Automated Cancer Detection and Classification

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Abstract: Detection of cancer is very difficult and need more concern in the field of medical. This paper studies the various causes, types, symptoms of cancer. The main objective of this paper is to design an efficient and effective approach to detect the cancer using image processing. The research proposed an improved hybrid approach for detection and segmentation. The research work includes improvement of microscopic image, then segmentation of cells, extract the features of cancer and then at the final stage it described the classification step. After using different approaches and review several previous approaches this technique used an efficient and appropriate method to design a proposed framework.

Keyword: Detection, Cancer, Image Processing, Segmentation, Hybrid Approach.

INTRODUCTION

For diagnosis and treatment, the cancer detection is always have the major issue in the medical field. The detection of cancer in natural way from microscopic biopsy images can vary from one expert to another and it is depend on the doctors and expertise 1) This type of detection can have lack of accurate and specific measurement to determine the biopsy image is a normal image or a cancer image (2).

Anywhere in the body if there grow uncontrolled and abnormal cells then this is known as cancer. These uncontrolled cells are called as malignant cells, tumor cells or cancer cells. On the basis of the origination of these unwanted tissues there are several types of cancer knows as lung cancer, skin cancer, breast cancer etc.
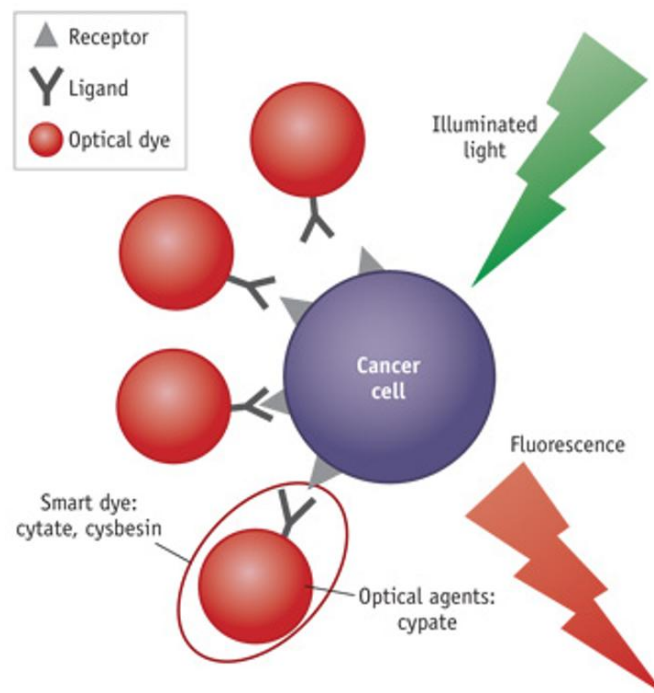
Figure 1. Cancer cell

To detect and treatment in the field of cancer the image processing technique used widely in many areas of medical science. Time factor is very necessary aspect in this type of disease because it is very important to detect the disease as soon as possible as the health perspective of patient, not diagnosis on time can cause the serious problem. Lung cancer is one example of this type of disease. There is need to improve the techniques that detect the cancers efficiently and less time consuming [3].

Literature Review

Ramya and Sasirekha [4] introduced techniques which are based on segmentation. This approach has three steps: in first step to denoise the image it used fourth order partial differential equation. In second step to remove the skull portion it used morphological operators. And in third step region growing segmentation is used for segmentation.

Ayed, Halima and Kharrat [5] described a five step approach. by using Spatial Gray Level Dependence Matrix and 2D Discrete Wavelet Transform features are extracted. Using simulated Annealing it reduces the size of features.

El-Khamy, El-Khoreby and Sadek [6] presented an approach which is based on and Conformed threshold and FCM. This is also a five step process. It includes the increment the intensity of brain MR image that is previously input.

Gopal and Karnan [7] shows an approach for detecting the tumor. This approach based on FCM with GA and Particle Swarm Optimization (PSO). This method is a two step method. It uses tracking algorithm to remove film artifacts and to remove high frequency components it uses high frequency components.

Selkar and Thakare [8] defined thresholding and watershed algorithm. This approach is three step approaches. In first step remove the noise and improve the quality of scanned image. And to get the high intensity it uses watershed segmentation and thresholding.

