A Review of Different Methods for Automatic Diagnosis of Oral Cancer

Anuradha S. Pandit, V.V. Dixit

Abstract: ***Oral cancer is having 6th rank out of all cancers in the world. There might be tumor in salivary glands, tonsils and also in neck, head, face and oral cavity. Oral cancer can be diagnosed with methods like biopsy or with screening method. In biopsy method small sample of tissue is being removed from affected part of the body and tested under microscope. But biopsy is invasive and painful. Also pathological analysis of it is time consuming. Screening method is non invasive. Early detection is possible with screening method which is necessary for improvement of survival rate. This paper presents different screening methods for detection of oral cancer. Optical Coherence Tomography and a variety of Machine Learning based techniques, including Artificial Neural Networks (ANNs), Bayesian Networks (BNs), Tree Boost Model are discussed in this paper.***

Keywords: OSCC, GLCM, SVM, Optical Coherence Tomography, Neo Maker, Deep Convolution Network.

I. INTRODUCTION

It is in cancer there is abnormal cells growth that gets control of normal tissues in the body. One of the most frequent abnormal growths in a part of human body is due to Oral Squamous Cell Carcinoma (OSCC). Death rate is familiar to be very high. It can be referred to any malignancy that has been begined in the head and neck region as it can be detected in any part of the oral cavity or oropharynx. As near about 400,000 new cancer cases accounted annually Oral Squamous Cell Carcinoma (OSCC) grades as the sixth most common cancer worldwide. Though early stage diagnosis and treatment of oral cancer will lead to higher survival rate than later, identifying the symptoms in the early stage manually is extremely challenging. After all it will also depend on the experience and skill of that person. Hence near about half of the oral cancer cases are not detected in early stages. To overcome this problem, effective methodology for early detection of oral cancer is required as early as possible. There are different techniques available for oral cancer detection like three-dimensional convolution neural networks (3DCNNs), digital Image processing techniques feature extraction, deep convolution neural network (DCNN) combined with texture map, Neo Mark system

II. LITERATURE REVIEW

Due to difficulty in detection of premalignant and malignant oral lesions, multiple times biopsy is needed. J. Woonggyu, J. Zhang, J. Chung, P. Wilder-Smith, M. Brenner, J. S. Nelson, and Z. Chen , for interpretation of different stages of oral cancer propogation authors have checked the suitability of OCT. OCT is made more suitable for diagnosis of Oral cancer is in this system by providing conventional 2-Dimentionl OCT images as well as 3-Dimentionl volume images premalignant as well as malignant oral injuries. OCT can clearly distinguish many histological features. The advantage of 3D images is that any structural information at any location and at any angle can be viewed as per the requirements of clinician. OCT uses diode based optical fiber system hence it is non invasive and inexpensive. In order to get more feasibility in the Current system broader light source which may enable resolutions approaching 1µm can be used.

As both morphological and biochemical changes go with transformation of normal tissues to neoplastic lesions. Both these changes should be concentrated during diagnosis of cancer. But optical imaging having fundamental lack of providing both information simultaneously. Hence J. A. Jo, B. E. Applegate, J. Park, S. Shrestha, P. Pande, I. B. Gimenez-Conti, and J. L. Brandon have first time developed bloodless imaging system. The system is developed by combining OCT and FILM. On comparing the sensitivity and specificity in early diagnosis of epithelial cancer, it is boosted for harmony of both instead of using a single modality. Three dimentional images provide high resolution. This system provides immediate diagnosis of lesions which are found in visual inspection. N. Sharma and H. Om proposed three predictive models. Based on classification analysis, the authors developed the predictive model. There are different predictive models like Single Tree, Decision Tree Forest as well as Tree Boost. They compared all these models and found out the effectiveness of the models for prediction of the endurance of the people those who are sufferer of oral cancer. Results and performance all the models are similar but Boost model is somewhat better than others. Use of neural network models for predicting the survival rate will be the future scope for the system. D. Salvi, M. Picone, M. Teresa Arredondo, M. Fernanda, C.Umpierrez, A. Esteban, S. Steger, and T. Poli presented the NeoMark system. Also for integrating all its related heterogenous data how they used an idea is also presented in this system. The main problem relevant to cancer treatment is recurrence. Its necessary to predict the probability of recurrence. It can done by analyzing the set of biomarkers. This paper presents ICT enabled cancer recurrence prediction method. though validation of the system showed positive results, still some improvements are still necessary.

