

A Study on Pattern Recognition of Tumor images in Medical Image Analysis

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Abstract: - Medical image investigation is carried out through some intelligent ideas and techniques that require distinctive solid information and reports. Nobody is very clear about what type of information and proofs are used for the sharp finding but however some low ranking features like shapes, texture and other pixel related statistics which are taken from the images may be used for prediction. Based on this understanding medical images can be identified through the use of exclusive pattern recognition algorithms. In this paper for cancer analysis through the use of unique forms in medical pictures, varieties of tumours' and pattern recognition process in medical image diagnosis might be studied considerably.

Keywords: - Computed tomography, Ultrasonography, Elastography, Thermography, Malignant, Pattern Recognition, Medical Images.

I. INTRODUCTION

Medical Image Computing (MIC) is an area which combines computer technology, general science, bio medical engineering, physics, mathematics and medicine. The diagnoses which are made with the help of medical images are very critical and difficult. Uncertainty in data is a major trouble in medical analysis. Normally a symptom is a sign of a disease but it is not sure because sometimes the symptoms may occur and sometimes it may not occur for a certain disease as it depends on a particular person and his/her immunity power. So there may be some ambiguity between signs and diseases. To handle this problem of uncertainty and to take precise decisions in this medical field is a very big challenging and thought-provoking task. To support these decisions making the doctors use the medical pictures which are taken from the body of the patients as an assisting aid for their accurate analysis.

1.1 Medical Images

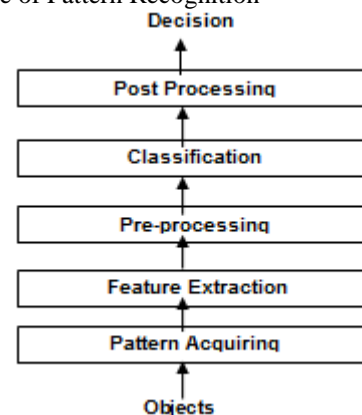
An image is a 2dimensional $f(a,b)$ or 3dimensional $f(a,b,c)$ signal. Using an image the internal organs, tissues, etc., can be visualized without penetrating the body of the patient. Medical imaging means it is the procedure of generating some images of the internal parts of the body for scientific assessment and medicinal intervention, and it is used to reveal the characteristics of a few organs or tissues inside the body. It also helps to view the inner structures of the human body which are concealed by the pores, skin and bones. The medical imaging has additionally established a

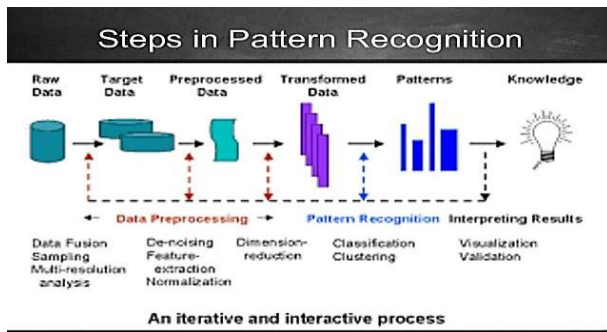
database for ordinary anatomy and physiology images which helps to pick out the anomalies from various patients. Generally when the organs and tissues are removed from the body of the patients its images will be used in the department of pathology. There are different types of medical images like X-ray, MRI, Ultrasonography, Endoscopy, Elastography, Thermography, PET and SPECT.

II. PATTERN RECOGNITION AND ITS APPLICATIONS IN REAL TIME

Pattern Recognition means a set of scientific and mathematical methods for performing the tasks like human being on computer systems. Pattern recognition tries to find out the solution for the problems of medical field through mathematical strategies.

2.1 Structure of Pattern Recognition





2.2 Applications of Pattern Recognition

- Clinical Diagnosis
- Reality Shape Analysis
- Sonar and Radar Detection
- Image Processing
- Process Control
- Data Management Systems
- Aerial Photograph Analysis
- Climate Prediction
- Sensing of Life on Remote planets
- Behaviour Evaluation
- Character Recognition
- Speech and Speaker Recognition

III. INTRODUCTION TO TUMORS

Tumors are the organic cells that will grow irregularly in the human body without any external symptoms and it will create inflammations in the body. Cancer cells will start and grow in any part or cell of the human body. Tumors are of different types like cancerous, non-cancerous and precancerous.

