FOREX Publication
Open Access | Rapid and quality publishing

International Journal of
Electrical and Electronics Research (IJEER)
Research Article | Volume 10, Issue 4 | Pages 788-791 | e-ISSN: 2347-470X

# Oral Tumor Segmentation and Detection using Clustering and Morphological Process

**Mahima Bhopal[1], Rajeev Ranjan[2] and Ashutosh Tripathi [3]**
*[1,2,3]Department of Electronics and Communication Engineering, Chandigarh University, Mohali, Punjab, India,*
*[1]mahima30bhopl@gmail.com, [2]rajeevranjan1134@gmail.com, [3]ashu20034@gmail.com*

***Correspondence:** Mahima Bhopal; Email: mahima30bhopl@gmail.com

**ABSTRACT-** Oral tumor is one of the most widely recognized tumors growing globally, continuously promoting a high mortality rate. Because early detection and treatment remain the most effective interventions in improving oral cancer outcomes, developing complementary vision-based technologies that can reveal potential evil high-quality oral diseases (OPMDs), which carry the risk of developing cancer, represent significant opportunities for the oral screening process. This paper proposes a morphological algorithm to preserve edge details and prominent features in dental radiographs. This technique, in the early stage identifies the oral tumor detection using clustering and morphological processing. This algorithm would allow for the identification of tumors in these images. Applying pre-processing in images leads to over-segmentation even though it is pre-processed.

**General Terms:** Mouth cancer detection, image processing, segmentation.
**Keywords:** Oral tumor, Segmentation, Clustering, Morphological processing

ARTICLE INFORMATION
**Author(s)**: Mahima Bhopal, Rajeev Ranjan and Ashutosh Tripathi;
**Received**: 03/07/2022; **Accepted**: 30/09/2022 ; **Published**: 18/10/2022
**e-ISSN**: 2347-470X;
**Paper Id**: IJEER-RDEC7298;
**Citation:** 10.37391/IJEER.100403
**Webpage-link**:
https://ijeer.forexjournal.co.in/archive/volume-10/ijeer-100403.html



## 1. INTRODUCTION

Oral infection or tumor is a sort of mouth cancer development in the mouth or oral cavity. These tumors are mostly found in lips, mouth, and tongue and can also be found in the gums, cheeks, top of the mouth, salivary organs, and tonsils. One of the most common cancers nowadays increasing worldwide is oral cancer. It now ranks as the sixth health problem in the world. The mortality or demise rate from oral cavity tumors grows and frequently expands [1]. Also, this tumor is very much common in India. India alone records over 33% of cases and 20% of the mortality rate. In India, Oral Tumor is the second most health problem [2]. The main causes of oral tumors are tobacco and alcohol consumption. Other factors driving this tumor may be a history of mouth cancers, genetics, unhygienic oral health, etc. [3,4].

According to American studies of cancer society, it is seen that men face double the possibility of growing oral cancer as compared to women; men who have the age above 40 years are at a higher possibility of getting oral cancer. The people who consume smoke and tobacco are at the risk of getting tumors, and those who do not consume smoke or any kind of tobacco face this risk. About 25% of people who do not consume any type of smoke or drink or tobacco consumption are at the risk of getting oral cancer, and 75% of oral cancers are found in people who consume smoke and alcohol [5,6]. CT, MRI, ultrasound, and PET are used to detect changes in tumors. None of these methods can provide a complete picture of a disease testing; MRI and sonography provided structural information on tumors, such as the place and addition; and at the same time, activated neurology and mono photo dialysis uncovered valuable atomic data [6,8]. Moreover, there are still requests for working on the spatial and contrast goals of these modalities to give more precise data. Early detection of tumor changes helps schedule surgery and minimize postoperative complications, especially in invasive and malignant tumors. A conclusive determination of malignant growth requires histopathological evaluation, which involves tissue arrangement and can be time-consuming. In huge cancers, a few examples from various regions should be taken. The surgery to remove a tumor often involves examining the margins of the removed tissue several times. This is important to ensure that the area around the cancer is clear and free of the tumor. In such cases, it may not be practicable to carry out an immediate and precise organizational pathology examination [4]. Artificial intelligence (AI) could be helpful as an additional diagnostic tool in some instances because intraoperative frozen sections are not always a good predictor of an ideal outcome.

