Yao, Jianzhong Zhou, Hongzheng Dong, "*A Fast Geometry Figure Recognition Algorithm Based on Edge Pixel Point Eigenvalues*", Proceedings of the Third International Symposium on Computer Science and Computational Technology Jiaozuo, P. R. China, 14-15, August 2010, pp. 297-300.