

COMPUTER AIDED CANCER CELL DETECTION USING IMAGE PROCESSING TECHNIQUE – A REVIEW

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ABSTRACT

In recent years the image processing mechanisms are widely used in several medical areas for improving earlier detection and treatment stages particularly in various types of cancer. Image processing is a method to perform some operations on an image in order to get an enhanced image or to extract some useful information from it. Cancer is a most dreadful disease in this era. Time is a major factor in cancer treatment because the mortality rate and spreading of cancer is high compared to other diseases. So more focus must be given on this area. The intention of this bibliographic review is to provide researchers deciding to work and easily understand the situation to find out better approach among them.

Keywords: Cancer, Image Processing, Segmentation, Feature Extraction.

I. INTRODUCTION

Globally, cancer caused 9.6 million deaths in 2018 and about 1 in 6 deaths is due to cancer. Approximately 70% of deaths because of cancer, especially in low- and middle-income countries. More than 1.8 million new cancer cases are expected to be diagnosed in 2020 Therefore; cancer is a serious problem affecting the health of all human societies. Cancer in the broader sense refers to more than 277 different types of cancer disease. Scientists have identified different stage of cancers, indicating that several gene mutations are involved in cancer pathogenesis.

Cancer is the second leading cause of mortality worldwide. It envisaged a “normal cell” transformed to “a typical or dysplastic” cell with progression into invasive of malignant cell. It is a group of diseases characterized by the uncontrolled growth and spread of abnormal cells. The prevalence of cancer has actually increased; just in the United States alone, approximately 1,665,540 people suffered from cancer, and 585,720 of them died due to this disease (Siegel *et al.* , 2013).

Cancer has the uppermost mortality rate, among other non-communicable diseases in the world (Fallahzadeh *et al.*, 2014) because of high occurrence. Early detection strategies are needed (Mohammadzadeh and Safdari, 2014; Vemuri *et al.*, 2014; Azadmanjir *et al.*, 2015; Shridhar *et al.*, 2015) for this type of diseases. It is diagnosed by using the aid of image processing such as image acquisition, preprocessing (segmentation, enhancement and noise elimination), processing, post processing and diagnosis (Demir and Yener, 2005; Patil and Jain, 2014).

Nowadays, image processing is rapidly growing technologies. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image. In general, computer-assisted image analysis are used to predict and diagnose the diseases. Particularly cancers since the early 1970s (Loukas *et al.*, 2003). Similarly, computerized image processing helps to early and correct detection of malignant tissue and decreases pointless biopsies (Polakowski *et al.*, 1997; Ganesan *et al.*, 2013; Sundari *et al.*, 2014).

II. LITERATURE REVIEW

Breast cancer is the most common cause of death in women and the second leading cause of cancer deaths worldwide (Deserno, 2010), and the chance of developing invasive breast cancer at some time in a woman's life is about 1 in 8 (12.5%). Approximately 182 000 new cases of breast cancer are diagnosed and 46 000 women die of breast cancer each year in the United States (Cheng, *et al.*, 2003).

According to Globocan latest report, there are 14.1 million new cancer cases, 8.2 million cancer deaths and 32.6 million people who living with cancer in 2012 worldwide. Almost 57% (8 million) of new cancer cases, 65% (5.3 million) of the cancer deaths and 48% (15.6 million) of the 5-year prevalent cancer cases happened in the fewer developed regions.

Early stage detection of cancer can save millions of lives. Computer-aided detection is used for early detection of cancer. Kumar (2015) proposed a new cancer detection technique using clinical interpreferable features. This algorithm works on K mean cluster and segmentation concept. This consists of so many stages like segmentation of cells, feature extraction and classification technique for the enhancement approach. The original image was divided into segments by using image segmentation concept of image processing.

Sampaio *et al.*, (2011) presented a computational methodology for detection of masses in mammogram images which can be described in following steps: (1) removing noise and objects outside the boundary and highlighting the internal structures of the breast, (2) regions containing mass are segmented using cellular neural network, (3) Thereafter the shape of these regions are analyzed through shape descriptors, (4) classification of candidate region is classified as masses or non-masses through Support Vector Machine.

Vaishaw (2018) reported that image processing techniques are very useful to detect tumor cells. A methodology is used to gather on average information parameters by applying image processing tools for lung cancer investigation the lung cancer diagnosis is the time constrictions for physical diagnosis. So they

proposed a method which successfully rejected the null hypothesis test by implementing a standard statistical model.

Kishor Kumar Reddy *et al.*, (2015) reported a novel approach for detecting the tumor size, bone cancer stage and segmented the region of interest by using region growing algorithm. Tumor size is calculated according to the number of pixel in the extracted tumor part. Depending upon the total pixel value cancer stage is identified. Selection of seed point depends on the image and it is difficult to select accurately.

