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Review Paper on Different Methodology for Cancer Detection

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ABSTRACT

During five decades various researches were conducted for analysis of cancer data. Cancer is the collection of related diseases. Cancer can start almost anywhere in human body, i.e. made up with trillion of cells. The current Indian population is 1,270,272,105 (1.27 billion). Present cancer rate in India was 70-90 people on 100,000 of populations. Around 6% deaths are occurred in India are due to cancer which give 8% cancer global cancer fatality. Total of 4, 91,598 deaths are occurred in 2014.In this paper various techniques are designed for the detection & classification of cancer. The automatic computerized based systems used for the identification of the cancer region. Also classify the category of cancer with distinct classifying methods. These classifying methods are ANN, SMO, J48 weighted NB, SVM, MLP and K-NN.

Keywords:- Cancer recognition, Dataset, Image processing, Cancerous Images

I. INTRODUCTION

Human body contained more than millions of small units called as cells and these cells are arranged into organs and tissues. When these small units or cells becomes aged they become spoiled they should die, and new cells can grow and takes their positions. When this actual phenomenon of cells can resolved than cancer developed at that region. The new cells are formed at that time when they not required and the spoiled or damaged cells are lie at that time when they should die than such unexpected cells can expanding and due to their exploration cancer cell can be formed. Cancer is a composition of inflammation that comprise of unwanted cell that break into many and spreading to another organ of body Multiple variety of cancers are generates solid tumors and those tumors appear as masses of tissues. Blood cancer, like leukemia's, are generally not composing a hard tumor. Cancerous tumors that are spreading into the neighboring organs are called malignant or cancerous tumors.

In malignant cancer a few cancer cells multiply and transfer through blood to the distinct organs of human body and refined a new tumor at other organs. As per report of global cancer statistics in year 2012, 14.1 trillion patients were inspected and round8.2 trillion of deaths occurred from cancer on this year. Primary sources of cancers–drinking alcohol, shortage of body exercise, fatness, due to body infection such as hepatitis B and C, and 22% deaths are occurred due to use of Tobacco, an exposure of UV radiations and environmental pollution. Generally, various genetic changes are needed before promoting cancer. The main organs of body which are primarily affected by cancer are lungs, prostate, breast, brain, skin, rectum and colon. Types of cancers comprise of:

Carcinoma – This is the category of cancer which initially started in skin and tissues that wraps the internal organs.

Sarcoma –This is a class of cancer which firstly starts in supportive or connective tissues like blood vessels, bone, fat and cartilage.

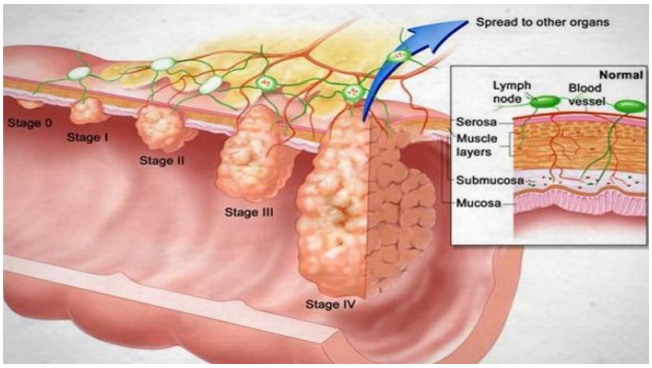

Fig. 1 Cancerous image

Leukemia – Leukemia cancer is starting in the tissues that forming blood-Like tissues of bone marrow. The leukemia cancer creates more abnormal blood cells.

Myeloma and lymphoma – This is a category of cancer which initiate in cells of immune system.

Brain tumor- This category of cancer also called as spinal cord cancer. In this paper the distinct types of approaches are used for identification of various forms of cancers.

II. BRAIN TUMOR DETECTION TECHNIQUES

An unwanted production of brain cell develop brain tumor. There are different categories of brain tumor such as malignant cancer and benign. Malignant are also called cancerous tumors and benign tumor are called as non-cancerous tumor. Cancerous tumor further divides into primary and secondary tumor. Primary tumor can initially started in brain & secondary tumor are spread to neighboring tissues or other organ of body and also called as metastasis tumor. According to Statistics, brain cancer is rapidly occurred and is developed about 22,850 new people per year.

A. Brain tumor detection using hybrid techniques and support vector machine.

Many techniques are used to identify the tumor as early as possible because early detection is healing of this disease.

