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Ultrasound Medical Image Representation For Systematic Learning

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Abstract— Ultrasound screened image is the output screen of ultrasound device. The nature of ultrasound screened image is noisy. These images are produced by sound waves by scanning inside the body. High - Frequency sound waves in the range 1 MHZ to 15 MHZ transmitted from the probe passed through gel to the body and output is produced. Though the technology is improved by detecting the kind of input image format, Ultrasound medical images have a high impact over natural color images since the pixel values range similar. The objective of the article is differentiating computer generated medical images among the collection of images in a dataset. Most of the research approaches have modeled images by its features and detecting it with several images. However, with advance growth in technology, the image quality is better in dimensional effects and thus visually differentiating the images is a significant task. A systematic filtering group of images is the ultimate aim of the work. A number of computer generated medical image in excess of the dataset and the approach starts compares the given digital image to store medical images in the form of key metrics. The values are used to identify medical images. The proposed method has achieved up to 95% of accuracy in identifying ultrasound medical images.

Keywords— Systematic approach, natural image, medical image, classifier, matrix.

I. INTRODUCTION

In the technical world, computerized processing is the key area over every feature detection. Such progressive calculation for every future predicting is processed by a computer system. Likewise, the medical images are stored as stack. While processing with ultrasound breast cancer image, the input given to the tool should accept only medical images. The difference between the photographic images and medical images is learned by the system, which progress constantly in identifying the matrix values of the images.

In addition to the software and hardware development of capturing an image arising with high quality, a system should accurately differentiate those natural images taken by digital cameras, mobile cameras or sensors with any computer based equipments. Although, image capturing with a computer system is low in quality, a tool which splits out the images other than computer based screening is an important task in current era. Many graphical software tools with 3D effects are proving to have high performance software.

Graphic representation of various scientific applications emerged with representing the real world objects as well as the computer-screened objects into high degree visualizing power. However, certain principles arrives in difficulty over computer generated images and real world photographs. In this research, certain ideas and techniques is implemented to classify between the medical image generated by screening tool and the real world objects.

Several researchers have come through the concept with the characteristics of the human power to classify the images [1]. A set of complex images is given as input and it separates the image with low accuracy rate as computer captured images. Specific characters such as edges, colors, objects are also the part of image differentiation.

If the captured images have a reliable mark and it is indicated by the source camera, prediction of computer image and natural images can be easily found [1]. Nevertheless, the hardware equipments for screening, medical images have not with this character. An intrusive approach for classification should be generated.

For differentiating medical images from natural images, the complex approach is chosen from human visual eye [2]. Using this stimulation, it is used to identify the visual features to distinguish generated images. This approach gives the relevant features of the same images and classifying the training images.

The key idea of the proposed work is training a large number of medical images and is stored in the data set. A key matrix is generated for all the trained image.

The rest of the article is Section II contains the related work carried out by several researchers; Section III contain the methodology for classifying the result. Section IV explain the working procedure of the proposed workload. Section V deals with the results obtained and a brief discussion over it. Finally, Section VI concludes with certain remarks and suggestions for future effort.

II. Related Work

The classification and identification of two different images are based on extraction of features and obtained characteristics. Several methods have emerged with identification of computer-generated images. Among large databases, only medical images are classified and the methodologies used for classification are discussed below.

Lyu e Farid [1] proposed a new methodology for distinguishing computer screened images and environmental images. The wavelet coefficients of natural images are characterized by classifying zero and peak values, and orientations along with color channels. The feature vector is classified and each coefficient for each color channel and obtained a set of 216 statistics. The authors found the accuracy of 54.6% and 66.8% with SVM classifier.

T. Pouli [4] followed a methodology with predicts 78 features from a color component and processed by 78 x 3 dimensional ratio with use of Hue Saturation and Value (HSV) color value. The characteristics perform the wavelet transformation and the coefficient and errors are associated with certain estimate.

Dirik et al [5] also projected a method based on the color properties applied to digital images. The reflexive wavelength of the incident light is calculated for differentiating the images. The data are used for classification based on SVM classifier and the result obtained for classifying the computer generated medical images are about 98.1% and 89.3%. The wavelet features are resulting in an accuracy of 99%. The authors also proposed that to classify an image as PG, it is sufficient to identify a color outburst process.