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***** Correspondence Author

Ms. Anuradha S. Pandit, Assistant Professor, Department of E&TC Engineering, Shrimati Kashibai Navale College of Engineering, Pune, India.

Dr. Vaibhav Vitthalrao Dixit, Principal and Director, Department of Engineering, RMD Sinhgad Technical Institutes Campus, Warje, Pune, India.

K. Kalantzaki, E. S. Bei, K. P. Exarchos, M. Zervakis, Garofalakis, D. I. Fotiadis, taken help of sparse experimental temporal data and suggested a framework for building and evaluate gene network. Also look over its implicity in oral cancer

X. Wang and A. Eisbruch have used IMRT advanced technology for high radiation dose on affected areas.

K. Kourou, C. Papaloukas and D. I. Fotiadis utilized transcriptomic data for identifying the most differentially expressed genes. Also they performed pathway enrichment evaluation for the particular gene list. This will help to find out the most important alley in terms of overrepresentation. DNB algorithm is employed for implementing the methodology.

K. Kourou , T. P. Exarchos , K. P. Exarchos , M. V. Karamouzis , D. I. Fotiadis have discussed the different predictive models based on different supervised ML techniques. The main task in learning is classifications. Summery is done for Application of different ML techniques in forecasting cancer by discussing different ML techniques.

C. R. M. Ahmed, M. Narayanan, S. Kalaivanan , K. S. Narayanan , A. K. Reshmy have detected and classified affected cancerous cell. They used digital image processing techniques for feature extraction. It clearly visualizes the affected areas. They used firefly algorithm for detection of cancer tumor. For classification of cancer cells they used Expectation maximization (EM) algorithm . In future scope is whether cancer cells are spreading to other parts.

Rajdeep Mitra and Dr. Menaka R have concentrated on image enhancement so that the affected areas of cancer can be effectively diagnosed. For enhancement of image, different operations are carried out on an Image like image segmentation, feature extraction. Dynamic output is achieved in this system by fusing GLCM features with Watershed segmentation. This analysis can be applied in future for characterizing the cancerous, precancerous and non cancerous lesions. H. Rajaguru, S. K. Prabhakar have used Hybrid Artificial Bee Colony – Particle Swarm Optimization (ABC-PSO) algorithm and Bayesian Linear Discriminant Analysis (BLDA) for classifying the risk levels of cancer. For classification of oral cancer they used Gaussian Mixture Models (GMM) and Multi Layer Perceptrons (MLP). Linear Layer Neural Networks is also used for classification. Authors have presented the accuracy of classifier at different stages of Oral cancer. It can be enhanced by using different classifiers and different machine learning algorithms.

D. Padmini Pragna, Sahithi Dandu, Meenakzshi M, C. Jyotsna, Amudha J.

In the proposed work, the health alert system is fed with CT scanned images. And these images are classified as normal or abnormal by performing different operations on it. Operations are performed to increase the pixel clarity. Preprocessing of CT image is performed using Adaptive Median Filter. And then the different features such as Texture, Shape, Water Content, Linear Binary Pattern (LBP), Histogram of Oriented Gradients (HOG) and Gray Level Co-occurrence Matrix (GLCM) are extracted from preprocessed images. The unnecessary features are excluded using features election process. For classification as benign or malignant Support Vector Machine (SVM) classification algorithm is used.Arianna Strome, Susanne Kossatz, Daniella Karassawa Zanoni, Milind Rajadhyaksha, Snehal Patel, and Thomas Reiner have analyzed current methodologies. Current methodologies were having lack of specificity. Also these methods are having inconsistent evident of their utility in clinical practice. Hence there is need for clinical tool that can separate, detect, and describe OSCC. This gap could be filled by molecularly targeted optical imaging. The system uses an ideal targeted imaging agent. That is to be fluorescent, targeted against an abundant biomarker, inexpensive, and simple to use. With this imaging tool, it is expected to improve early detection of tumors.