The most common method used to detect oral cancer present in the mouth is Biopsy. The biopsy is the technique that the doctor suggests for diagnosing most types of cancer. In past years, even doctors with experience and knowledge could not determine the location of the biopsy. Early detection of oral cancer can help doctors operate quickly and efficiently. With his early accurate detection, many methods can be used. Mostly the three ways that are used such as i) Biopsies ii) surgery iii) Image testing. There has been growth in the treatment of oral cancer through different treatments like radiation and chemotherapy; despite that the death rate has not changed over many past years. There are two types of tumors, namely benign and malignant. The most cancerous tumor is malignant as it may also spread to other tissues [3,8]. Benign tumors are non-cancerous, and the cell tends to spread and grow slowly. They have clear boundaries.

FOREX Publication
Open Access | Rapid and quality publishing
International Journal of Electrical and Electronics Research (IJEER)
Research Article | Volume 10, Issue 4 | Pages 788-791 | e-ISSN: 2347-470X

Malignant tumors are the cancerous ones. They applied to other parts of the body from the origin. The National Centre for Health Statistics has gathered mortality information through 2019. In 2022, there will be 1,918,030 new instances of disease and 609,360 passing from malignant growth. This incorporates 350 passes each day from a cellular breakdown in the lungs, the primary source of disease demise. Treating malignant growth, particularly late-stage disease, is over the top expensive. The late examination need not describe, as oral sickness is ordinarily gone before by evident oral bruises, named anticipated oral malignancies (OPMDs), which can be recognized by a clinical oral appraisal (COE) by a general dental expert during routine screening. If a dubious sore is identified, the patient alludes to an expert for affirmation of the analysis and further treatment [14-16]. Past investigations in India show that screening has brought about early findings, a down-organization of the infection, and a decrease in mortality among the individuals who use tobacco and liquor. Since the vast majority of the weight of oral disease falls on LMICs because of the set number of trained professionals and medical care assets, screening projects should give a practical and productive way to deal with calculation. One such reasonable methodology would be the utilization of telemedicine [7]. The cycle which distinguishes this cancer from harmless injuries depends on tiny pictures. In recent publications, the use of deep learning-the artificial neural networks was used. Convolutional neural networks (CNNs) are one of the essential tools that are being used in medical fields for the detection of different cancers. Image processing is also the work of research nowadays. Various techniques of image processing are being used for detection. To track down a solution for the untimely identification of mouth sickness, assembling clinically hacked data is essential to enable mechanized structures to be created. This should be done at a large scale to take advantage of significant learning [7]. There is still much research for accurate, simple, and fast methods to detect oral cancer. One of the most efficient methods, FT infrared spectroscopy, detects abnormalities that support early oral cancer detection. In infrared spectroscopy, IR radiations are used, and a pattern produced by it is known as an interferogram. It is difficult to detect the early stages of oral cancer; oral tumors may be present in different forms, which should be familiar to oral health care workers.

In this paper, we proposed a system for early detection of oral cancer so that doctors can take appropriate measures to prevent it and know the accuracy of the position of oral cancer. This oral cancer is detected using image processing which uses the image segmentation process for a clear view of cancer. The segmented image helps find the type of tumor present in the oral. Morphological image processing has been used to obtain a clear picture without any distortion in the vision.

## 2. SYSTEM MODEL

Firstly, input image data is captured, and in the pre-processing of the image, it is done so that the nature of the picture can be viewed. Their further step is to segment the image, and for image segment, dean thresholding is done. Thresholding is one of the simple forms for segmenting the image still. Stallone of the efficient methods. Then the morphological process is used for boundary detection. Then anisotropic filtering is used to increase the quality of the image texture. Then collecting the content center extraction is operated by using the Stockwell theorem. Then comes the step that is clear, classification of the tumor, whether it's Benign, Malignant using different classifiers.

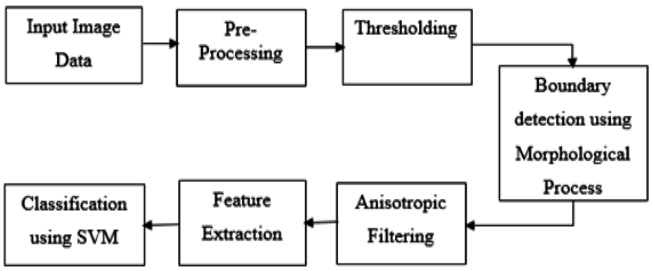



**Figure 1:** Block diagram for segmentation

Image processing is the image-to-digital form technique to gather all the valuable information from the picture. The processes like CT scans and MRI images, become blurred dry so that we can use an image processing algorithm. It enhances the image and increases the quality of the image, which helps identify tumors if present. This technique needed some different operations as shown in *figure 1*.

