A Detailed Research Method on Various Lung Cancer detection Methods

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Abstract: Early diagnosis and detection of carcinomas can be identified using image processing techniques primarily in the case of lung carcinoma detection. Detection of these tumors in early stage is a herculean task. Computed Tomography (CT) scan images is classified into four stages – Image enhancement and Segmentation, Feature Extraction and Classification. The main objective of this paper is to explain about various methods used for lung carcinoma detection using CT scan images.

Keywords: Lung Cancer detection

I. INTRODUCTION

Diagnosis and detection of lung tumors is basically with the aid of CT images. Based on the area of the tumor spread and its cell type treatment will be decided by the clinician. In real time the constants are usually not shown due to the inadequate data collected or inadequacy of the computed factors, cost and constraints related to the medical equipment etc. With all these circumspection modeling of the data is a tedious task, but by using predictive modeling with reserved data is widely used in clinical practices across the world. Due to the lack of accurate data most of the patients are not getting the opportunity of surgery before the disease could get substantiated. An extensive treatment method like hypothermia plays a viable role in the early detection and treatment of lung carcinoma. The accouterment of hypothermia on anti-tumors has been already accommodated with a method to destruct the tumor cells directly, aptosis of tumor cells and other response by the immune system. Developing an algorithm which automatically detects the tumor is the key step in medical image processing. An automatic detection algorithm is designed in such a way to detect the carcinogens nodules in Lung CT images is described. Original image is segmented into small divisions which are filtered by a multi-scale morphological filter and adaptive Gaussian template is used to remove the false positives. This algorithm has high sensitivity with very less false positives which can be improved by tuning the morphological filter by a ideal solution. Vast range of applications in image processing is used in the detection of tumors at the very budding stage. How fast, the algorithm detects and how automated the algorithm in detecting the tumors is a challenging task. Most crucial actor in these kind of techniques which are used is the time taken for the

detection of tumors. The most adaptive technique is to design a computerized tool with image processing techniques applied for lung carcinoma detection. . In comparison with the death rates, majority of the death in the world is due to tumor and primarily due to the failure of early stage detection.

II. REVIEW ON VARIOUS METHODS

Most of the existing techniques that are available in the world for lung carcinoma detection is based on Computed Tomography images. For establishing and retaining an integrated computer model to forecast the probability of the carcinoma. This is implemented by using a semi-automated CT based detection method. This method uses the challenging segmentation process and feature extraction. In order to assess the phenotypic differences, the tumor cell characteristics are correlated with the past cases in the archive. These types of automated methods is grounded with a theoretical mathematical functions will help to predict the stage of lung tumors and also it can be used for the feature extraction and analysis [1]. Yutong Xie et al [2] describe a method to classify the lung nodule by using GLCM surface descriptors with a Deep Learned data. The main aim of Image Segmentation is to segment the data in the original image and decompose into multiple regions which can be preprocessed and analyzed in the later stages. These extracted features are the input to the decision making algorithm which decides whether it is a tumor or not [3]. For a radiologist classification using Artificial Neural Network (ANN) can be used to easily identify and detect the teratoma cells. These can be done by using various image enhancement techniques which can be used for better resolution of the tumor cells. SVM classifier is majorly used as a classification tool and Prediction method uses Linearization techniques to decide whether it is a tumor or not [4]. For training the data restricted Boltzmann machine (RBM) with ODNN feature reduction is used. The features of the cells are extracted using histogram, shape, and are classified using Wavelet Transforms [5]. Most of the existing work will adapt the different computed aided algorithms and also will evaluate the best model thereby proposing a new algorithm with elevation in the existing model. These detection algorithms are sorted and listed out based on the algorithm accuracy. Image segmentation process detects the objects or boundaries in the Region of Interest in the CT image. Features are extracted based on area, diameter, of the ROI and are classified into malignant or benign [6]. Makaju et al points out the drawbacks in various method used for carcinoma detection and in this work classification of a tumor is based on the Pattern recognition of the tumor cells [7].

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In the current phase of carcinoma detection most of the Algorithms are based on back propagation base Artificial Neural Network. The database contains of 50 CT scan images. Segmentation helps to locate the area of the tumor and with the help of adaptive histogram methods the region is localized and portrayed in X and Y coordinates. The texture can be used for extracting the characteristic of the malignant cell and decision is obtained with the aid of Back propagated ANN methods [8]. Sangamithra et.al describes about LDA based classification techniques which will eradicate all the disadvantages of the conventional methods. To classify the trained dataset of CT images Multi SVM is used [9]. Hao Wang et al in 2016 describes a model which is incorporated in the CAD system which detects the lung tumor. The major advantage of this algorithm is that uses a circular filter to extract the tumor region and ineffectively reduces the multiple training phase of the datasets [10]. Jin X. Zhang et. Al describes a House field Unit (HU) to assess the teratoma region and features were extracted. These features are used to train the data and classify using SVM [11]. Rendon – Gonzalez proposed a method comprises of machine learning and image processing techniques where the classification of malignant and benign cells are provided [12]. Agarwaal proposed a method which positions the malignant cell using Linear Discriminant Analysis (LDA) for optimal segmentation and classification.

Before segmenting the image, preprocessing of the image is done by binarizing the original CT image [13]. Decision making is done by fuzzy interference method. Roy. T et al proposed a method which consolidates the water sheds segmentation techniques and Gabor filtering techniques. Water shed based segmentation will reduces the drawbacks of over segmentation of the image and thereby better accuracy can be achieved in the algorithm [14]. Van Iersel et al developed a statistical approach to classify the lung carcinoma image based on ANN. Due to the feed forward propagation technique in the ANN algorithm better accuracy with minimal false positives can be accomplished [15]. Feed forward methods have better accuracy compared to the existing lung detection methods that are available in the world. Kuruvila et al describes about the extraction and classification of pulmonary parenchyma and thereby segmenting the tumor cells. Micro genetic algorithm was used to detect the good model from the SVM classifier [16]. Antonio Oseas explains about the Hopfield Neural Network and Fuzzy C-Mean clustering techniques.