Dimililer (2017) state that the image processing techniques such as image pre-processing, image erosion, median filtering, thresholds and feature extraction. It is applied in CT images and they discussed the development of an image processing algorithm for lung cancer detection using CT images.

Kyoung-Mi Lee and W. Nick Street, (2003) have erected a technique for automated detection and segmentation of breast cancer by neural network. To learn the cluster shapes to classify the nuclei and it grows incrementally by creating a new cluster whenever hidden cluster shape is presented. The hidden nodes in each cluster deliver fast, more precise nuclei detection and segmentation.

Dimililer *et al.*, (2016) state that Eye Tumour Detection System (ETDS) and an Intelligent Eye Tumour Detection System(IETDS) are an image processing model that combines different techniques in the field of image processing. ETDS is used to detect eye tumours located within the iris and mark them on the original image using image fusion, whereas IEDTS detects tumours within the intelligent system.

Image enhancement is a technique to reduce the noise, scratches and obstructions. Feature extraction helps in the extraction of the lung affected regions, where the calculation such as area & perimeter is calculated. That is used to validate the spread of the lung cancer across the cells. The stages and occurrence of the lung cancer can be identified by Classification of algorithms (Kulkarni 2014).

III. IMAGE PROCESSING TECHNIQUES

Image processing techniques is widely used in various medical sectors. It involves performing several operations on images to extract some constructive information. It is very obliging in the early detection of various cancers.

Image Enhancement

Image enhancement defined as a way to improve the quality of image, so that the resultant image is better than the original one. Image enhancement techniques can be divided into two broad categories: Spatial domain methods and frequency domain methods. It is the simplest and most tempting areas of digital image processing. Mainly, the idea behind enhancement techniques is to bring out detail that is obscured, or simply to highlight certain features of interest in an image. Such as, changing brightness and contrast etc.

Image Restoration

It is an area that also deals with enlightening the morphology of an image. However Contradictory enhancement, which is subjective, image restoration is objective, in the sense restoration techniques tend to be based on mathematical or probabilistic models of image degradation.

Image Detection

Image or Object Detection is a computer technology that processes the image and detects objects in it. It detects Cancer cells and it involves radiological imaging. Imaging is also used to check the spread of cancer and progress of treatment, and to monitor cancer cells. Oncological imaging is continually becoming more varied and accurate. Different imaging techniques aim to find the most appropriate treatment.

Image Reconstruction

Reconstructing a two-dimensional field from its one-dimensional projections where the projection are at various angles relative to the object.

Compression

Compression deals with techniques for reducing the storage required to save an image or the bandwidth to transmit it. Particularly in the uses of internet it is very much necessary to compress data.

Image Analysis

Representing image information into a form compatible with automated, machine based processing, usually in an interpretative context.

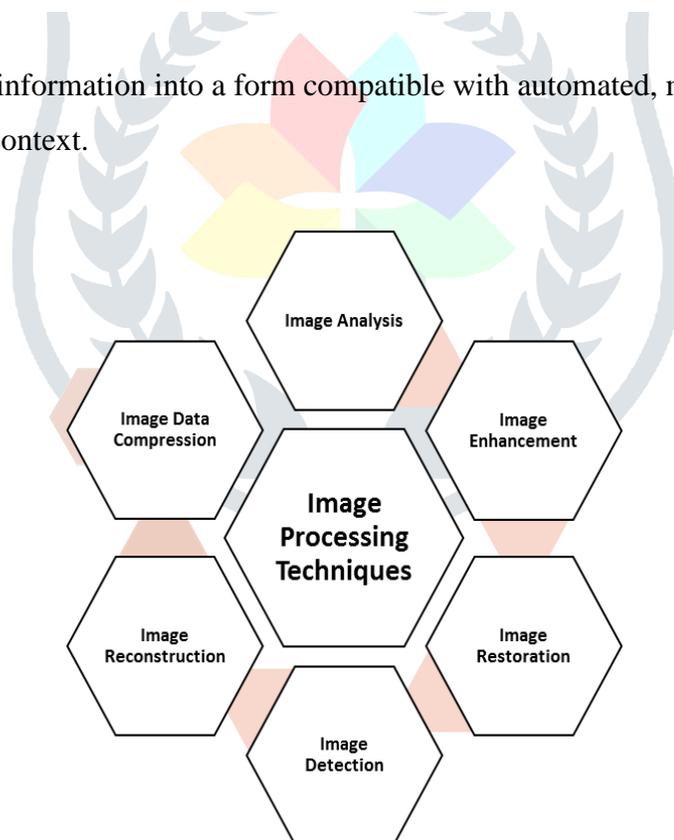


Figure.1 Graphical Representation of Image Processing Techniques

Image segmentation

Image segmentation is used to divide an image into parts having similar features and properties. Sophisticated algorithms based on image processing and computer vision are being developed to segment the region of interest from medical images The main aim of segmentation is to simplify the image by presenting

in an easily analyzable way. Some of the most popular image segmentation methodologies are edge, fuzzy theory, partial differential equation (PDE), artificial neural network (ANN), threshold and region-based segmentation (Kaur & Kaur, 2014).