Li et al. [7] Proposed a new method which implements the use of wavelet decomposition and used HSV color space. The images are classified as original and reduced one. The variance and kurtosis statistics are calculated on the original image. For each scale, RGB color channel and orientation, two statistics from the matrix differentiation and provides the total number of 144 characteristics.

Peng et al [6] proposed a method for differentiating real world images and computer generated images using hybrid features. The statistical features and hybrid features are extracted and histogram calculation of grayscale images is evaluated. The visual images are preprocessed with the Gaussian filter and the images prior to the computation of Photo Response Nonuniformity noise (PRNU) through wavelet based denoising filter and its physical feature are characterized with enhanced PRNU. The SVM classifier achieved an accuracy of 97.3% of computer-generated images.

Farid [8] chosen a way to detect different types of images based on different models of camera. A sample block of pixel with color channel will represent a different correlation pattern. The authors compute the probability that every interpolated image belongs to any one of learned images. The result obtained is classified as 97% accuracy in identification of interpolation models using the LDA classifier.

III. Methodology

It is noted that the problem over existing systems for differentiating computer generated medical images with real world images is crucial in prediction also accuracy over predicting is less in nature. Thus, a new methodology proposed which overcome the existing methods.

(A) Primary details of computerized medical image Vs Natural Image:

Medical images are in the form of noisy because it is the images of human, screened symptoms. The quality of the image is also has weakest intensity since the device which sense the human part in a closed room using artificial lights focused on it. Whereas the natural image is very different from medical images with several characters. The main objective of this article is to make a computer system to learn the difference computer generated medical images i.e. Screened medical images and natural images.

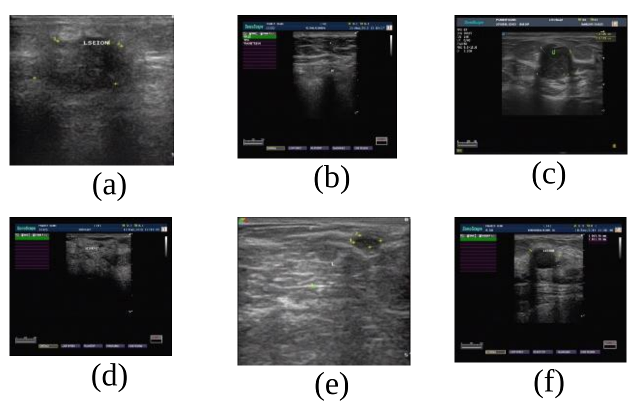

Figure.1.Ultrasound Screened breast tumor images

The intensity pixel values of computerized medical images having maximum in the range 50 to 150. In addition, the medical images are a collection of weakest pixel values.

Ultrasound images are the initial screen image that states the basic characteristic of the disease.

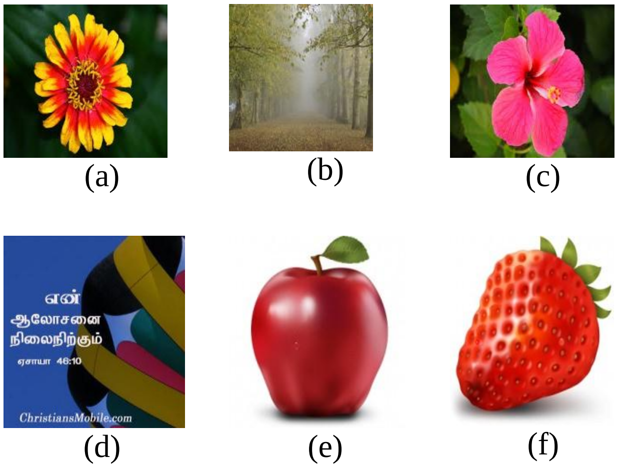

Figure. 2. Training natural images.

The intensity values of natural images range from 200-pixel value. The pixel value 0 is weakest intensity, which is the black color, and pixel value 255 is strong intensity, which is white in color. All kinds of natural images are of strong intensity values, thus a systematic approach for differentiating between computerized images and natural images is starting from this basic initiative.

