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Study and Analysis of Filters

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Abstract

Breast cancer detection is very important to save one's life. It is commonly found in women but there are chances where some men can also get a breast cancer. But the most cases are reported in women only with nearly 1.7 million new cases diagnosed in 2012. Doctors and many experts can miss the unusual change in the breast of a woman due to lack of experience in cancer detection field. There can be chances when a woman has cancer but the doctors or lab experts are unable to detect it and there can be situations when the woman has no cancer and still the result come out as that the woman has cancer. The mortality rate can be reduced to a great extend through breast cancer detection. Diagnosis and detection of breast cancer in its early stage improve the chances for a successful treatment and full cure from the cancer. In today's time, among the various techniques available mammography is considered to be one of the effective method for the doctors to detect the presence of cancer in women. Mammography is a unique medical imaging that uses a low-dose x-ray system to see inside of the breast. Breast cancer is related to hormone, and the areas that transform the risk of this cancer when diagnosed prenopausally and when diagnosed postmenopausal are not the same. We will apply various filters to the images and will compare the accuracy of each filter in prediction of breast cancer.

General Terms: X-ray, algorithms, mean, median, average

Keywords: Breast cancer, mammography, filters, classification, image pre-processing, feature extraction

1. INTRODUCTION

At present breast cancer is one of the main reasons for death among women and the second most after the lung cancer [1]. Around 25% of all cancers diagnosed in women are breast cancer. Through mammogram technique, radiologists and doctors have a higher detection rate of 76% - 94%. , which is considerably higher than the 57% - 70% detection rate for a clinical breast examination [1]. In the year 2010, 2, 10,203 women's in the United States diagnosed with breast cancer, and 40,589 women's in the United States died because of breast cancer. In 2011, around 2, 30,480 cases of non-invasive cancer and 56, 650 cases of invasive cancer have been cured. Mammography is a medical procedure to get the insight of the internal structure of the breast. A mammogram is done through compacting the patient's breast between two acrylic plates and passing an X-beam motion through it. It is all dim scale picture demonstrating points of interest inside the breast through contrast [4]. Mammography has been proven the most trusted method and it is the key screening tool for the early detection of breast cancer [1]. Numerous Computer algorithms led to recognize and order suspicious areas in computerized mammogram. These calculations are assessing the likelihood of malignancy in light of features got from regions of interest (ROI) for a given mammogram [6]. Treatment and tests for the breast cancer is divided into three main types, they are, screening, diagnosing and monitoring. The screening will look for the signs of cancer, if any. If the screening test shows up some signs of breast cancer then additional diagnosing tests are suggested. Then finally at detection of breast cancer, primary solution or therapy is provided in order to reduce or kill the cancer cells [6]. B.M Gayathri in her paper has used machine learning algorithms particularly neural network in order to predict the breast cancer. A neural system is a model that is planned by the way human nervous systems, for example, brain, that procedure the data. Neural systems, with their striking capacity to infer significance from complicated or uncertain information, can be utilized to concentrate designs and identify patterns that are too mind boggling to be in any way seen by either people or other PC systems. Numerous neural network models, even organic neural systems accept numerous improvements over real organic neural systems. Such improvements are important to comprehend the proposed properties and to endeavor any scientific examination [10].

The most common properties of the medical images like as unknown noise, poor image quality, in homogeneity, delicate boundaries and unlinked parts will affect the content of the medical images [1]. This issue is resolved by pre-processing techniques. The pre-processing is a fundamental step in the medical image processing to create better image quality for the feature extraction step. The pre-processing steps deals with image enhancement and noise removal [7].

2. LITERATURE REVIEW

In [1] R. Ramani expressed that the preprocessing technique including cutting out back range and standardization for CT cerebrum pictures. R Ramani in his paper drew

closer, a circular structure developed in view of skull form and afterward the slope imaging edges rectified.

In [2], the proposed strategy for the histogram of the power in CT pictures down tested. So on account of this the low complexity and obscuring areas in CT pictures upgraded. A Markov Random Field display, which is consider the geometrical limitations of the prepared picture used to build up the exactness coming about because of the down-testing technique.

In [3], the proposed framework comprised of four fundamental strides including: 1) picture scaling; 2) breast region segmentation; 3) noise cancelation utilizing a channel, which is touchy to MCCs; and 4) differentiate improvement of mammograms utilizing Contrast-Limited Adaptive Histogram Equalization (CLAHE) and wavelet change. To assess this technique, 120 clinical mammograms were utilized. To assess the execution of the picture upgrade calculation, Contrast Improvement Index (CII) was utilized.