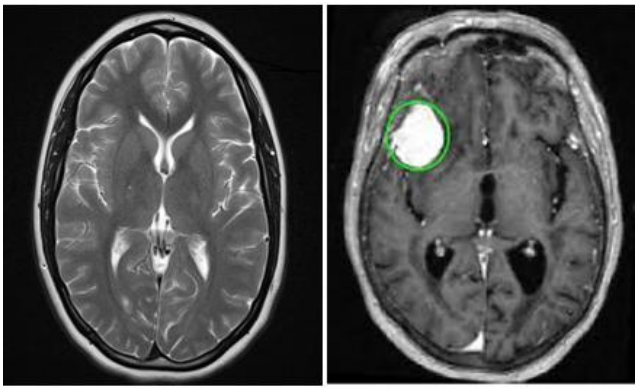

Fig. 2 Normal and Tumor MRI image

In the given paper MRI images of brain are used for the identification the brain neoplasm. In the given paper the feature selection is done by hybrid method. Here SVM & NB classifiers are used for identification of tumor and non tumor in the brain. Image distribution is completed by using fuzzy c_means segmentation Method. And GLCM is used as a feature. Two kind of transform are used. And these are wavelet and quadtree transform.

These two feature extracted images are combined together and is given to SVM algorithm for the classification of tumor in trained images. Including that NB classifier is also introduced for the given method. In SVM single and multilevel methods are used.

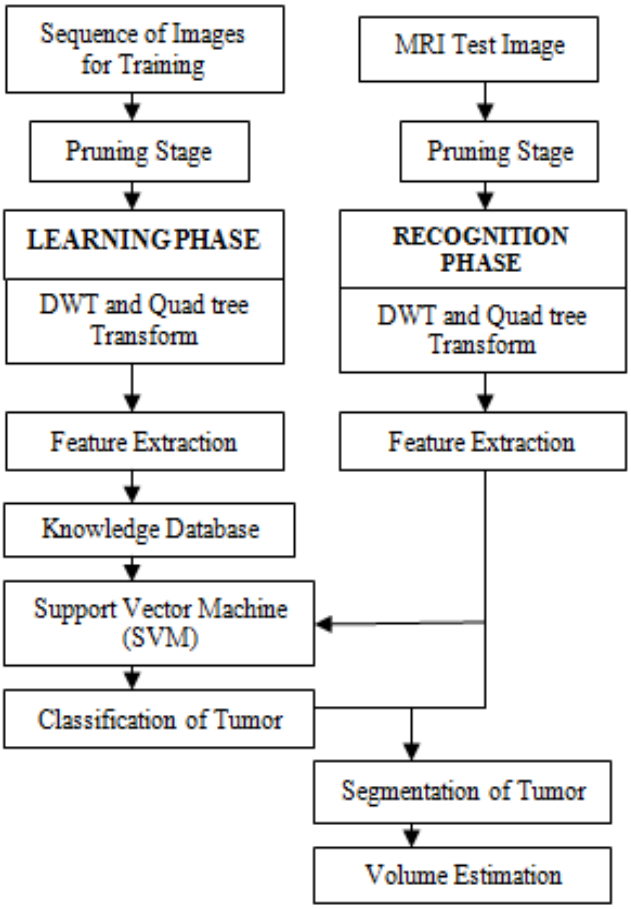

Fig. 3 Flow Diagram for proposed method

One more kind of method is used to classify a tumor. In a machine study naïve bayes classifiers is a group of simple probabilistic classifiers that depends upon Bayes theorem with strong (naive) ability presumption between the features. Then it will give to the FCM for segmentation. In the given paper receiver ROC graphs is used to visualizing the completion of the classifier. Prime advantage of these techniques is that it will give rapid and accurate outcomes with the help of training data set and it diminishes time and calculation power.

B. Detection of brain tumor by using ANN.

In this paper brain cancer is identified by using MRI images. Brain tumor is a menacing stroke of life. The system used computerized based methods to recognize the tumor blocks and classify the form of cancer by applying ANN in MRI images of distinct patients with astrocytoma form of brain tumors.

