Bio medical image retrieval using support vector machine

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Abstract. Bio Medical Image Detection is done by using the Image retrieval method. It analyzes the contents of the image rather than the metadata associated with the image. Here the input image passes through a series of tasks which is the classification task. A classification task involves with training and testing of data. For proper training and testing of data, SVM can be used. The goal of SVM is to produce a model which predicts target value of data instances in the testing set which are given as attributes. Actually, this work can provide the result values by doing the retrieving the medical image in high resolution. This work introduces the detection of medical images using Support Vector Machine.

Keywords: Support vector machine, Extraction, Machine Learning

INTRODUCTION

Today, one of the mostly seen disease in women is Breast Cancer. It is circulated different countries of all over the world. Mammography is a kind of low-powered X-ray diagnosis approach for detection and diagnosis of cancer diseases early [1]. The entire work focuses on to extract features from such type of medical images such as mammogram images, lungs, brain etc. Here I used to provide detection of the image of lungs. There are some phases of detection of tumor: image detection, image color feature extraction using histogram, extraction of features from medical images, classification using Support Vector Machine (SVM) classifier. Image detection is basically done by using SIFT detectors Then extraction of features is done from the images.

This work is based on Content Based Image Retrieval. It reduces or avoid the problem of searching images in large databases and this is helpful for the medical field. CBIR can be done on different features such as color, texture, shape etc. For color feature, it used color histogram. Color difference histogram and color correlograms to retrieve the content in the image. For texture features, it works by adopting the several texture methods in this feature. The method that always been used are statistical and signal processing method. And many other methods are applicable. For shape features, it retrieves the content by compare the edge density of each shape in the image. Several methods have been used such as edge points Orientation model and edge points distance model. Similarity measures is conducted to measuring the similarity and differences between each method and each feature. Besides, it also can be used to define which is most efficient to be implemented for retri eving image.

MACHINE LEARNING

In machine learning, the input to the computer are the data and the output and the result from the computer is the program. Machine learning is a subset of AI techniques which use statistical methods to enable machines to perform with experiences. Here, support vector machines are a unit of supervised learning models with associated learning algorithms that analyze data and acknowledge patterns. These are used for classification and statistical procedure. The learning algorithms used in machine learning are Supervised learning, Unsupervised learning and Reinforcement learning.

Supervised learning techniques included with Naïve Bayes, k-nearest neighbours (kNN), SMO as base classifiers, random a decision tree as a base classifier, boosting with Naïve Bayes, kNN and, and voting by all single classifiers using as a combination rule, as well as five single classification strategies: kNN, Naïve Bayes, random tree and sequential minimal optimization algorithm for training support vector machines. Unsupervised learning uses k-means algorithms [2]. In Supervised learning, the output labels have to be learnt earlier. Machine is trained with pre data and the output to learn with hidden pattern, which can be for predictive analysis. In Unsupervised learning, output labels are not known earlier. Machine is fresh which is not used to train any data. Its main function is clustering. In reinforcement learning, machine is used for decision making. The learning is based on reward and punishment policy. It is used for making decisions in problems .This is a technique to maximize reward. Here by using machine learning technique, the data are trained. only less time is needed to train data. In this work target variable not available. So clustering is required [3]. Thus, the Unsupervised machine learning with clustering, probability distribution, finding association and dimension reduction.

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SUPPORT VECTOR MACHINE

Support Vector machine is a linear classifier. The main idea behind the SVM is the classification, so before classify separation should be achieved. The separation is achieved by the hyper plane that has the largest distance to the nearest data of any class, since usually the larger the margin the lower the generalization error of the classifier. Suppose there is a classification between positive and negative samples using a hyperplane. The central line is the hyperplane. Apart from hyperplane two margin lines, which are equal distance from the hyperplane in both sides are required. So, the margins are parallel to the hyperplane. When creating the margin lines make sure that it passes through the nearest positive point and make sure that the margin line in the negative area will passes through the nearest negative point. The distance between the two margin lines is the marginal distance. The hyperplane with the maximum margin distance is called optimal separating hyperplane or SVM. The datapoints that lie closest to the optimal separating hyperplane is the support vectors. The hyperplane here act as a cushion for dividing the positive and negative line in a better way. So, there should be a hyperplane to separate data linearly, without the hyperplane the data cannot be linearly separable [4]. This is the geographical intuition of SVM.