Initially take input image data then apply pre-processing and thresholding. Pre-processing is a process where we can remove or extract undesired elements and improve a feast pectate which is essential for specific applications. Pre-processing is done so that we can get better results. It enhances the vision of the picture. There are steps of processing using rereading the image, residing the move distortion, and segmenting

### 2.1 Image Segmentation

In digital image processing, sometimes we need to detach the virtual object from the image to get a clear hint of the tincture. Segmentation of pictures helps in this distribution. Each pixel is allotted some label in this procedure, which then pixels are reshared with these characteristics. Segmentation is popularly used in the medical field for the detection of cancer. Therefore, due to these segmentation properties, we have used the segmentation of the image.

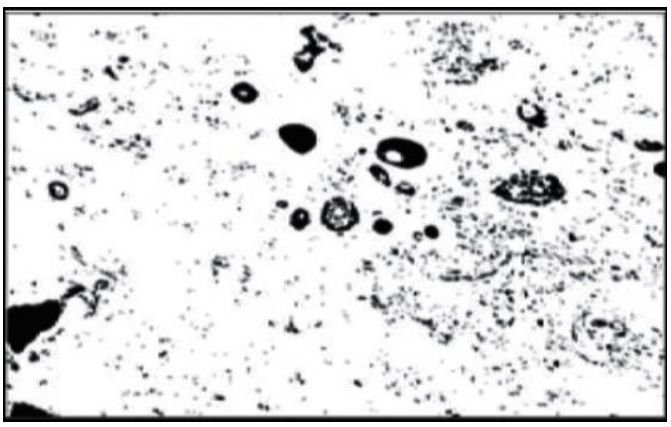


**Figure 2:** Segmented Extraction

FOREX Publication
Open Access | Rapid and quality publishing
International Journal of Electrical and Electronics Research (IJEER)
Research Article | Volume 10, Issue 4 | Pages 788-791 | e-ISSN: 2347-470X

A method that can collect the content of pictures for arrangement and regain. It is valuable for the commutative estate to ask for a specific application. There are two types of feature extraction – 1st order and 2nd order. In the 1st order, measures are statistics, and they are only calculated from the pixels. In 2nd order, measures considered relationship be neighborhood relationship and solo pixel [4].

## 2.2 Morphological Operators

Morphological operators are used in image processing and even in many fields such as texture examination, elimination of disturbances in an image, and boundary extract. Morphological image processing is used to extract image components for representing and describing region shape, boundaries, and skeletons. Morphological operators verify the image shape and the shape conditions of different types like moonscapes and square-shaped [5]. It operates on a set of pixels. There are two essential operations of this process – erosion and dilation, in which addition and reduction of pixels are made from the object.

## 2.3 Stockwell Ransform

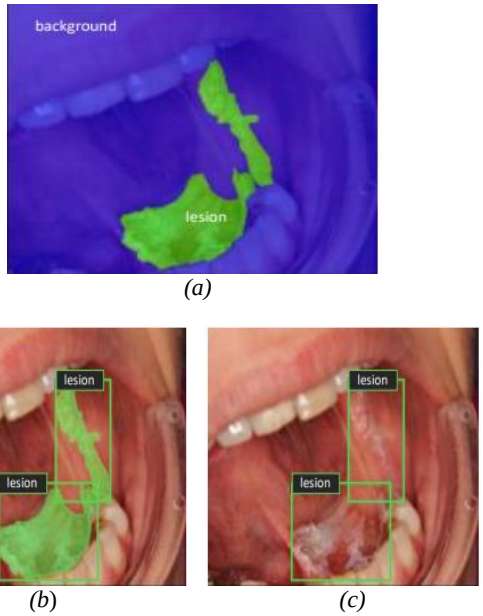
In signal processing, a time-frequency examination is a valuable tool. DSP uses the word 'Transform' commonly as it changes or transfers one form of signal into another. Signals often represent quantities that change over time, such as sound or mechanical vibration. These quantities, such as time and frequency, are quickly visible in a signal. Tools like Fourier Transform (FT), short-time FT, and wavelet transform (WT) can be used to change a signal into a simple form for analysis. One of the most well-known transforms among these is FT. This component has clear physical meaning and compositions known to vibrate. But these vibrations are throughout, which makes the sound notes or pictures not clear. The basic idea for the introduction of Stockwell is a way to connect the DWT and CWT. By using a Fourier-like basis and keeping the phase at zero at t=0, Fourier-based analysis could be performed locally. A problem like STFT is needed to create a complex Fourier signal. ST uses a window, which is Gaussian in nature and has a length and width controlled by the frequency of the data. There are no cross-qualification problems, so there is better signal clarity than other transformations [8,9]. The algorithm of ST is based on CWT and STFT [10-13].

$$s(\tau, f) = \int_{-\infty}^{\infty} x(t) \frac{|f|}{\sqrt{2\pi}} e^{\frac{-(t-\tau)^2 f^2}{2}} e^{-j2\pi f} dt$$

where frequency and time shift are represented by ' f ' and ' τ ' respectively.