These combined Fuzzy detection algorithm will boost the survival rate of the subject [17]. Figure 1 shows death rates due to various diseases, in these major portion of the deaths occur worldwide is due to the tumors. This can reduce by creating an efficient early tumors detection algorithm and better treatment facilities to the subjects.Taher et al describes a technique in which a feature vector is extracted from Lantern Transform which classifies the region is affected or not [18]. Rubin et al proposed a technique in which reduces the false positives by using a dot enhancement filter. In olden days most of the research was focused on the 2D as well as 3D LDA based methods to label the tumor [19]. Conventional ROI based detection and thresholding methods are implemented in Hoffman et al paper where the portioned images are feeded into the histogram and histogram based fuzzy clustering will divide into tumor and no tumor images [20]. These are tested and validated in measured sensitivities of approximate 20 false positives per patient [20]. Fuzzy C-

Means techniques comprises of clustering of the data into multiple clusters where it is majorly used in most of the lung carcinoma detection algorithms [21].
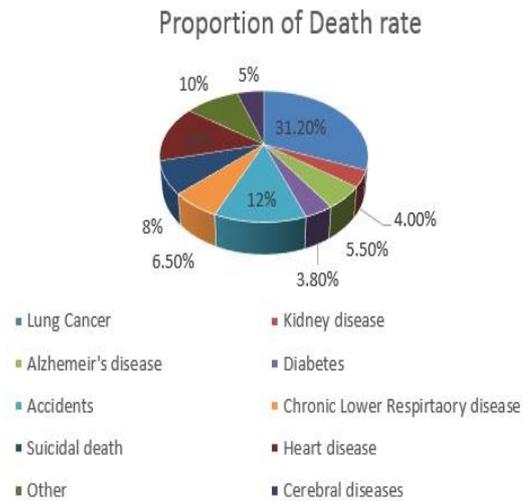

Figure 1: Proportion of Death Rate

In the Fuzzy C- means technique the trained data is featured into arbitrary shaped so that classification will be easy. The pre-processed binary image contains imperfections which can be threshold further to avoid the noise occur in the later stages of the algorithm. Prediction of the lung tumor will be a tedious task when the wall of the teratoma cell will vary it texture and shape. Due to the urban life style and pollution causes the mutations in the genetics that drives the carcinoma amelioration. Primarily studies states that these mutations can be taken account for the research and development of the automated algorithm for carcinoma detection [22]. For the individuals with high risk of Lung tumor can induce majorly due to Smoking and consumption of the alcohol. Due to the poor sensitivity of the radiographic images detection of the lung carcinoma in the early stages were difficult in the olden days. In this current era of technological advancements medical equipment are also advanced and able to produce a better resolution [23]. Also in future due to more advanced automated algorithms with the aid of Internet of Things (IOT) based medical equipment will hover in the main stay which will foresee the identification as well the diagnosis [24]. A standardized approach and better automated algorithms will help us to control carcinoma in the nearby future. Lung Carcinoma is predominantly seen in the major population in the world in which only 5 % of the patients only survives due to the proper early detection. Rest of the population is missed adequate treatment due to the lack of early detection.

Most of the lung carcinoma can be detected by using better radiographic images or by using autopsy. Also early detection of lung carcinoma can be studied with the help of different gene mutations. An efficient algorithm starts with preprocessing the data after the acquisition, the preprocessed data is feeded into a system where it is filtered and classified using a superficial classifier and decide whether the cell is malignant or benign. Classification phase will train the data according to the data in the database and clustered. Finally the clustered data is used for decision making algorithms.

Template matching in Image processing techniques using cross correlation method can be also used for the early detection of the lung carcinoma. Better accuracy and efficiency of an algorithm can be achieved by using a proper classification tool and as well as the preprocessing technique, thereby reducing the number of False Positives.

A good resolution CT image with balanced contrast will help clinicians in the early detection of malignant cells. Another way to increase the accuracy of the automated algorithms in lung carcinoma detection is to train the data with a large set of database. The more trained data, more accurate the results will be Identification and detection of the lung carcinoma in the earlier stages can save lives. With the latest advancement in the technologies combined with the automated algorithms will give better results in the early detection of the carcinoma. Early intervention of the detection algorithms will always help doctors to better understand the location of the Region and start diagnosis followed by the treatment. Nair et.al, [24] provided densely populated regions can be identified using density based clustering algorithm with minimal input parameters and noisy outliers. Nair et.al, [25] provided grouping of biological data using k-means clustering provides a dataset of genetic disorder from the phenotypical appearance in human body.

Sl. No	Method	Sensitivity	Accuracy
1	Histogram based Analysis method	75%	85.95%
2	Prewitt and Sobel based Algorithm Detection technique	69%	95.7%
3	Naïve Bayes Classifier detection	72%	80%
4	CBCT image processing with gamma analysis	85%	99.94%
5	Bacterial Foraging Optimization Algorithm for denoising the image	78%	89.76%
6	Watershed based segmentation Algorithm	87.14%	99%

Table 1:- Comparison of various Lung Cancer Detection Methods.

III. CONCLUSION

This paper encloses a brief review on various image processing and other techniques which are used for the early detection and diagnosis of the lung carcinoma. Also the proposed work comprises of a detailed comparison of the different methods based on sensitivity, accuracy and efficiency mentioned in Table 1.

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