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Identifying affected tissues in Histopathological image

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Abstract- Cancer is uncontrolled multiplication of group of cells in a particular location of the body. It increases the death rate of human being. Cancer affects the tissue by two ways preinvasive and invasive also known as benign and malignant. In this paper it deals with, whether the tissue is affected by benign or not. It is carried out using image processing techniques. Scale invariant feature transform algorithm is used for finding the key points and descriptors in tissue images. This algorithm is used to satisfy scale invariant, rotation invariant and orientation invariant in which the image rotates or shrinks, it retrieves the same key points of the image. The image is then converted into binary format and stored in the hash table in order to reduce the memory size using binarization technique. Finally the accurate classification and retrieval of the similar images from the database is done by using content based image retrieval technique.

Key words- preinvasive, invasive, key points, descriptors.

1. Introduction

One of the most dangerous diseases in women is Breast cancer, which causes higher death rates than any other cancers. According to statistics recorded by U.S in 2011, 39520 cases were found to be dead due to breast cancer among women. However death rates can be decreased by treatment advances, increased awareness, and early detection.

Mainly cancer is affected in the tissue by two ways. First is pre invasive is also known as benign. It does not invade into surrounding. It does not affect the surrounding tissues. The one which grows rapidly and affects the surrounding tissue is called malignant.

Histopathological images identified by using various image processing techniques. Histopathology deals with study of the microscopic structure of cells and tissues of organisms. Also used to study and analyze histological image under microscope, to identify the cancer. Pathologists identify the affected tissues using morphological (erosion and dilation) characteristics of tissue.

The biopsy sample is processed and its sections are placed on glass slides to observe them under microscope for analysis. The tissues or cells are studied by pathologist using different magnification levels such as 10X, 20X, 40X, 100X etc under microscope.

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A benign is a mass of cells that lacks the ability to invade neighboring tissue or metastasize. When compared to malignant tumors benign tumors have slower growth rate. These type 1 tumors are covered with outer fibrous sheath of connective tissue or they remain with the epithelium.

Benign tumors will produce negative health effects even though they do not metastasize or locally invade tissues. The negative health effects caused by the growth of benign tumors are nerve damage, reduction of blood in the body. The mass effect of tumors is noted, if the tumor is within a bounded space it leads to cranium, respiratory tract, sinus or inside bones. If these cells are well differentiated the tumors present in the endocrine tissues may produce in excess certain hormones. Examples are thyroid adenomas and adrenocortical adenomas.

Most benign tumors are not life-threatening, but due to rapid growth of tumors it will become Malignant. Some of the benign tumors are removed by surgery.

2. Related work

Studies conducted by Xiaofan Zhang, weiliu, Muratdundar, Sunil Badve, Shaoting Zhang on Classifying the benign and malignant of breast cancer tissue using kernalized and supervised hashing method.[1]

Karthikeyanganesan,U.RajendraAcharya ,Chuakuangchua, Choominlim and Thomas Abraham.k used breast scan images and identified one class classification pipeline which classified the image into benign and malignant. Classification pipeline using GMMs was tested on a set of 313 mammograms and accuracy rate of 92.48% was obtained[2]

Shen-Chuan Tai, Wei-ting tasi, Zih-siouchen analyzed the breast images through visual fatigue which miss produced only 10%-30% of approximate result. To reduce this using automatic CAD system for mammographic mass detection.[3]

Leon kanelovitch, yaakovItzchak, ArieRundstein, Mirisklair, hedvaspitzer proposed Compression, expansion, enhancement of mammograms in fully automatic way. Companding the HDR mammography images into LDR mammography images.[4]

Mehdi Alilou, vassili Kovalev Detecting and Segmenting the immature cells found in peripheral blood. Utilizing flexible agents the segmentation process move and changes their shapes according to the cost function [5]

Brian kulis, KristenGrauman. Analysis Kernalized locality sensitive hashing algorithm to enables accurate and fast performance.[6]

Haticecinar Akakin and Metin.N.Gurcan used multilayer approach called CBIR system to classify and retrieve microscopic images to involve their specific subtypes, which are mostly difficult to differentiate and classify. The accuracy of image level retrieval about 38 and 26 percentage points for follicular and neuroblastoma diseases respectively. [7]

Junwang, Sanjiv Kumar, Shih-Fu chang using Semi Supervised hashing method that is formulated as minimizing the error on the labeled data. Similar samples are mapped using Localized Sensitive Hashing to the same bucket with high probability. Spectral Hashing is used to improve the efficiency of hashing.[8]

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Juan.ccaicedo, Angel cruz and Fabio A. Gonzalez. Developed Bag of features approach using an analogy have been proposed to classify natural scenes in which visual features are to images as words are to text document.[9]

3. Proposed Architecture

Various image processing techniques are used in proposed architecture which includes feature extraction, bag of features, classification and similarity matching. Histopathological image is used to analyze whether the tissue is affected by benign or not.