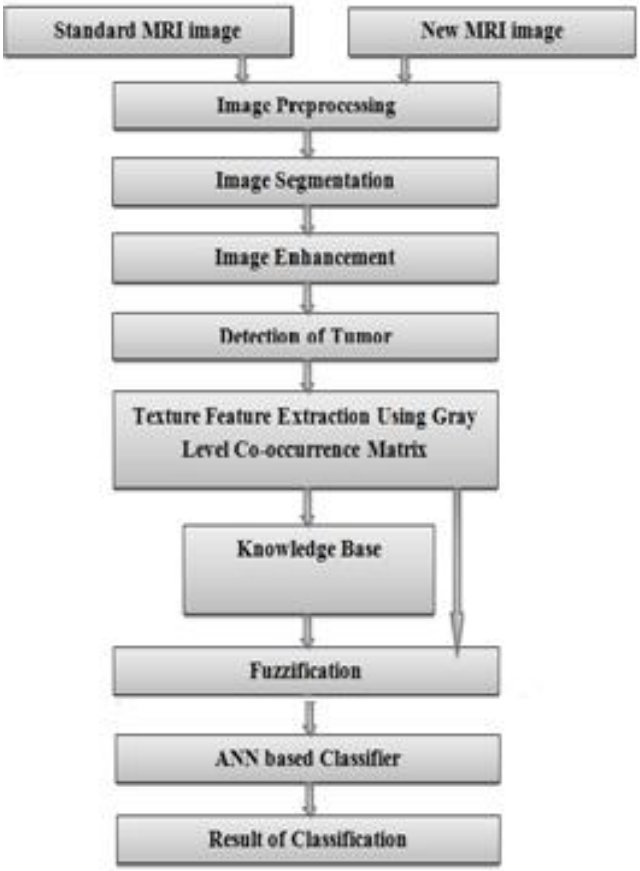

Fig. 4 Overall block diagram

The Image processing approaches such as image partitioning, image upgrading, histogram equalization and feature selection was proposed for the reorganization of the brain cancer. Here Neuro-fuzzy classifying technique is used to recognize the different forms of brain tumor. System extract the cancer region from the whole image using different image processing methods such as thresholding, histogram equalization, filtering and sharpening etc. Segmentation should be stop when edges of tumor are identified, and tumor extracted from the background. To assort between abnormal & normal brain tumor GLCM features method are applied.

ANN is an algorithm that is applied on distinct images because of that it will get the stated tumor. ANN used as a classifier resulting superior classification efficiency related to another classifiers. The specificity and accuracy and sensitivity are also upgraded.

C. Brain tumor detection using FCM and BPNN.

Magnetic Resonance images (MRI) and computer tomography images consist of inadmissible sound that creates by operator performance. And this inadmissible sound can calculate defects in classification. In the given paper, BPNN and fuzzy c_means two method are proposed for the recognition of brain cancer. The entire work is done in subsequent steps that are pre-processing and Decision Making.

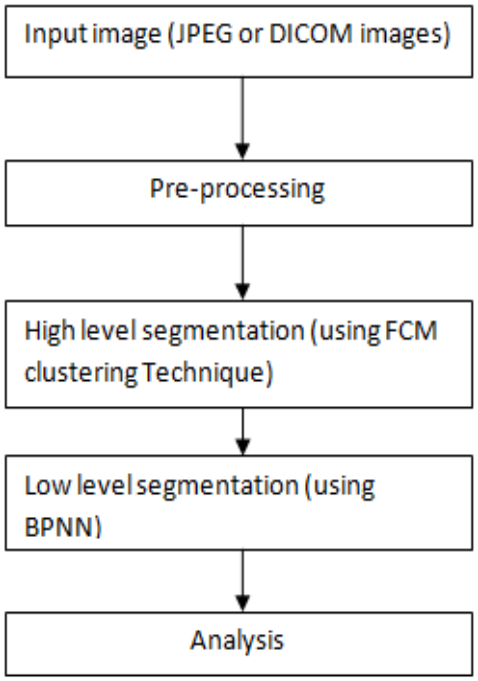

Fig. 5 Flow Diagram of proposed method

The Decision making step is done into two parts-one is high level segmentation that is completed by using fuzzy c_means and second is Low level segmentation that finished by using BPNN and then analysis is done. In the given paper, 25 brain tumor images are used to complete the calculation. The pre-processing of image includes the steps like image acquisition, filtration of the image,

finding negative image, adjusting the brightness of image, removable of noise etc. Partitioning of image could be used to search the object, confining of image, image alteration, or look-up image database. In the given paper for the segmentation of images Fuzzy c_means are proposed.