In [11], the proposed method incorporates use of I-D Continuous wavelet transform (CWT) on the mammogram pictures i.e. the information set gathered from Digital Database for Screening Mammography (DDSM) (l00 sound pictures and 100 malignantly debilitated suspicious calcification pictures). The resultant wavelet coefficients are sorted in a dropping request rank; and take best 100 coefficients for every picture are chosen. At last resultant wavelet coefficients are chosen over the limit to be carcinogenic and discover the area of development and underneath the threshold as typical picture or ordinary pictures alongside lumps or cyst, yet not dangerous. At long last coefficients for every picture above and underneath edge are chosen.

In [13], the created strategy is compressed as, the underlying stride in light of dark level picture data is improved and the breast malignancy is sectioned. For each malignant region, components are extricated to order the breast tumor. Finally for arrangement the SVM classifier is utilized.

In [14], two-sided filtering and bivariate shrinkage capacity is executed in the ABUS picture to expel the noise and to upgrade the tumor limits. At that point the hearty geography watershed division technique is used for portioning the breast tumor influenced region. More quantitative elements are important to ascertain different databases. Different components like GLCM highlights, Tamura highlights, MCHOG highlights and shape elements are extracted for multi resolution examination and it is helpful in handling the datasets from different ABUS frameworks. The quantitative elements of Binary logistic regression classifier foresee the output values. The value 0 represents to a non-tumor picture and a value 1 represents to a breast tumor picture. The weighted neurons are applied in this part to decide a definitive diagnosis procedure to foresee the breast tumor and its exactness is one-sided to break down the marginal instances of the breast tumor. The review can be further reached out by utilizing more vigorous classification strategy utilizing simulated neural systems.

In [15], the vast majority of the systems utilized for breast cancer detection so far are evaluated and every one of these systems gives better upgrade execution. The other upgrade measures ascertain just the greatest and least estimations of the little locales or the squares in the pictures and it is delicate to commotion. By utilizing these strategies the upgraded picture will be keener than the first picture it recognizes the micro calcifications in the mammogram and along these lines it distinguishes the breast growth at its early stage, which prompts to diminish in the demise rate among women.

3. MATERIALS AND METHODS

In this paper, we have used Matlab and python in order to analyze the images and bring the output. We have taken the images from MIAS database. There is a total of 322 images that we have used here. First we will pre-process the images using three different filters and we will have three different sets of images (322 images in each set).After this process we need to classify the images and in order to classify the images we will use python here and perform the classification. For the classification of images we have used adaboost classifier and have classified the images.

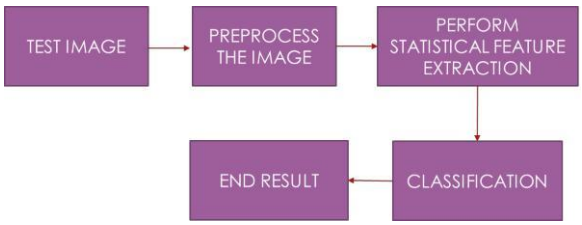

Fig 1: Block Diagram

3.1 Data Collection

The images have been taken from the MIAS database. There is a total of 322 images of the breast. The MIAS database is the common database used by all the researchers around the world.

3.2 Pre-processing

The basic objective of the pre-processing is to enhance the picture quality to make it prepared for further handling by evacuating or diminishing the irrelevant and surplus parts out of sight of the mammogram pictures. Mammograms are medicinal pictures that confused to translate. Consequently pre-handling is basic to enhance the quality. It will set up the mammogram for the following two-handle division and highlight extraction. The clamor and high recurrence segments are evacuated by channels.

A. Mean filter or Average filter

The objective of the mean channels is to enhance the picture quality for human viewers. Here we see, filter replaced every pixel with the normal estimation of the powers in the area. It privately lessened the change, and simple to complete. Constraints of normal channel I) Averaging operations prompt to the obscuring of a picture, obscuring influence highlights confinement. II) If the averaging operations connected to a picture adulterated by drive commotion, the motivation clamor weakened and diffused yet not evacuated. III) A solitary pixel with an exceptionally unrepresentative esteem influenced the mean estimation of the considerable number of pixels in neighborhood essentially.

