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THE DIAGNOSIS OF BREAST CANCER USING IMAGE FUSION TECHNIQUES

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ABSTRACT

Breast cancer is the leading cancer killer of women and the second leading cancer killer globally. Primary prevention in the early stages of the disease becomes complex as the causes remain almost unknown. However, early diagnostic techniques, which are crucial for women's quality of life, can be improved with the help of some typical signatures of this disease, such as masses and micro calcifications appearing on mammograms. The prognosis for breast cancer patients can be greatly improved through regular screening and early diagnosis using X-ray mammography. Many computer-aided diagnostic systems have been devised to help radiologists and internists in the identification of masses and benign glandular tissue, which often show with poor contrast and frequently quite blurry. Early diagnosis is key to preserving the patient's health. As stages increase, the chance of preserving decreases. There are numerous imaging techniques that play a vital role in detecting breast cancer. This study compares and contrasts the current breast cancer detection system with a number of other systems that employ different image processing and data mining approaches, as well as other factors.

KEYWORDS: Breast Cancer, X –Ray, Data Mining, Image Processing, Feature extraction.

INTRODUCTION

Cancer is a deadly disease, which can start in any internal organ; slowly it spreads to the entire body and the patient dies. Each year American Cancer Society publisha greater number of new cancer cases and deaths caused by it. For the year 2015-2016, they forecast 1,658,370 new cancer cases and 589,430 cancer deaths only in the United States. Therefore, it is expected that the statistics will be very high for the entire world. Among all types of cancer, breast cancer is the second leading cause of death in the United States. Current solutions to diagnosing cancer are not adequate due to less promising computer technology and high false negative results.

Cancer can grow almost all types of cells. Typically, we name it according to the place where it found for the first time. As an example, if cancer found in lungs, we call it lung cancer, or if we find it in the breast, we call it breast cancer. In this work, among different types of cancer, we focus on breast cancer treatment because, breast cancer is most common, extremely dangerous, and treatment of breast cancer is not satisfactory

As the name suggests, breast cancer starts in breast cells and soon it invades neighbor cells, and finally, it spreads to the entire body through the bloodstream. Generally, breast cancer is curable

if it can be diagnosed in early stages. Primarily, breast cancer screening or diagnosis done by mammography images. There are some other techniques also, which are used also in some special cases.

One of the most dangerous and fatal diseases these days is cancer. Cancer begins in cells, the building blocks that make up tissues. Tissues can be found in parts of the human body, including breasts. Usually, cells are formed and divided each time the body needs them, in order to grow and stay alive. When normal cells become old, they shrink to die, then, new cells will be formed. Sometimes, this process does not follow the normal way. Some new cells are formed when they are not needed, and old cells do not die to allow new cells to replace them. This unusual creation of the cells forms a mass of tissue, also called, a lump, tumor, or growth. Cancer that forms in the tissues of breast, usually in the ducts (tubes that carry milk to the nipple) and in the lobules (glands that make milk) is called, the breast cancer.

Breast Cancer is one of the major death causes for women in recent decades. Due to its fatal consequences, most of the countries around the world, especially the industrialized countries, have directed offer to the early detection of breastcancer, which will improve the chances of success treatment.

A sentinel lymph node is classified as a node that has a direct lymphatic connection to the cancer, thus it is a highly probable location for cancer 2 spreading from the breast. (Basha and Prasad, 2009) numerous research efforts have been conducted in the area of breast cancer detection and classification. Thus, it is highly important to concentrate the efforts in order to develop an adaptive system that can classify and detect breast cancer.