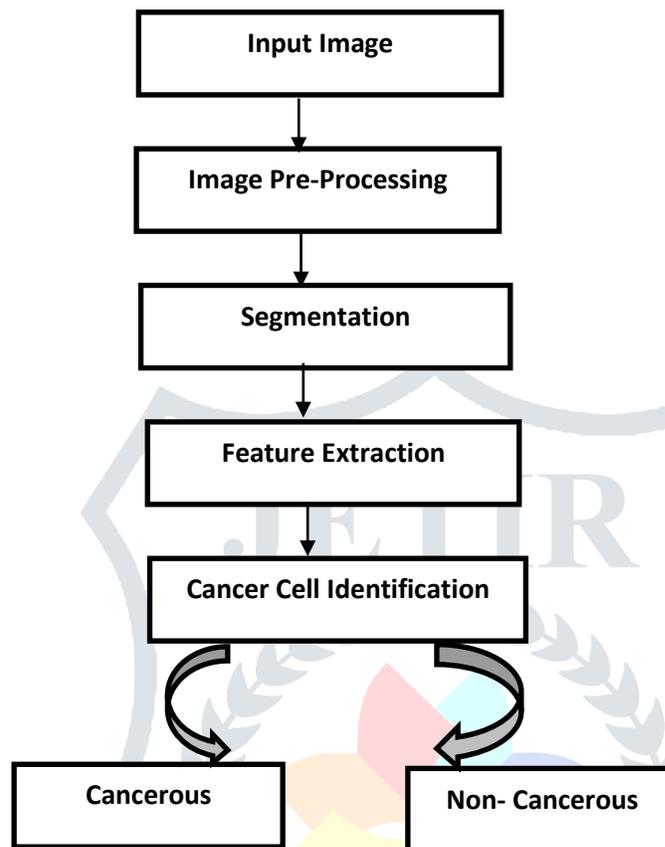


Figure.2 Structural Outline of cancer cells detection by image processing techniques

IV. APPLICATIONS OF IMAGE PROCESSING

a) Agriculture: Ranu Gorai, (2016) reported that the image processing approach is very suitable for agricultural domains. It can be used for the yield management to produce scoring, seeding etc. This approach can be utilized for performing numerous works which cannot be implemented manually. The fresh fruits can be graded and sorted with the aid of image processing. Especially the fuzzy logic analysis can be used for the grading of crops.

b) Communication: Image processing plays several role in communication field, such as video conferencing, density and telecommunication. It provides support for the identification of features during the video conferencing, coding and it is performed for the interpretation of vocal interaction.

c) Character Recognition: The handwritten and printed documents can be easily recognized with the aid of image processing applications.

d) Commercial use: A numerous operations like stocking, signature and bar coding. The barcodes and signatures can be documented in confidential manner with the help of image processing approach.

e) **Medicine:** The technique of image processing is used in clinical regions for the recognition of body parts performance. This approach is also used in the radiography of skull and chest.

f) **Visual Inspection:** The computer vision, mechanism vision and optical scrutiny are the three main classifications of image processing. A combination of Artificial intelligence and image processing is used for the generation of computer vision on the basis of single or more picture scrutiny. The output of processor vision is obtained in the form of picture sense.

V. VIRTUES OF DIGITAL IMAGE PROCESSING

- ✓ Images can be given more sharpened and better visual appearance.
- ✓ Minor errors rectified.
- ✓ Size of the image enlarged or minimized.
- ✓ Image can be compressed and decompressed for faster image transfer over the network.
- ✓ It is automatically sorted depending on the contents they have.
- ✓ Unrecognizable features can be made prominent.
- ✓ It allows robots to have vision.
- ✓ In industries it is used to remove faulty products from the manufacture line.
- ✓ It allows weather forecasting and used in the analysis of medical images.

VI. CONCLUSION AND FUTURE ASPIRE

This review provided all the obligatory information to the beginners of this field, starting from the main concepts of cancer detection, image processing techniques, applications, segmentation and medical methods. Pathological tests are expensive and appropriate. So we focus this kind of approach. There is a rush to include most effective classification algorithm to get better accuracy for detection of cancer cell along with its histopathological studies.

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