B. Median filtering

A median filter is a nonlinear channel which is proficient in evacuating salt and pepper noise, median filter tends to keep the sharpness of picture edges while expelling noise. We can see here different kinds of median filter I) Center-weighted median filter II) weighted median filter III) Max-median filter, the impact of the size of the window increments in median filtering and the noise is removed effectively.

C. Weiner Filter

The wiener filter tries to assemble an ideal gauge of the first picture by implementing a base mean square error limitation amongst gauge and unique picture. The wiener filter is an ideal filter. The target of a wiener channel is to minimize the mean square error. A wiener filter has the ability of taking care of both the debasement work and as well as noise. From the degradation model, the mistake between the information flag f (m, n) and the assessed flag f (m, n) is given by E (M, N) = F (M, N) – F (M, N)

The square error is given by

$$[F (M, N) – F (M, N)]^2$$

The mean square error is given by

$$E \{[F (M, N) – F (M, N)] ^ 2\}$$

3.3 Feature Extraction

Feature extraction is the first step in the breast cancer detection. Various techniques have been used for computing texture features [5]. Feature extraction includes diminishing the measure of assets required to portray a substantial arrangement of information [1]. At the point when performing examination of complex information one of the significant issues originates from the quantity of factors included [2].

Examination with countless and large variables requires a lot of memory and calculation control, likewise it might make an classification algorithm to over fit to preparing tests and sum up inadequately to new examples [4]. Feature extraction is a general term for techniques for building mixes of the factors to get around these issues while as yet depicting the information with adequate accuracy. The best outcomes are accomplished when a specialist develops an arrangement of set of application-dependent features, a procedure called feature engineering. By and by, if no such master learning is accessible, general dimensionality reduction systems may offer assistance [5]. Kim and Park similarly researched the exhibitions of the surrounding region dependence method (SRDM) and other traditional measurable surface investigation strategies for distinguishing grouped small scale calcifications in digitized mammograms, for example, spatial gray level dependence matrix (SGLDM), gray level run-length method (GLRLM), gray level different method (GLDM), gray level histogram moments (GLHM), and gray level co-occurrence matrix (GLCM).

3.4 Implementation

Prediction of breast cancer can be done in many ways. There are various techniques in which we can predict the breast cancer. So here we have used some images of breast of various women obtained from the MIAS database. There are around 322 images which have been used here. The concept which is used here is enhancing the pre-processing techniques which is used in the process of predicting the breast cancer. We are applying some filters to the existing mammogram images. Each filter will give a different output i.e. accuracy. So after applying the filters to the images we will get more clear view of the mammogram images or we can say a more enhanced version of the existing mammogram image we will get to see and analyze it more accurately. Following are the steps which we will follow:

1. First get the images from the MIAS database.
2. Apply different filters to the images. After applying the filter you will get a different set of images (filtered image).
3. Store the filtered images in a different folder. Here we are using three filters so we get three different sets of images, store each set of images in different folders. So finally we get three folders.
4. After that, the process of feature extraction comes into picture. We need to do the feature extraction process to each filtered set of images.
5. After the above step, we will get three different text files containing the features of each filtered image.

Pre-processing stage is an application dependent technique for improving the substance of restorative picture in view of expulsion of uncommon markings and speckle noise. Removal of special markings and speckle noise existing in medical images will increase the quality of image segmentation. On the other hand, it will

improve the accuracy and efficiency of content based medical image classification and retrieval systems. In this project, we have considered four types of filtering techniques for pre-processing of mammography images.

The comparison of four types of filters are tested for 322 mammogram images(MIAS), from the output observation, we conclude that average filter is the most appropriate filter while compared with other filters, because image quality of average filter is better than other.

We get the following advantage from this research on comparison study of filters. They are:

- We can get a clearer picture of the image.
- We will be able to know the presence of cancer in the breast more accurately.
- We will get to know the accuracy of various other filters.

This proposed system is user friendly and the process is very simple.