SVM for Classification

SVMs may also be applied to regression issues by the introduction of another loss perform [5]. The regression is linear and non-linear. If linear combinations of coefficients in the model given,call it linear model. Weights are the coefficients in regression model. w1x1+w2x2+…. +wnxn=y, where w is the weight and x and y are variables. So if the linear combinations of weights in the model, call it linear model. Classification issue is a non- linear model. A non-linear model is the logistic regression. Now weights are in an exponent value for z, the z (output of logistic regression) is not linear combination of weights, therefore NON-linear. The kernel approach is used to deal with the curse of spatial property. Within the regression methodology square measure issues supported previous information of the matter and also the distribution of the noise.

Classification in SVM is an associate degree of supervised Learning. A step in SVM classification involves identification [6] as that square measure done to the identified categories. This is actually the term feature choice or feature extraction. “Fig1” shows the input image, The proposed technique was applied to detect the boundaries in several types of images

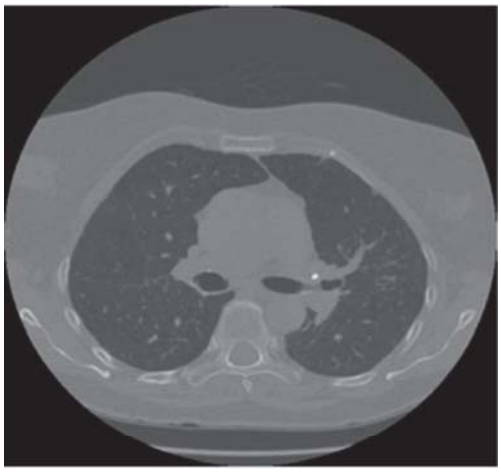

FIGURE 1. Input Image

Detect Key-points: SIFT (Scale Invariant Feature Transform) Detector

SIFT detector is introduced by David Lowe, which is the most important detector used in the area of computer vision. It transforms image data into scale invariant coordinates, invariance to image scale and rotation[7]. Its robustness to affine distortion and change in 3D viewpoint. SIFT descriptors are extracted from an image in two steps. First, a detection step locates points that are identifiable from different views. Second, these locations are described by a descriptor that is distinctive yet invariant to viewpoint and illumination. For stability, it is not sufficient to reject keypoints with low contrast. The difference-of-Gaussian function will have

a strong response along edges, even if the location along the edge is poorly determined and therefore unstable to small amounts of noise. By assigning a consistent orientation to each keypoint based on local image properties, the keypoint descriptor can be represented relative to this orientation and therefore achieve invariance to image rotation [8]. These operations assigned an image location, orientation and scale to each keypoint. After that descriptor representation and descriptor testing has to be done.

Detection stage passes through two elements, a training phase and a testing phase. In training phase, database images are selected and extract the colors means Red, Green and Blue. From all those images preserving colors generate into a feature matrix. At the testing phase it read the query images and extract the color means of RGB and generate feature vector. Finally calculate the distance between official database and feature database [9]. And finally assign the label. The input to the testing half could be a learned model and moreover the output of the testing half is the predicted classes for the pixels supporting their choices. "Fig2" shows the image after the detection process, the proposed technique's performances were evaluated by comparing with other methods.

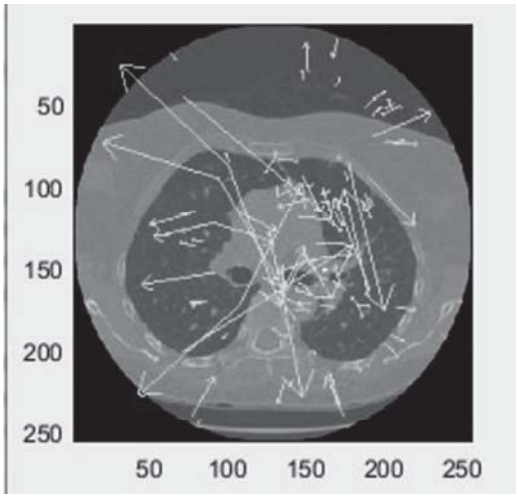

FIGURE 2. Sift Detector

Feature Extraction

In feature Extraction, the features of an image can be extracted by its content like color, texture, shape, position, dominant edges of image items and regions etc. Here creates histogram for query image also and find all the 256 values of pixel. Less distance means more similarity. Here two problems need to be resolved. First one is dimensionality curve in which each of image is having large number of dimensions or 256 color features. Another one is crosstalk, which leads to more time complexity.