Consider, f (x, y) is the intensity of a pixel value in an image. If an image is a color image, then the values are in RGB format. The pixel values range from R (0 to 255), G (0 to 255), and B (0 to 255). The key matrix is formed by subtracting the pixel values of two medical images.

Thus, $Z(x, y) = X(x, y) - Y(x, y)$.......................... (1)

Where, X(x, y) is the pixel value of a first medical image,

Y(x, y) is the pixel value of a second medical image.

The resultant matrix is,

$$Z(x,y) = \sum_{k=0}^{255} (X(x,y) - Y(x,y)) \text{ .... (2)}$$

The values are collected as 12 X 11 key matrixes. This matrix is mapped towards the original key matrix and medical images are filtered.

Implementation methods:

The analyzed possibility of key matrix is the classifier towards solving the basic idea of computer-generated images with natural images. The features obtained from different images bring together the common features of all. To do so the only constraints involved in it are the images should be of the same category.

The combinational idea of key factor for feature extraction to get better classification id shown below:

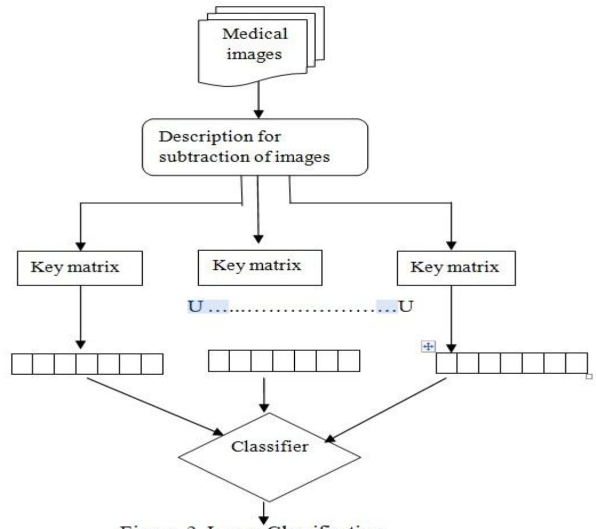

Figure. 3. Image Classification

Classification:

Among a group of images, the proposed system separates computer-generated images (CI) and natural images (NI) for each k classified key matrix. If the resultant training matrix has the same value or absolute values of the key matrix, then the images are classified as CI otherwise if the training values are more than the key matrix values, is identified as NI. Implementation of this system has a powerful response since its accuracy would be 100%.

Let p (m) be the output image of the classifier in an image m and it can be defined as,

$$P(m) = \begin{cases} +1, & \text{if m is of class CI} \\ -1, & \text{if m is of class NI} \end{cases} \text{ .... (3)}$$

The rule for classifying is expressed as,

$$R = \begin{cases} \text{CI}, & \text{if } \Sigma\, p(m) < key_i \\ \text{NI}, & \text{if } \Sigma\, p(m) > key_i \\ \text{Unidentified, otherwise} & \end{cases} \text{ .... (4)}$$

Algorithm

{

Input // Training matrix of images.

Definition // Each training matrix is compared with key matrix.

Output // Classified output of computer generated images and natural image.

For I = 1 to n

Sub= image 1 – image 2

Check if sub resists within the key matrix

Return sub

IV. Results and Discussion

The following table shows the appearance of training matrix, which is compare3d with the key metrics.

Table 1. Accurate representation of training matrix

Training Matrix	Accuracy		Variance		Average Accuracy
	Computer generated Images	Natural Images	Computer generated Images	Natural Images	
M1	0.910	0.893	5.43E-04	8.72E-04	0.901
M2	0.878	0.812	5.10E-04	8.42E-04	0.845
M3	0.947	0.900	5.61E-04	4.36E-04	0.923
M4	0.960	0.959	4.45E-04	7.34E-04	0.959
M5	0.921	0.949	5.33E-04	8.26E-04	0.935

V. Conclusion and Future Scope

In this context, medical images and natural images are an important form of communication. The differentiation of any object is clearly distinguished with the help of our eye. However, the same time, processing in a computer system with a mathematical logic is simple but to specifically pick up only the computer generated screened medical images among a large data set is complex in nature. Most of the existing system does not provide accurate results for predicting only computer-generated images.

By overcoming the limitations, the logic of proposed methodology works with high priority to the theme of the research.

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Authors Profile

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