Arivoli, Lakshmi and Vinupriyadharshini [9] introduced a two step model. It uses preprocessing and segmentation.

Beham and Gurulakshmi [10] described a three step model. For enhancement of the image it removes the outer elliptical shaped object. For getting the required area this approach uses morphological processing.

AREAS OF FOCUS FOR EARLY DETECTION RESEARCH

Figure 2. Areas of focus of early detection research

Anyplace in the body on the off chance that there become uncontrolled and strange cells, at that point this is known as malignant growth. These uncontrolled cells are called as threatening cells, tumor cells or cancer cells. Based on the start of these undesirable tissues there are a few sorts of malignant growth knows as lung cancer, skin cancer, breast cancer etc. generally cancer risk factor is divided in the groups given below:

1) Based internal factor or biological factors. For example gender, skin type, age or inherited genetic disease
2) Based on environmental exposure. For example UV radiation, fine particulate matter and radon.
3) Based on risk factor related to occupation. For example carcinogens like several asbestos, radioactive materials and chemicals.

1. Factors that based on lifestyle
   a. The factors that based on lifestyle which will be the reason for cancer include:
   b. Food reaction
   c. Sunlight's UV radiation
   d. Alcohol
   e. tobacoo
2. Factor based on living environment and work
   a. Various compounds of metal
   b. Chemicals of plastic like Vinyl chloride
   c. Pitch and tar
   d. polynuclear hydrocarbons
   e. asbestos fibres
3. Factor based on Bacteria and viruses
   a. human papilloma virus (HPV)
   b. Epstein-Barr virus (EBV)
   c. hepatitis viruses (HBV, HCV)
   d. H. pylori (Helicobacter pylori)
4. Factor based on Radiation
   a. X-ray radiation and soil radon. It is known as ionising radiation
   b. the sun's ultraviolet radiation known as non-ionised radiation
5. factor based on Some drugs can increase the possibilities of cancer
   a. having some drugs of certain antineoplastic agents

b. having some drugs of certain hormones
c. having some drugs that causes immune deficiency

METHOD

The method of writing Literature Review articles is the method of library research and Systematic Literature Review (SLR), analyzed qualitatively, sourced from Google Scholar online applications, Mendeley and other online academic applications.

Systematic Literature Review (SLR) is defined as the process of identifying, assessing and interpreting all available research evidence with the aim of providing answers to specific research questions.

In qualitative analysis, the literature review should be used consistently with methodological assumptions. One of the reasons for conducting qualitative analysis is that the research is exploratory,.

RESULTS AND DISCUSSION

Symptoms Of Cancer

Depend on the part of the body the symptoms of cancer can vary. Some basic symptoms and signs of cancer are given below:

1. Find difficulty in swallowing
2. Change in weight, sudden increase or decrease of weight
3. Under the skin it can felt lump or thickening area
4. Fatigue continuously
5. Feel change in bladder and bowel habits
6. Hoarseness
7. Feel trouble in breathing or Persistent cough
8. Feel unexplained join or muscle pain
9. Feel night sweats or unexplained fevers
10. Unexplained bruising or bleeding or bruising
11. Showing change in skin like redness or darkening the skin, changing the moles

Types Of Cancer

Based on the part of the body in which it finds the unwanted tissue there are several type of cancer are there. The main types of cancer are:

1. Carcinoma
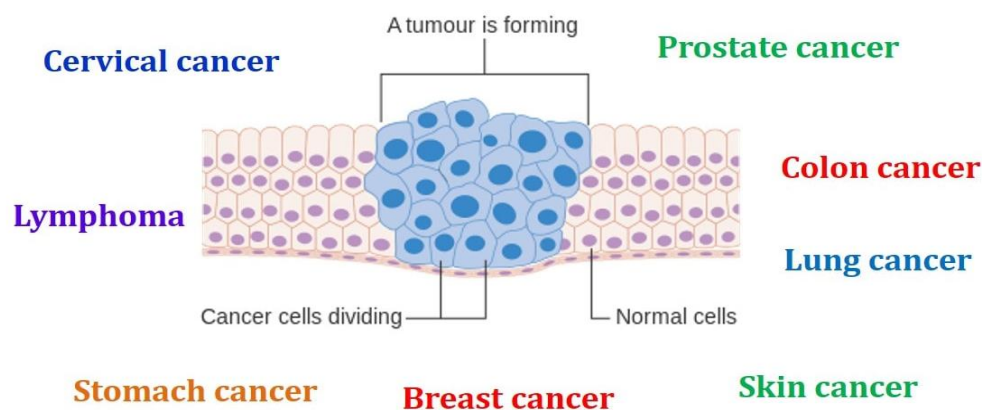2. Sarcoma
3. Lymphoma
4. Leukemia
5. Melanoma

Figure 3. Types of cancer

Based on the effective part of the body the types of cancer are:
1. Bladder Cancer
2. Breast Cancer
3. Colorectal Cancer
4. Kidney Cancer
5. Lung Cancer - Non-Small Cell
6. Lymphoma - Non-Hodgkin
7. Melanoma
8. Oral and Oropharyngeal Cancer
9. Pancreatic Cancer
10. Prostate Cancer
11. Thyroid Cancer
12. Uterine Cancer

Cancer Detection Method

For detecting the cancer from an image generally radiological imaging method is used. This method is also used for determining the effected body area, treatment process and also monitor at each stage. Some cancer detection methods are discussed below:
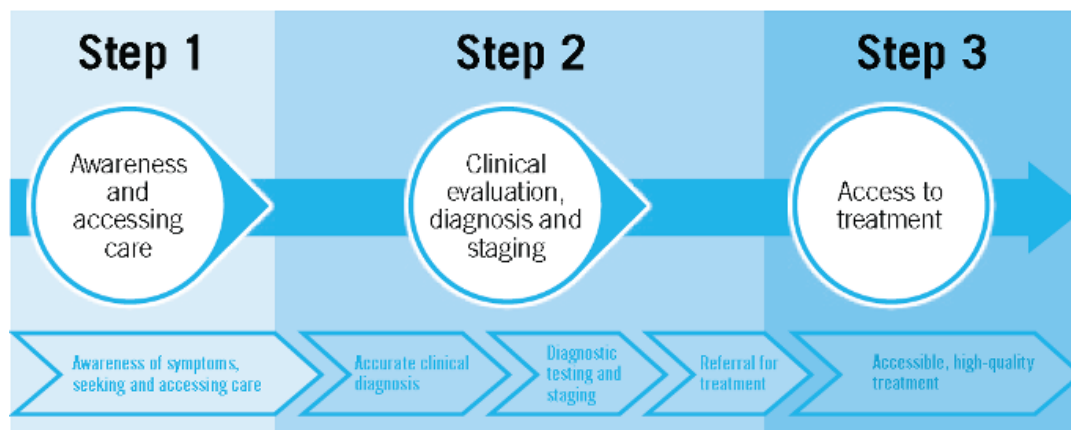

Figure 4. Early Detection Of Cancer

1) For detecting the cancer oncological imaging is most commonly used technique. It gives the accurate result. For each patient to find the most appropriate treatment different techniques are used. To get the sufficient data imaging technique generally used in combination.
2) Computed Tomography (CT) is most common method for monitor and detect the cancer. By using the computer it provide cross-sectional imaging. By using X-rays CT scans are made.
3) Another method that use for detecting the cancer is MRI i.e. Magnetic Resonance Imaging. This procedure used a powerful magnetic field. If there find a cancer in head or neck region then this type of technique is used. This approach uses magnetic field but does not generate any ionising radiation.
4) As compared to normal cell the PET (Positron Emission Tomography) is based on cancer cell's quick metabolic rate. Scintigraphy detects the radioactive tracer of patient that is given by PET imaging. The PET images can use with the combination of CT.
5) For checking the condition of pancreas, kidneys, liver and cervix the Ultra sound examination is useful approach. In ultra sound examinations needle biopsies can take.
6) For examine the gastrointestinal tract, bladder, bronchial tubes, head and neck region, prostrate, cervix Endoscopic examinations can use generally.

7) For detecting the breast cancer mammography method is used. An X-ray image is used to find the cancer. It also used for screening of best cancer.