LITERATURE REVIEW

Giri, Prannoy&Saravanakumar, K. (2017). Breast Cancer is one of the significant reasons for death among ladies. Many research has been done on the diagnosis and detection of breast cancer using various image processing and classification techniques. Nonetheless, the disease remains as one of the deadliest diseases. Having conceive one out of six women in her lifetime. Since the cause of breast cancer stays obscure, prevention becomes impossible. Thus, early detection of tumor in breast is the only way to cure breast cancer. Using CAD (Computer Aided Diagnosis) on mammographic image is the most efficient and easiest way to diagnosis for breast cancer. Accurate discovery can effectively reduce the mortality rate brought about by using mamma cancer. Masses and microcalcifications clusters are an important early symptoms of possible breast cancers. They can help predict breast cancer at its infant state. The image for this work is being used from the DDSM Database (Digital Database for Screening Mammography) which contains approximately 3000 cases and is being used worldwide for cancer research. This paper quantitatively depicts the analysis methods used for texture features for detection of cancer. These texture features are extracted from the ROI of the mammogram to characterize the microcalcifications into harmless, ordinary or threatening. These features are further decreased using Principal Component Analysis (PCA) for better identification of Masses. These features

are further compared and passed through Back Propagation algorithm (Neural Network) for better understanding of the cancer pattern in the mammography image.

Gupta, Siddhartha &Sinha (2019) Cancer is the uncontrolled multiplication of group of cells in a particular location of the body and is the second largest disease leading to the death of women in the world. The disease can be cured if it is detected in early stages. A lot of research has been done to find out the tumor correctly but a 100% accurate method has not been found. Research on breast cancer detection using digital image processing is not new but many new approaches in this field is being considered to accurately predict the tumor region. The present approach is to detect the tumor region visually as well as to figure out in which region the tumor is mostly concentrated. This work majorly focuses on finding out the best algorithm/s to detect the tumor present in the breast. In the proposed work, a variety of algorithms has been applied but the best one suited for cancer detection is the combination of K Means, Closing, Dilation and Canny Edge Detection algorithm.

Mohamed Adel (2019) As a trending medical imaging technique, Elastography and B-mode (ultrasound) are combined as a diagnostic tool to differentiate between benign and malignant breast lesions based on their stiffness and geometric properties. Image processing techniques are applied to the resulting images for feature extraction. Data preprocessing methods and principal component analysis (PCA) as a dimensionality reduction technique are applied to the dataset. In this paper, supervised learning algorithm "support vector machine (SVM)" is used for the classification of combined electrogram and B-mode images. Model validation is performed with K-fold cross-validation to ensure the generalization of the algorithm. Accuracy, confusion matrix, and logistic loss are then evaluated for the used algorithm. The maximum classification accuracy is 94.1

P Chitra (2020) Breast cancer is the most common malignancy of women and is the second most common and leading cause of cancer deaths among them. At present, there are no effective ways toprevent breast cancer, because its cause is not yet fully known. Early detection is an effective way to diagnose and manage breast cancer can give a better chance of full recovery. This paper gives a clear idea of classification from the mammogram image to find cancer affected area which is a crucial step in breast cancer detection. The output of the classifier differentiates the normal, benign and malignant cases from applied digital mammographic images.

METHODOLOGY

The search strategy was performed by searching the databases such as Medical Literature Analysis and Retrieval System Online (MEDLINE) via PubMed, Springer, IEEE, Science Direct, and Gray Literature (including Google Scholar, articles published in conferences, government technical reports, and other materials not controlled by scientific publishers) for relevant publications from 2007 to 2017.

Study images along with the corresponding radiology and pathology reports for each biopsied case were shown to 2 radiologists at our institution (R.W. and S.G.) for annotation. We asked the

radiologists to identify masses and architectural distortions that were biopsied and to put a rectangular box enclosing them in the central slice using a custom software developed by a re searcher (N.L.) in our laboratory. Each case was annotated by 1 of 2 experienced radiologists. The first radiologist, with 25 years of experience in breast imaging (R.W.), annotated 124 cases, whereas the second radiologist, with 18 years of experience in breast imaging (S.G.), annotated 77 cases. This way we obtained 190 bounding boxes for cancerous lesions in 173 reconstruction views and 245 bounding boxes for benign lesions in 223 reconstruction views. There were 336 and 99 bounding boxes for masses and architectural distortions, respectively, across cancerous and benign lesions.