After partitioning of image, classification of brain cancer is completed by using the BPNN. Proposed technique are feasible and given its relative simplicity, it can be applied to the medical images at the instant of acquisition to provide many medical applications related with brain tumor & its category and the amount to which it is present because it has less PIXEL COUNT value, high MEAN value, less VOLUME value and less SD value.

III. LUNGS CANCER DETECTION TECHNIQUES

The lungs cancer is an unregulated expansion of tissues that initially start off one or both lungs; generally lung cancer initially occurred on cells that are responsible for breathing. If this growth of cell left untreated, than it increases behind the lungs and invade into neighboring tissue or any other organ of body by the phenomenon called metastasis.

D. Early detection of lung cancer using neural network techniques.

Initial stage identification of lungs cancer is significant and mandatory aspect for processing of an image. The different data mining method were used for classification of the lungs cancer at early stage. In the given paper, a technique has been used which will identify lungs cancer in an initial stage from CT scan image that are in Dicom (DCM) format.

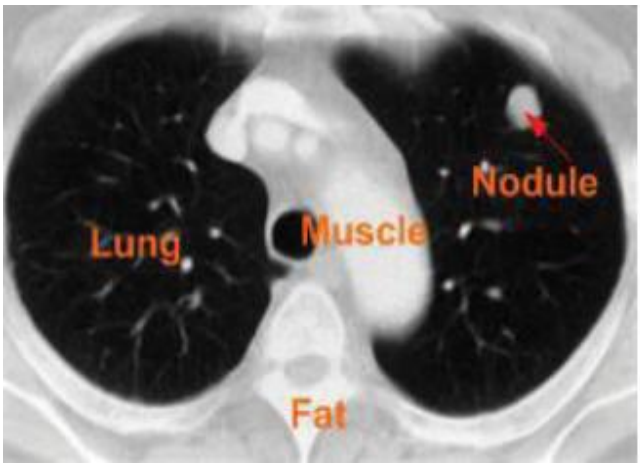

Fig. 6 Lung CT scan image

White Gaussian noise is exhausted from image of CT scan, by non local mean filter. Lung Image Segmentation is done by Otsu's thresholding technique. The textural and structural features are selected from the image to generate feature vector.

In this paper, three classifiers namely ANN, k-NN, SVM are adapted for the revelation of lung cancer to find the severity of disease. Comparison is built with k-NN and ANN classifier towards the several aspects of peculiarity such as efficiency, specificity, precision and sensitivity.It has been constructed from the conclusion that SVM achieves greater accuracy of 95.12% while ANN obtained 92.68% accuracy on given datasets; k-NN appears lowest accuracy of 85.37%. SVM algorithm which accomplishes 95.12% accuracy support patients to take therapeutic action on time and lower the integrity rate from this deadly disease.

E. Segmentation and analysis of lungs cancer images using optimization techniques.

In the given paper an optimization methods has been used for the partitioning of the lungs cancer images.

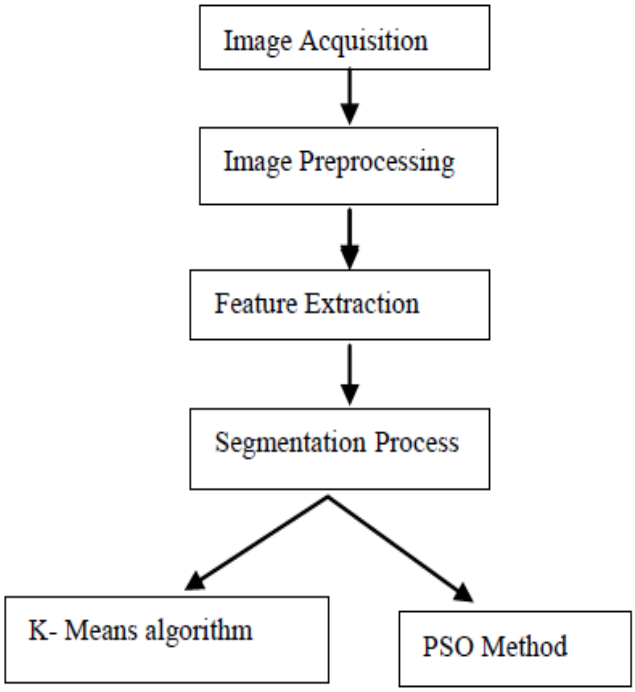

Fig. 7 Methodology of work

Here Otsu's thresholding technique is used to determine histogram equalization of the image. It is computational technique that array images into groups as per their correlation. The several specifications like MSE and PSNR are determined and correlated. The proposed optimization approach provides the optimal results. The MSE values PSNR values are computed for several images processed using distinct segmentation techniques. The image is processed by different techniques like histogram equalization, thresholding etc., to eliminate the repetition present in the scanned images without affecting features of image.