8) A method in which a radioactive tracer is inserted in the body of a patient is known as isotopic diagnostics. In this technique a marker insert to the particular organ and to determine the growth of the cancer many imaging methods can be apply. To identify the some prevalence cancers like prostate, colorectal and breast the Isotopic diagnostics can be used.

Proposed Hybrid Approach For Automatic Cancer Detection

This research work introduced a five stage algorithm for detecting the cancer in an effective way. in the stage of preprocessing the noise is extracted and it increase the contract. Low pass filter is used to remove the high frequency noises. for increment of contrast histogram stretching is used. in 2nd stage of segmentation the portion that are not required like nose, eyes and skulls are removed. Main body feature is extracted by several ways like Histogram leveling, DWT, Gray-Level Co-Occurrence Matrix (GLCM), FFT etc. for getting a better performance of classification many domains are combined to each other. The complexity of calculation and time is decrease by using algorithms like genetic algorithm in feature selection stage [11].
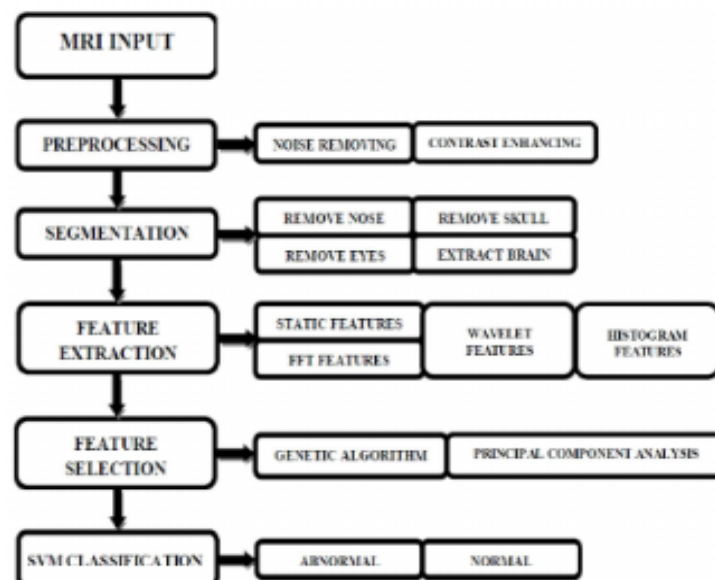

Figure 5. Hybrid Approach For Cancer Detection

From microscopic biopsy images for cell, nuclei and cytoplasm segmentation many segmentation methods are used. These images can uses region-based, clustering based and threshold based algorithm. On the basis of type of the features to be extracted and preserved the selections of segmentation methods has to be done [12].
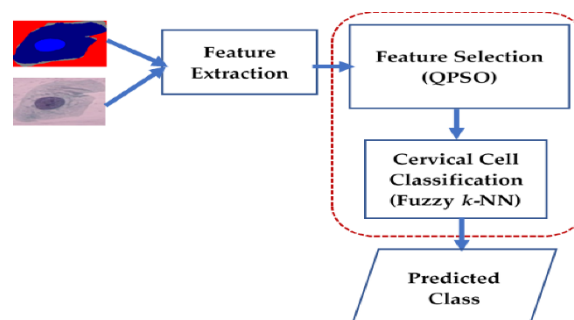
Feature Extraction

Figure 6. Feature Extraction

For feature selection Genetic algorithm is used in this approach. In many areas of optimization Genetic algorithm is realized as computer program. The Genetic algorithm generates population of individuals. The computer program examines each people and gives it a review of fit or unfit [13]. For classification Support vector machine is used. It gives better computational advantage as compared with traditional approaches [14].

CONCLUSION

This paper present different types of cancer, its causes and symptoms according to different perspective. For diagnose and treatment, the cancer recognition is consistently having the serious issue in the medicinal field. The identification of cancer in common manner from tiny biopsy pictures can fluctuate starting with one master then onto the next and it is rely upon the specialists and ability. This sort of discovery can have absence of exact and explicit estimation to decide the biopsy picture is an ordinary picture or a cancer picture. The paper discuss several cancer detecting methods and it introduce a hybrid approach to detect the cancer in appropriate way.

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