# 3. RESULTS AND DISCUSSION

The work is stimulated in MATLAB using clustering and morphological image processing. The ST is applied for the feature extraction of the image, and morphological image processing gives us the precise image or the enhanced image by shaping the image. The segmented image is obtained and how below




*(a)* *(b)* *(c)*

**Figure 3:** (a) Segmented image (b) Instance segmentation (c) Object Detection

*Figure 4* below shows a different semantic segmentation test that has been done. Hyperparameters were enhanced given the exhibition on the approval set. The outcomes for the foundation versus injury division task are noted. The Efficient model is accomplished. The expected veil yields and their ground-truth covers are accommodated in the test pictures in *Figure 6*, utilizing the best working model.

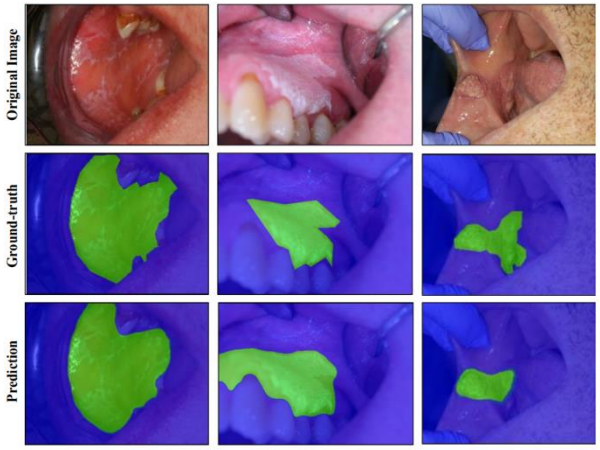



**Figure 4:** Semantic Segmentation

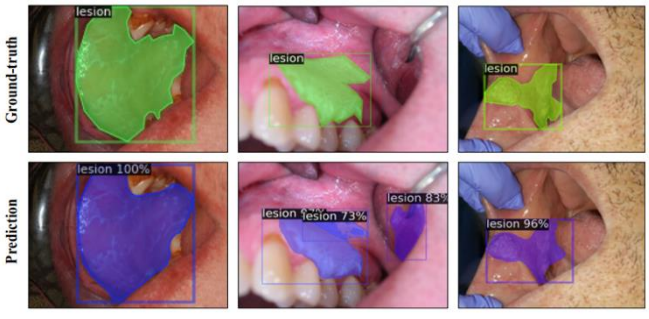



**Figure 5:** Instance Segmentation

FOREX Publication
Open Access | Rapid and quality publishing
International Journal of Electrical and Electronics Research (IJEER)
Research Article | Volume 10, Issue 4 | Pages 788-791 | e-ISSN: 2347-470X

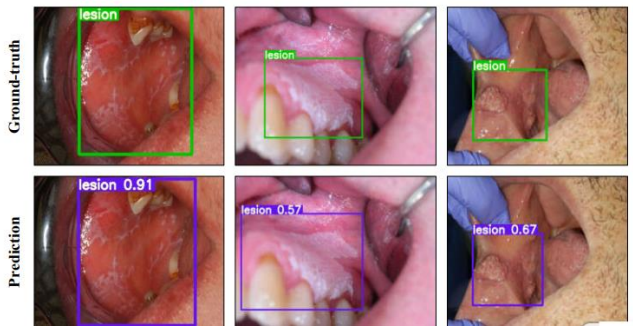



**Figure 6:** Oral Lesion Result

## 4. CONCLUSION

This paper demonstrates a new method of detecting mouth cancer. The image drawn from this method is straightforward and enhanced, and it is used in the early detection of the tumour, which is necessary for the surgeons to operate. The Stockwell transform makes it more efficient and using clustering and morphological image processing, we get a clear view of the tumour. This enables us to detect the tumour efficiently as older techniques used before were less efficient. The proposed method is implemented using MATLAB, which gives better image processing. The proposed way is efficient, simple and easy to implement, and has better accuracy as the image pixels are increased. The input image received in the output is enhanced, and segmentation is applied, making the classification of tumours easy. In the future, it can be further enhanced and can be used in detecting other health issues containing the tumour.