4. RESULT AND DISCUSSIONS

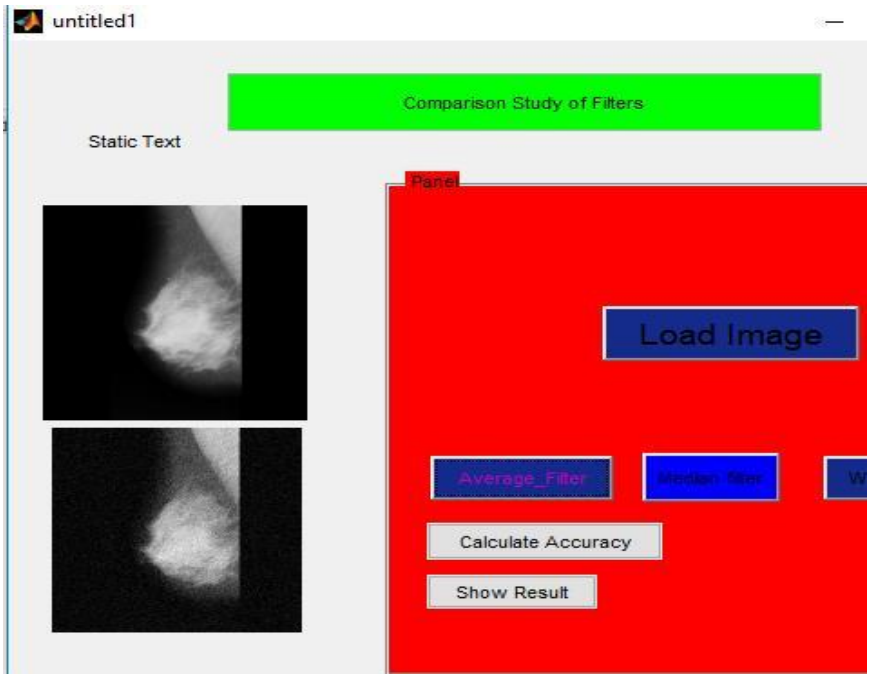

Fig 2: Average Filter

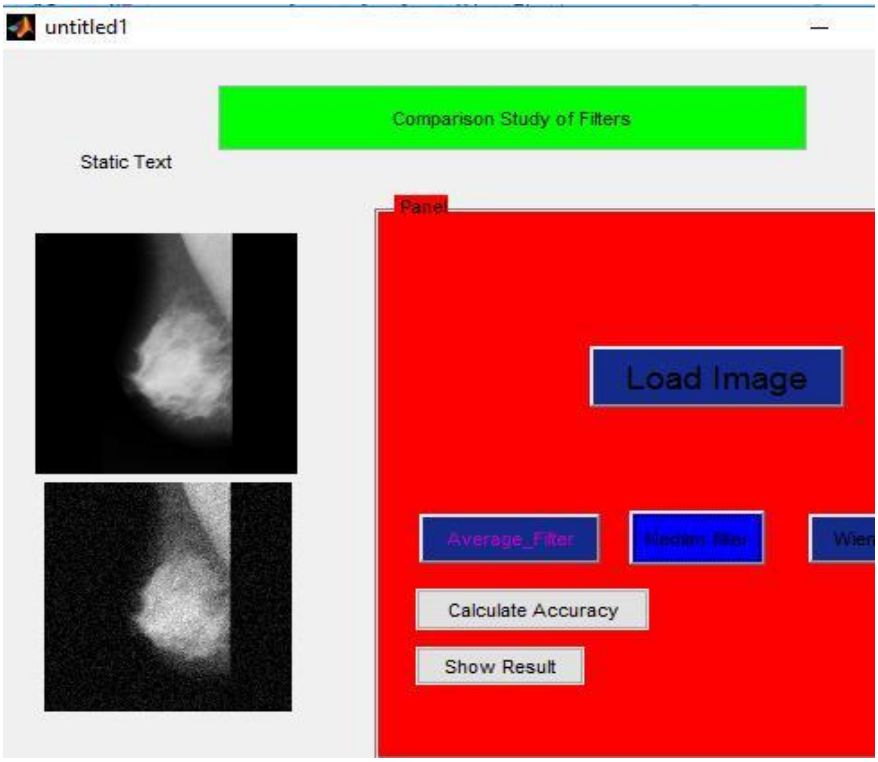

Fig 3: Median Filter

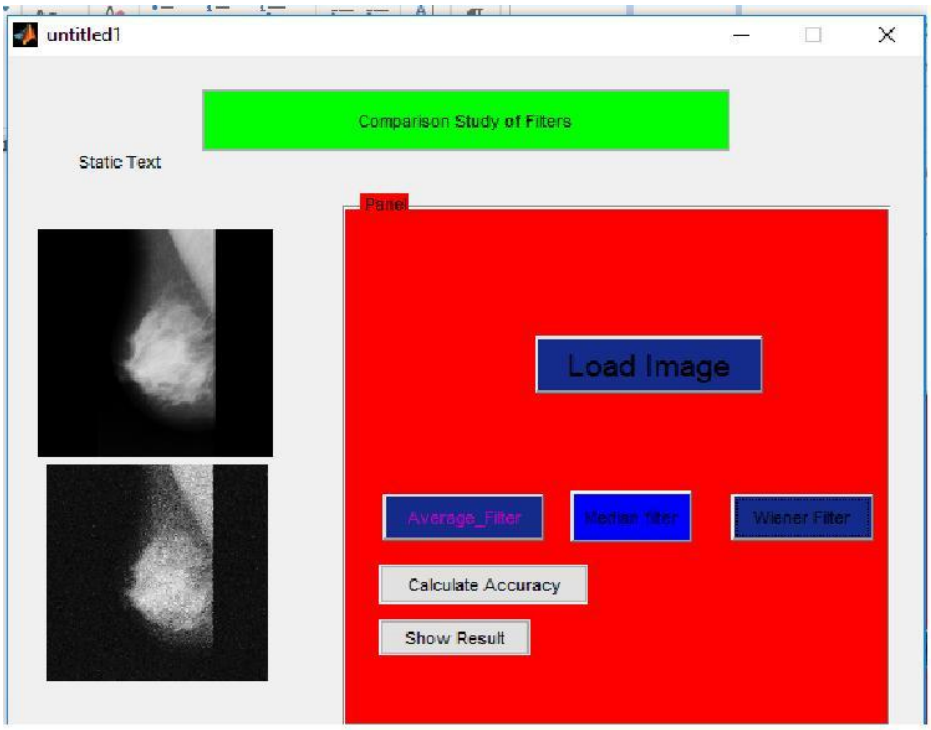

Fig 4: Wiener Filter

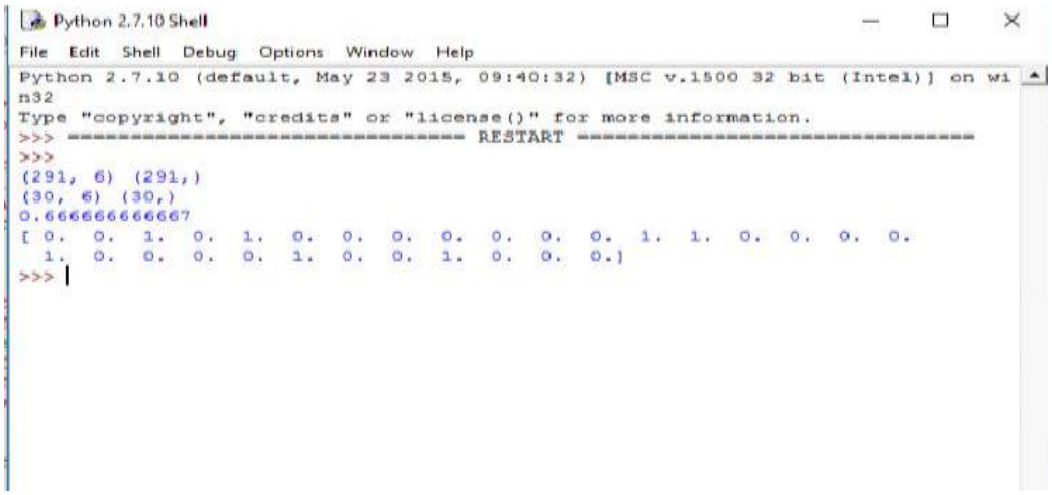

Fig 5: Accuracy Calculation

Table 1: Accuracy Table

Filter Used	Accuracy
Average Filter	82 %
Median Filter	66 %
Wiener Filter	67%

5. CONCLUSION AND FUTURE WORK

Pre-processing is a stage where a particular image undergoes several operations. These operations performed on the image helps to enhance the image quality to a great extent [1]. It depends on the filter which we have used on the images, to what extent the image will be clear and visible. The enhancement of the image will help in the prediction of breast cancer more clearly and hence improve the chances of predicting the breast cancer more accurately [2].

Though the proposed system is capable of predicting the breast cancer accurately to a great extent but we can work on it and make it more usable in the future. The current system is capable of predicting the breast cancer upto 70%. We can add some other technologies with the current system and make it work more accurately and there are chances to increase the accuracy. So in future we can work upon the accuracy of the filters and try to improve the accuracy by adding some more techniques with the current ones.

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