The different features of an image are obtained by various methods like GLCM and binarization. The features are abstracted to identify and abstract several desired part or shapes of image. PSO algorithms are used to calculate the perfect values of the threshold that can result a useful segmentation for target image as according to fitness function. Here the PSO technique is proved to be superior to collecting the PSNR and MSE value.

IV. BREAST CANCER DETECTION TECHNIQUES

Cancer that evolves from the unusual expansion of breast tissue is known as breast cancer. And it is the second prime cause of female cancer casualty. Breast cancer Symptoms are comprises of a nodule in breast, fluid coming from nipple, changes in shape of breast, red scaly plot of skin and dimpling of skin so on. Dangerous aspects for establishing breast cancer consisting of: fatness, female sex, shortage of physical activities, family history, drinking alcohol, having children too late or not at all, analysis, at the time of menopause, prime age at first menstruation, and earlier age.

F. Early detection of breast cancer using SVM classifier technique.

In the given paper an algorithm is used on different mammograms images to recognize breast cancer. In the given paper the proposed system mostly introduced the solution of two problems.

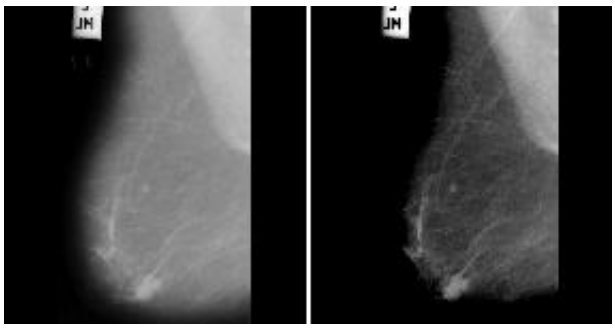

Fig. 8 (a) Original mammogram (b) Filtered image

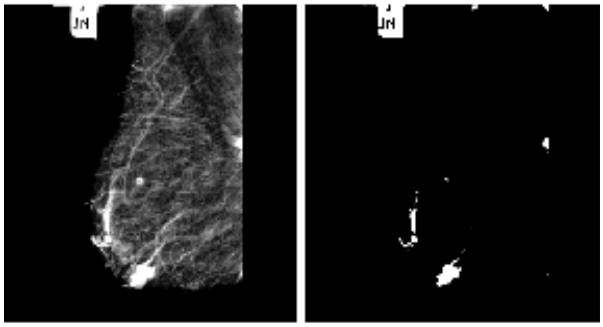

Fig. 8 (c) Second level DWT reconstructed mammogram (d) Tumor segmented output

One is how to recognize cancer as suspicious parts with a very weak contrast to their background and the second is how to select the features which classify cancer.

The cancer identification technique follows the schemes- (a) mammogram improvement (b) Segmentation of the cancer area (c) Selection of features from the segmented tumor area (d) The use of SVM classifier. Different enhancement methods are used to expand an image, where to raise the SNR and to make certain features simple to see by varying the colors or intensities of image.

The intensity adjustment is an image's intensity values to a new range. Later the mammogram improvement segments the cancer area. For the improvement of mammogram of breast DWT, filtering and hot and hat bottom techniques are used. The partitioning of mammogram images were used to modify the reorganization of cancer. The most usual segmentation technique was thresholding.

The features were abstracted from the selected breast area. Next stage consists of classification of the selected area by using the SVM classifier. In the given paper, on 75 mammographic images, the given methods were implemented from mini-MIAS datasets. And at the end of the process gives sensitivity 88.75% of sensitivity.

G. A new classifier for breast cancer detection based on naïve Bayesian.

A primary invasive types of cancer i.e. breast cancer which is mostly occurred in females. Various machine learning & pattern identification approaches have been used to identify the breast cancer. One of these approaches is Bayes classifier. In the paper NB classifier also called simple classifier is used to recognize the breast cancer. This is depends on Bayes theorem. New weighted NB classifiers were used for the identification of cancer & its application was also shown. In the given paper several experiments were proposed on mammogram images to calculate the results of the classifier on the cancer datasets.