## REFERENCES

[1] Ranjan, R., Jindal, N., & Singh, A. K., "The identities of n-dimensional s-transform and applications," Multimedia Tools and Applications, 2022. https://doi.org/10.1007/s11042-022-12757-8

[2] B. Song et al., "Mobile-based oral cancer classification for point-of-care screening," Journal of Biomedical Optics, vol. 26, no. 6, 2021. https://doi.org/10.1117/1.jbo.26.6.065003.

[3] Sharma, N., Nawn, D., Pratiher, S., Shome, S., Chatterjee, R., Biswas, K., Pal, M., Paul, R. R., Dutta, S., & Chatterjee, J. (2021). Multifractal Texture Analysis of Salivary Fern Pattern for Oral Pre-Cancers and Cancer Assessment. IEEE Sensors Journal, 21(7), 9333–9340 https://doi.org/10.1109/JSEN.2021.3053262

[4] C. S. et al., "Machine learning and treatment outcome prediction for oral cancer," Journal of Oral Pathology and Medicine, vol. 49, no. 10, pp. 977–985, 2020. https://doi.org/10.1111/jop.13089.

[5] Ranjan, R., Jindal, N., & Singh, A. K. (2020). Fractional S-Transform and Its Properties: A Comprehensive Survey. In Wireless Personal Communications (Vol. 113, Issue 4, pp. 2519–2541). Springer. https://doi.org/10.1007/s11277-020-07339-6.

[6] R. A. Welikala, et al., "Automated Detection and Classification of Oral Lesions Using Deep Learning for Early Detection of Oral Cancer," IEEE Access, 8, 132677–132693, 2020. https://doi.org/10.1109/ACCESS.2020.3010180.

[7] R. Ranjan, N. Jindal, and A.K. Singh, "A Sampling Theorem for Fractional S- transform with Error Estimation, "Digital signal processing, vol. 93 (2019), pp.138-150.

[8] R. Ranjan, N. Jindal, and A.K. Singh, "Convolution theorem with its derivatives and multiresolution analysis for fractional S-transform," Circuits, systems, and signal process, (2019) 1-24.

[9] R. Ranjan, N. Jindal, and A.K. Singh, "A sampling theorem with error estimation for S-transform," Integral Transforms and Special Functions, (2019) 1-21.

[10] Chan, C. H., Huang, T. T., Chen, C. Y., Lee, C. C., Chan, M. Y., & Chung, P. C. (2019). Texture-Map-Based Branch-Collaborative Network for Oral Cancer Detection. IEEE Transactions on Biomedical Circuits and Systems, 13(4), 766–780. https://doi.org/10.1109/TBCAS.2019.2918244.

[11] H. Zhalong et al., Early-Stage Oral Cavity Cancer Detection: Anisotropic Pre-Processing and Fuzzy C-Means Segmentation, 2018.

[12] R. Ranjan, N. Jindal, and A.K. Singh, "Multiplicative filter design using S-transform," IEEE conference 'ICMETE-2018' DOI: 10.1109/ICMETE.2018.00064.

[13] T. Derlin, et al., "Molecular Imaging in Oncology Using Positron Emission Tomography," Deutsches Arzteblatt international, vol. 115, no. 11, pp.175–181, 2018.

[14] A. E. Heidari et al., "Optical Coherence Tomography as an Oral Cancer Screening Adjunct in a Low Resource Settings," IEEE Journal of Selected Topics in Quantum Electronics, 2018.

[15] J. Wang, Y. Xu, and S. A. Boppart, "Review of optical coherence tomography in oncology," Journal of Biomedical Optics, vol. 22, no.12, 2017.

[16] K. Anuradha and K. S. Narayanan, "Detection of Oral Tumor based on Marker-Controlled Watershed Algorithm," In International Journal of Computer Applications, vol. 52, Issue 2, 2012.

[17] Harendra singh and Roop Singh Solanki (2021), Classification & Feature extraction of Brain tumor from MRI Images using Modified ANN Approach. IJEER 9(2), 10-15. DOI: 10.37391/IJEER.090202. https://ijeer.forexjournal.co.in/archive/volume-9/ijeer-090202.html

[18] Harendra Singh, Roop Singh, Parul Goel, Anil Singh and Naveen Sharma (2022), Automatic Framework for Vegetable Classification using Transfer-Learning. IJEER 10(2), 405-410. DOI: 10.37391/IJEER.100257.

[19] V. Sanjay and P. Swarnalatha (2022), A Survey on Various Machine Learning Techniques for an Efficient Brain Tumor Detection from MRI Images. IJEER 10(2), 177-182. DOI: 10.37391/IJEER.100222.