H. Rajaguru and S. Kumar Prabhakar have compared classification accuracy of TNM staging system with the aid of MLP and GMM classifiers. Post classifier for oral cancer classification Extreme Learning Machines (ELM) is employed in this system. Also there is a comparison between this system and both GMM and MLP is done.

R. Anantharaman, V. Anantharaman, Y.Lee uset d deep learning technique. Analysis of oral cavity images is done in this system. Hardware from this system is very good for capturing oral images. The hardware not only captures the oral cavity images but also it provides diagnosis at right point without waiting for the dentist go through the images. The data set in this system is very less, need to more work in this area using deep learning. S. Xu, C. Liu , Y. Zong , S.Chen , Y. Lu, L. Yang, E. Y. K. Ng , Y.Wang, Y.Wang, Y. Liu, W. Hu, C. Zhang used 3dimensional Convolution Neural Network for analyzing the images. Also 2Dimesion & 3 Dimension Convolutional Neural Network comparison is done this system. 3 Dimension Convolutional Neural Network provides better results as compared to 2 Dimensional convolutional Neural Network. In this system early diagnosis of oral cancer is done with the help of 3 Dimensional Convolution Network. It early diagnose malignant and benign. A. E. Heidari, S. P. Sunny, B. L. James, T. M. Lam, A.V. Tran, J. Yu, R. D. Ramanjinappa, U. K, P. Birur, A. Suresh, M. A. Kuriakose, Z. Chen, and P.Wilder-Smith designed mobile OCT imaging system. in the remote areas where specialist and facilities are not available, it is really difficult to diagnose oral cancer. In such a case this system provides easy diagnosis by providing a good mobile based screening. There is need to enhance speed of image processing. C.H.Chan, T. T. Huang, C.Y. Chen, C.C. Lee, M.Y. Chan, and P.C. Chung proposed model that marks ROI and cancerous region automatically. Gabor filtering method and wavelet transform methods are used in this system. Standard deviation is computed. This will be helpful for preparing texture map and it will be used as an input for deep convolution network.

III. CONCLUSION

In order to decrease mortality rate in Oral Cancer its early diagnosis is very important. Manual detection will require more time as well as may not give accurate results, after all it depends on skill of expertise. Hence there is a need of automatic detection. The different methods are listed in this paper like OCT, combination of OCT and FILM, different predictive models, novel ICT based method, IMRT advanced technology, Gaussian Mixture Models (GMM) and Multi Layer Perceptrons (MLP), Multi Layer Perceptron (MLP) and Gaussian Mixture Model (GMM) classifiers.

Extreme Learning Machines (ELM) and different machine learning algorithms are used. Recently machine learning shows better resuls.

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AUTHORS PROFILE

Ms. Anuradha S. Pandit received her M.E. degree in E&TC Engineering in 2016 from SPPU, Pune, (India). Presently she is working as an Assistant Professor, in Shrimati Kashibai Navale College of Engineering, Pune,(India). Her research areas include neural networks and Biomedical applications. She has 5yrs teaching experience.

Dr. Vaibhav Vitthalrao Dixit received his Ph.D. degree in E&TC Engineering in 2015 from SPPU, Pune, (India). Presently he is working as Principal, RMD Sinhgad School of Engineering and Director of RMD Sinhgad Technical Institutes Campus, Warje, Pune, (India). His research areas include pattern recognition, neural networks and Biomedical applications. He has 19 yrs of teaching and 5 yrs Industrial experience.