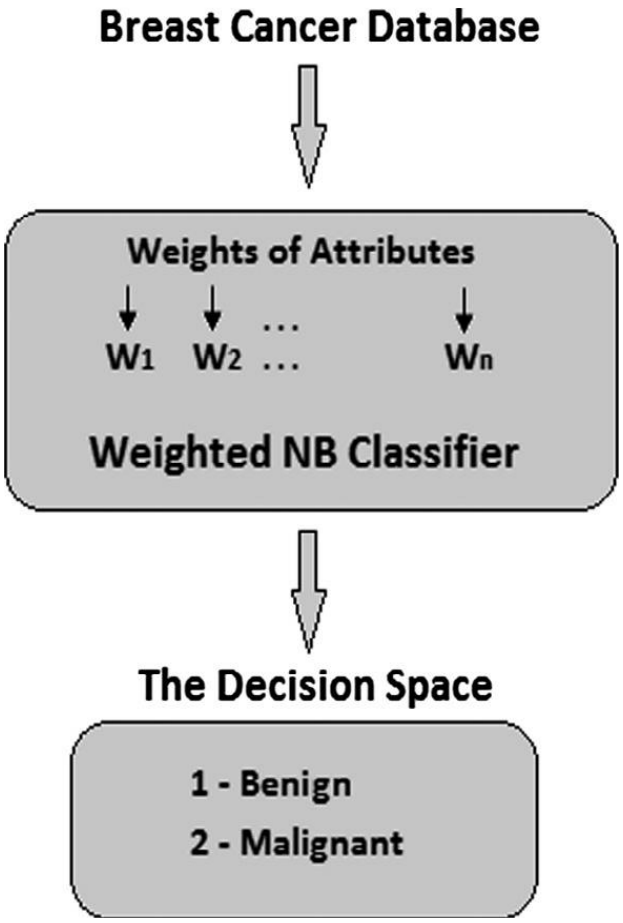

Fig. 9 Block diagram of weighted NB

In this paper the experiments for the identification of breast cancer were completed with a 5 fold cross validation test. Furthermore, several performance analyzing techniques are calculated, namely specificity, sensitivity and accuracy. The NB classifier is the simplest and more powerful classifier that is used for the detection the breast cancer. But it also contains several disadvantages that are; in training data only crisp classes are assigned. To avoid these disadvantages of the NB classifier, a weighted NB classifier was used and its application on breast cancer identification was also presented. It has been constructed from the experiment that the applied weighted NB classifier obtained the accuracy of 98.54%, specificity of 99.11% and sensitivity of 99.115%.

H. Breast cancer diagnosis on three different datasets using multi classifiers.

In the given paper a contrast between the several classifiers that are NB, MLP, decision tree also called J48, SMO, and on different breast cancer databases at instances that based on K-NN, these databases are Wisconsin prognosis Breast Cancer abbreviated as WPBC, Wisconsin diagnosis breast cancer abbreviated as WDBC and Wisconsin breast cancer and abbreviated as WBC are obtained by using the confusion matrix and classification efficiency and it depends on 10-fold cross validation test.