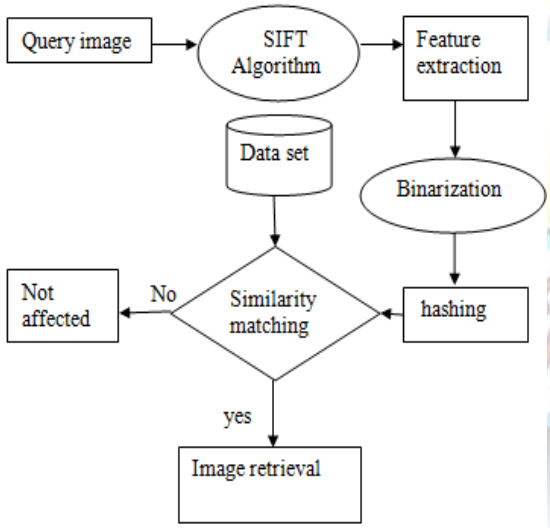

Figure 1: Proposed Architecture

Feature is extracting from the image then it is converted into binary form and stored in hash table the classification is done.

4. Implementation and results

Histopathological image is the tissue image. The feature is extracted by using scale invariant feature transform algorithm. Here image key points are extracted, whether the image rotate, shrinks it gives same key point and also description and location values are also obtained.

Key point descriptor has 128 values and location has 4 values. Each key point must satisfied descriptor and location values if it is not satisfied it gets eliminated. After analyzing key point it is converted into binary format using bag of features. Bag of features are converting the image into binary or text format. Then it is stored in the hashing table. Then the classification is done by using content based image retrieval method to identify whether the tissue is affected by benign or not.

Results obtained after implementation

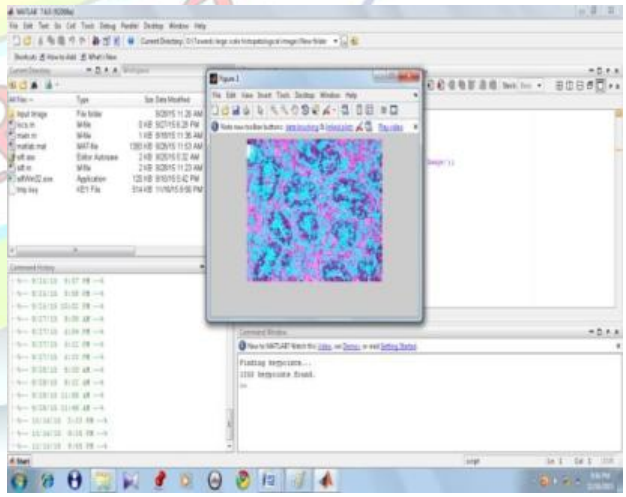

Figure 2: key points

Using Scale invariant feature transform algorithm in fig: 2 find the key points from the image. This algorithm identified the same key points whether the image rotate or shrink. The key points are marked by blue star. And it display how many key points found for each image.

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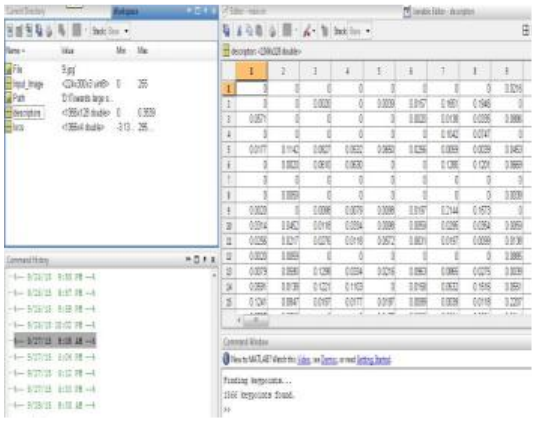

Figure 3: key point descriptor values

Key point descriptor value in fig: 3. For each key point it found the descriptor value. There are 4 x 4 = 16 histograms each with 8 bins the vector has 128 elements. Key point that cannot find descriptor value in 128 dimension then its get eliminate.

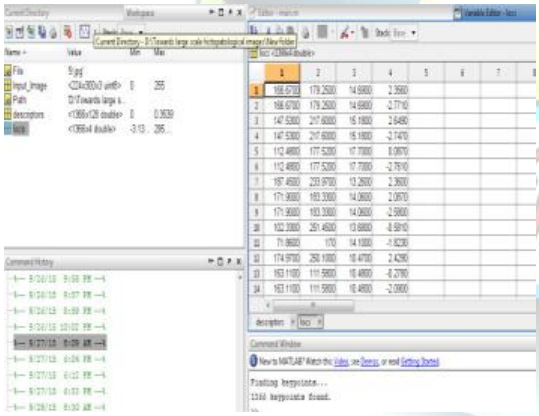

Figure 4: key point location values

Fig: 4 it displays the location for each key point. It should have four values (length, height, width, breath) if it does not has four values its get eliminate.

5. Conclusion and future work

To identify the benign cancer tissue in early stage to reduce the death rate of human beings, using image processing technique feature extraction, binarization, and classification. Feature extraction is done by scale invariant feature transform algorithm. Binarization and classification are done by bag of words and content based image retrieval technique. In future identify all types of diseases not only cancer using best algorithm.

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