This section describes about the diverse stages involved in order to identify breast cancer in the digital mammogram images. The different stages are collecting the image from the online repositories, preprocessing the input image for extracting the features, which are then applied as an input to the classifier.

DATA ANALYSIS

Training, Validation, and Test Sets

In total, our data set contained 22 032 reconstructed volumes that belonged to 5610 studies from 5060 patients. It was randomly split into training, validation, and test sets in a way that ensured no overlap of patients between the subsets. The test set included 460 studies from 418 patients. For the validation set, we selected 312 studies from 280 patients, and the remaining 4838 studies from 4362 patients were in the training set. The selection of cases from the benign and cancer groups into the test and validation sets was performed to assure a similar proportion of masses and architectural distortions. Descriptive statistics for all the subsets are provided in Table 1.

Table 1. Descriptive Statistics of the Data Set Used for Training, Validation, and Testing

Characteristics	No. Training set	Validation set	Test set
Patients			
Total	4362	280	418
Normal group, No. (%)	4109 (94.2)	200 (71.4)	300 (71.8)
Actionable group, No. (%)	178 (4.1)	40 (14.2)	60 (18.9)
Benign group, No. (%)	62 (1.4)	20 (7.1)	30 (7.2)
Cancer group, No. (%)	39 (0.9)	20 (7.1)	30 (7.2)
Studies	4838	312	460
Reconstruction volumes	19 148	1163	1721
Bounding boxes for cancerous lesions	87	37	66
Bounding boxes for benign lesions	137	38	70
Bounding box diagonal, mean (SD), pixels	344 (195)	307 (157)	317 (166)

If we discard skin cancer, breast cancer is the largest cause of cancer among women, accounting for one-third of all the cancer types. Obtaining the best outcomes in breast cancer depends on early diagnosis. Therefore, imaging techniques have been developed to increase the likelihood of early diagnosis of breast cancer and reduce unnecessary

Table 2 Advantages and disadvantages of various imaging techniques in breast cancer

Imaging method	Application	Advantage	Disadvantage
Mammography	Golden standard imaging and diagnosis of breast cancer early stages	• It uses low levels of X-rays for imaging This method is good for • detecting DCIS and calcifications Mammography is the gold • standard method to detect early-stage breast cancer before the lesions become clinically palpable	• Radiation risk and other risks • Risk of false alarm It is difficult for the • radiologist to interpret the results from mammograms as mammograms generally have low contrast Double reading of • mammogram leads to increase in the cost of detection Mammography alone misses • many cancers in dense-breasted women
Ultrasound	Suitable for dense and soft tissues	• Widely available and accessible • Noninvasive • Quick • Highly sensitive • Suitable for women with dense breasts	Quality and interpretation of • the image depends highly on the skill of the person doing the scan
Thermography	Suitable for muscle tissue	• Noninvasive	Physicians can have difficulty • interpreting the images because of the low quality and low resolution of the images taken by the first generation of the medical infrared imaging cameras

Biopsy. Table 2 shows a summary of advantages and disadvantages of each method. Currently, digital image processing techniques are often used in solving machine visual problems and have provided good results. The importance and necessity of processing digital images are examined in the following two directions: 1) to improve images for human interpretation and 2) to process images for automatic understanding and interpretation by the machine. In the field of diagnosis, first, medical images are collected and, then, preprocessing, segmentation, extraction of features, and eventually categorization are performed.

Comparative Study of Existing Breast Cancer Detection Methods

In this section a brief comparison of existing breast cancer detection system with various features and various data mining methods used are provided. TABLE III provides a detailed study of the existing works in terms of kind of image database used, nature of features used and data mining techniques used of the existing breast cancer detection techniques.