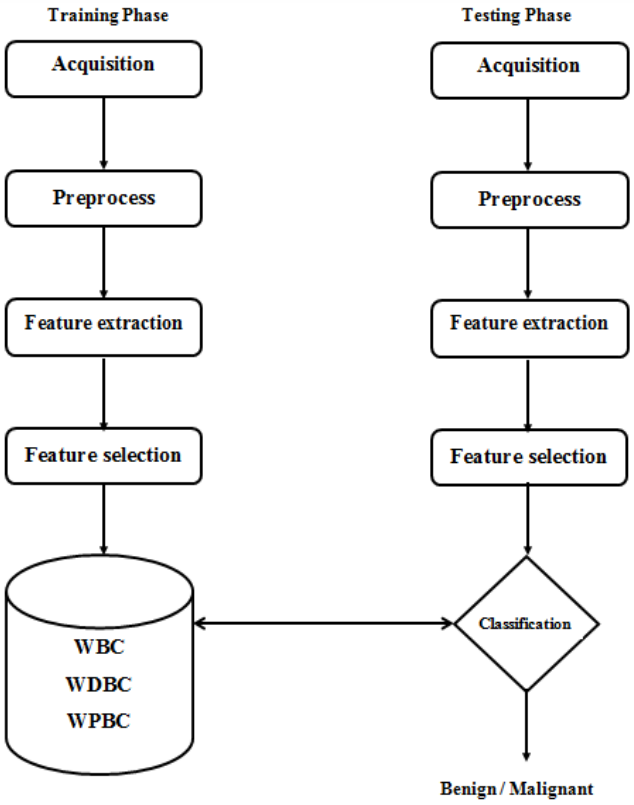

Fig. 10 Proposed breast cancer diagnosis model

The proposed work expressed into two different steps. First is training phase that further comprises of four different phases i.e. preprocessing, acquisition, feature abstraction and segmentation of features. Second is the testing phase that contains similar four phases as in the training phase only one in addition that is classification step. The experimental results concluded that in the classification using combination of MLP and decision tree with the PCA are better to another classifiers that using WBC cancer databases.

The PCA is used in WBC database as a features minimization conversion approach in which set of correlated features are combined. In WDBC datasets the results of experiment concluded that the classification by using SMO only and also combination of SMO and Multilayered perception or IBK and SMO is best classifiers as compare to other classifiers. In WPBC databases the results of experiment concluded that the classification by using combination of J48, MLP, IBK and SMO is good to other classifiers. Results of experiment in WBC databases concluded that the combination of J48 and MLP classifiers with different features segmentation (PCA) is best to other classifiers. Finally results shows that combination of MLP, SMO, IBK and J48 is one of the best to other classifier in WPBC datasets.

V. SKIN CANCER DETECTION TECHNIQUES

An uncontrolled expansion of skin cells governing to disease called skin cancer. It appears when unimpaired DNA contaminate to skin cells, cause variations or genetic faults, that lead the skin cells to expand immediately and form malignant cancer.

I. Detection of melanoma skin cancer using digital camera images.

Skin cancers are immediately growing in the western parts of world. Survival rate of patient those are suffering from skin cancer is high, if it is recently recognize. So an effective technique is important to identify skin cancer at the earliest. In the given paper for the stage of pre-processing wiener filter and adaptive histogram equalization methods are proposed. The proposed technique constitutes at first Pre-Processing the images. And to eliminating the noise from the images Weiner filter is applied. Than to abstract skin lesion from digital camera images ACM technique was used for segmentation.

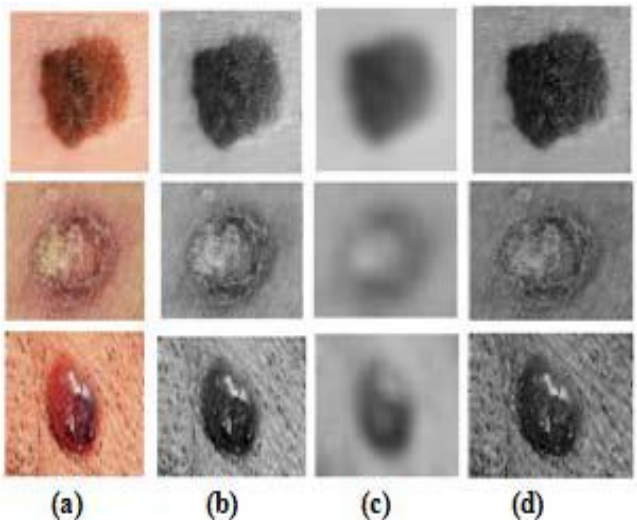

Fig. 11 (a) original image (b) Gray scale image (C) Filtered image (d) contrast enhanced image

Thirdly to extracting second order statistical textural features GLCM are used to the selected skin lesion. Finally classify tumor as malignant or benign cancer by applying SVM classifier. Calculation of proposed approach is completed by calculating specificity, sensitivity and accuracy. Active contour model can be used to solving the many problems of image processing such as detection of edges, lines, contours and object tracking. By providing a relevant energy it is feasible that to push initial contour to the desired solution. The features are extracted and then decimated into three orders of statistics i.e. in first, second and higher.