First, we have to reduce the number of features. So, to extract features of an image instead of creating histogram, we will use the concept of RGB colors. Each pixel color can be formed with particular percentage mixture of Red, Blue and Green color. Take average of all the red color values of all the pixels, Likewise the average values of blue and green has to be taken for all the pixels. Hence the dimensionality curve problem and the crosstalk problems are solved. Homogeneous Texture Descriptors compliant with the MPEG-7 Multimedia Content Description Interface are extracted using banks of Gabor filters tuned to five scales and six orientations and Color histogram features are computed in three color spaces: RGB, hue lightness saturation (HLS), and CIE Lab, which does not represent real color, it is a combination of two colors. The formulation is based on a Gaussian scale-space representation of the hyperspectral data cube, and the use of a principal components decomposition to combine information efficiently across spectral bands. A spectral distance measure is used to characterize spatial relations between neighboring hyperspectral pixels [10]. In this example the color histogram is not working since the image is not a color image." Fig3" shows the output after the features extracted. Feature Extraction does the scale-space extrema detection, which detect the points. View point localization , orientation assignment which provides the angle direction, and finally the keypoint description which convert the features into representation.

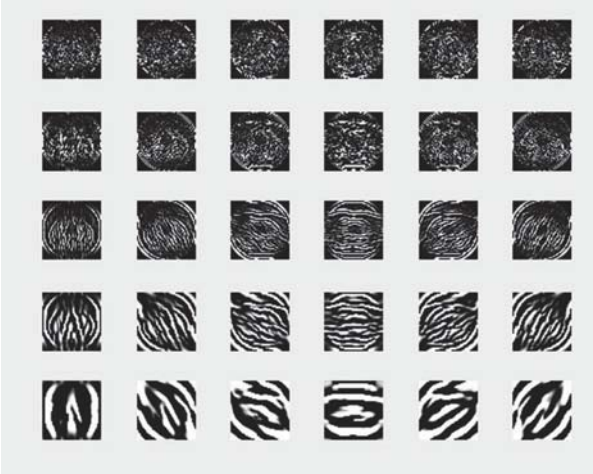

FIGURE 3. Feature Extraction

BOVW (Bag of Visual Words) Representation

Bag of Visual words works on the principle of Bag of Words where the frequency or occurrence of any word in a document is calculated. Likewise, descriptors we can cluster the things. This is the sub- sampling process. It is not a random sub-sampling. A Methodology which is K-means clustering can be applied. It is an unsupervised learning. The methodology of classification separates the things having similar feature values into one group. This separation of similar feature value things into group is the clustering. A classifier is used to achieve this process. Here a decision is making based on the classification which supports the Euclidean distance. A Euclidean space has some number of real-valued dimensions and dense points [11]. There is a notion of average of two points. This distance calculation is based on the properties of points, but not their location in a space. In this technique, image is considered as sentence or group of words and test image, which is being classified is considered as document. Later according to frequency or occurrence of the visual words, that image is classified. Apply standard k-means clustering to a large number of SIFT [12] descriptors to create a dictionary of visual words or codebook. "Fig4" provides the result.

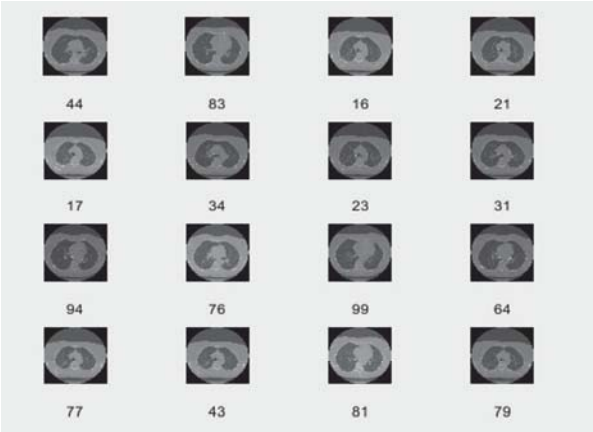

FIGURE 4. Proposed Multi SVM Output

CONCLUSION

Our proposed method will provide the better result than the existing method. This work investigates support vector machine for medical image retrieval. The experimental results show that the proposed method is able to optimize both feature selection and the SVM parameters for the breast cancer tumor detection. putting the tumor mask on dilated brain MR image, the final image will obtain with detected tumor.

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