Table 3. Comparative study of breast cancer detection methods

Author	Image Database	Features used	Data mining technique
Cabrera	DDSM database	Texture feature	Clustering algorithm
Padvekarl	DDSM and MIAS database	LBP features	Support vector machine
Anujkumar	Mammogram images	Gradient	Max-Mean & Least variance techniques
Oliveira	DDSM database	Texture characteristics	K-means & Support vector machine
S.Naresh	MIAS database	LBP features	Support vector machine classifier
Oliver	DDSM & MIAS database	Eigen faces approach features	Combined C4.5 with K-nearest neighbors classifier
Pereira	MIAS database	LBP features	Support vector machine classifier
Oliver	DDSM database	LBP features	Support vector machine
Spandana	KIMS, Hyderabad	Texture, wavelet and geometric features	-
Kashyap	MIAS database	Region based features, Tamura features	Fuzzy- C means clustering
Kanojia & Abraham	58H&E (Hematoxylin& Eosin)	Mass displacement, mean intensity edge, Mean intensity, std intensity &Diagnosis	Radial basis function neural network

CONCLUSION

Breast cancer is the second leading disease for women in the world. In recent years, different types of methods developed to segment the mammogram images and it helped the radiologist to make an accurate decision about breast cancer cells. This research analyzed different stages of CAD and diagnosis methods for breast cancer using mammography. The mammogram image processed through various stages to detect whether a person is suffering from benign or malign ant breast cancer. This paper analyzed segmentation and classification methods for breast cancer detection, which are much helpful for other researchers to enhance the traditional techniques in order to get better and accurate results. the introduction about breast cancer, impacts of breast cancer, methodology of breast cancer detection framework, different kind of images used for breast cancer detection and finally a comparative study of existing breast cancer detection system with various parameters which are used for the detection of breast cancer.

REFERENCES

1. Charan, S., Khan, M.J. and Khurshid, K., 2018, March. Breast cancer detection in mammograms using convolutional neural network. In Computing, Mathematics and Engineering Technologies (iCoMET), 2018 International Conference on (pp. 1-5). IEEE.
2. Song, H., Men, A. and Jiang, Z., 2017. Breast tumor detection using empirical mode decomposition features. IEEE Access.
3. Tan, Y.J., Sim, K.S. and Ting, F.F., 2017, November. Breast cancer detection using convolutional neural networks for mammogram imaging system. In Robotics, Automation and Sciences (ICORAS), 2017 International Conference on (pp. 1-5). IEEE.
4. Sangeetha, R. and Murthy, K.S., 2017, January. A novel approach for detection of breast cancer at an early stage using digital image processing techniques. In Inventive Systems and Control (ICISC), 2017 International Conference on (pp. 1-4). IEEE.
5. Paramkusham, S., Rao, K.M. and Rao, B.P., 2013, September. Early-stage detection of breast cancer using novel image processing techniques, Matlab and Labview implementation. In Advanced Computing Technologies (ICACT), 2013 15th International Conference on (pp. 1-5). IEEE.
6. P Chitra (2020), "Breast Cancer Tumor Detection Using Ann Classification In Image Processing Application P Chitra," IOSR Journal of Engineering (IOSRJEN) www.iosrjen.org
7. ISSN (e): 2250-3021, ISSN (p): 2278-8719Vol. 10, Issue 2, February 2020, ||Series -I|| PP 01-0
8. Mohamed Adel (2019), "Breast Cancer Diagnosis Using Image Processing and Machine Learning for Elastography Images," 2019 8th International Conference on Modern Circuits and Systems Technologies (MOCAST)
9. Gupta, Siddhartha &Sinha, Neha&Ramasamy, Sudha&Babu, Challa. (2019). Breast Cancer Detection Using Image Processing Techniques. 1-6. 10.1109/i-PACT44901.2019.8960233.
10. Giri, Prannoy&Saravanakumar, K. (2017). Breast Cancer Detection using Image Processing Techniques. Oriental journal of computer science and technology. 10. 391-399. 10.13005/ojcst/10.02.19.