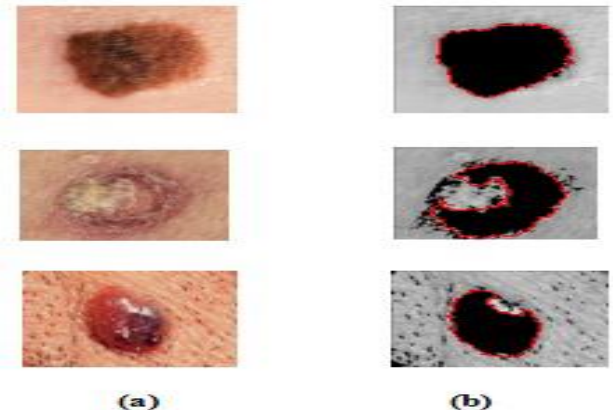

Fig. 12 (a) original image (b) segmented image

They are determined from position of the pixels with specified intensities. The GLCM technique is methods of selecting second order statistical texture features.

The SVM classification technique with two type i.e. malignant cancer and benign cancers, gives 95% accuracy, sensitivity of 90% and 85% specificity are observed. The texture parameters can be included in the feature set to improve the overall performance of system.

(J). Automatic detection of melanoma skin cancer using texture analysis.

Melanoma is one of the serious types of skin cancer. It can develop in any part of human body which contains melanocytes. In this paper MLP classifier was used with distinct techniques. Features extraction is depend on GLCM, and the classification method used MLP classifier to classify between malignant melanoma and Melanocytic Nevi. These techniques are training and testing process that used Automatic and Traditional MLP. Two techniques for that classifier were used.

The First classifier is Automatic multilayer perceptron that divides the given data into three subsets. In which 20% of data is validation, 20% data is test and 60% of data train.

The automatic Multilayer perceptron proposed 93.4% accuracy for training and 76% accuracy for testing. The second technique is Traditional MLP, proposed 100% accuracy for training and 92% for testing. So finally this study shows that combination between co-occurrence matrix and artificial neural network is a best technique for the discrimination between the malignant melanoma and melanocytic nevi dermoscopy images

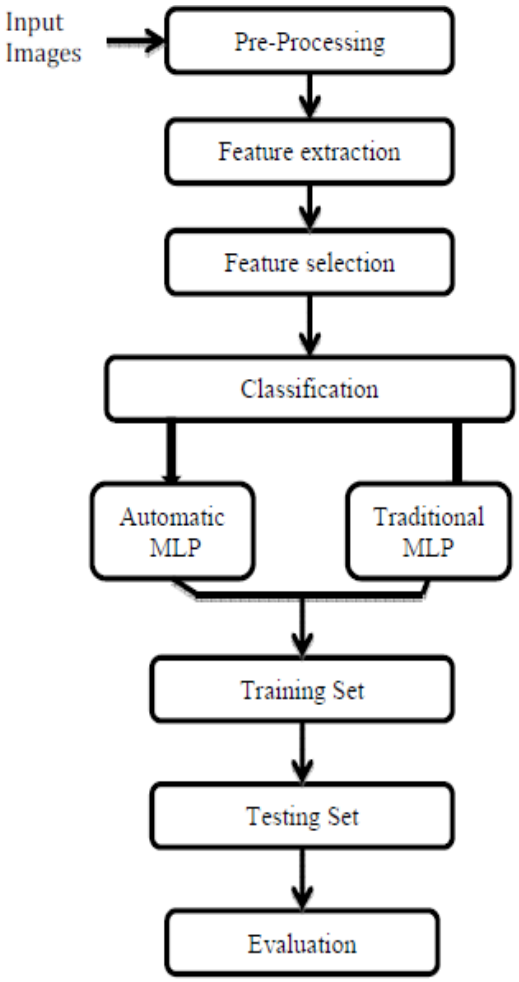

Fig. 13 Automated diagnosis block diagram

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VI. CONCLUSION

This research work evolved few techniques for detection and segmentation of four distinct forms of cancers i.e. brain, lungs, breast and skin from distinct forms of images such as digital camera images, CT scan images, MRI, and mammogram images. Here distinct approaches for segmentation of images such as thresholding fuzzy c_means, optimization techniques, ACM so on are used. To abstract and improving the features like geometry, color, statistical analysis, entropy, contrast etc of the image here we used GLCM, Binarization and hybrid techniques. To analyze the kind of cancer that is malignant cancer and a benign the distinct classification techniques are used such as SVM, MLP, NB, ANN, SMO, and J48

etc. The above given techniques are computationally adequate and yielding better outputs related to sensitivity, specificity, and accuracy. This automatic analyzing system could be further in future used for classification of images with many different pathological conditions, categories and status. In future work distinct automatic techniques are used to produce much accurate & more efficient results.

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