3.1 Cancerous Tumors

The cancer cells will grow from any part of the body and they create a swell or inflammation. The conditions for a cancerous tumor are:

- The cancer cells grow nearby the soft tissue in the human body.
- The cancer cells will split and pass through the blood or circulatory system

3.2 Non-Cancerous Tumors

The non-cancerous tumors are not dangerous to the human body. They:

- Will not spread to other parts of the body but still they remain in one part
- Once if they are removed from the body they don't happen again.
- Non cancer cells will have smooth shape and they are ideal.

3.3 Precancerous Situations

The Precancerous cells are also having irregular shapes and they also are dangerous because they can develop into

cancer cells if they are left untreated with proper medicines. But sometimes without any treatment also some of the small cells may disappear from the human body. Some precancerous cells will undergo many genetic changes as they divide vigorously to progress into a cancer. But for a precancerous cell to develop into a cancer cell and become risky is a time consuming process.

IV. PATTERN RECOGNITION IN TUMOUR IMAGES

A pattern in an image contains a cluster of features that will give a qualitative or structural explanation of an object that is examined. A pattern is a vector of functions where in $x = [x_1, x_2, \dots, x_N]$. Pattern class contains a group of patterns which have related function vectors. Pattern classes are denoted as $\omega_1, \omega_2, \dots, \omega_M$, in which M is the variety of classes. Pattern recognition or classification faces a very big challenge in assigning patterns to their respective classes. It establishes a mapping: $x \rightarrow \omega$ from the function space x to the pattern class area ω .

4.1 Pattern Recognition in Medical Decision Support

- Trying to decode the 1-dimensional facts in ECG and EEG images.

- Understanding 2-dimensional facts in X-ray, MRI and tomography images and also

discovering the tumors and abnormalities in those images.

- Processing all the hereditary records to find out the tumors in their ancestors.
- Dealing out the numerical data and blood test reports.
- Handling of non-numeric details like patient records, doctor readings and reviews

4.2 Different Patterns in medical images for identifying tumor

The patterns in medical images which are used for diagnosing the cancer cells are the shape and size of the cells, cell nuclei and division of the cells.

(a) Shape and Size of the Cells. Generally the length of the cells within the tissues is mostly normal. But the cancerous cells are either large or short than regular cells. The normal cells are evenly shaped with equal capability. But most of the cancerous cells have uneven shapes with different capability.

(b) Size and Shape of the Cell's Nucleus. The shape and length of the nucleus of a cancer cell are often no longer normal. The nucleus is reorganised in the cancer cells. The nuclei of the cancer cells will be in different color, size and shape

(c) Partition of the Cells in the Tissue. The task of each tissue in the body depends on the circulation of the normal cells. The numbers of the cells which are healthy are fewer inside the cancerous tissues.

4.3 Shape and morphological based features [2-3]

- i) The location and brightness of the nucleus
- (ii) Longest and Shortest diameter of the nucleus
- (iii) Perimeter and Elongation of the nucleus
- (iv) Roundness, Solidity, Eccentricity and Compactness of the nucleus

4.4 Texture Features [6-8]

Autocorrelation, Cluster difference, Cluster pattern, Difference variance, Dissimilarity, Energy, Entropy, Homogeneity, max probability, sum of squares, average, variance, sum entropy, difference entropy, statistics degree of correlation 1 and correlation 2, Inverse distinction (INV), Inverse distinction normalized (INN), and Inverse difference moment normalized are predominant texture features

4.5 Wavelet Features

The small waves that are used to alter the pointers for powerful processing are the wavelets. Generally the wavelets are valuable for the learning of multi resolution analysis because the wavelets are fast and deliver very high compression than the other type of transforms. The Fourier transform is used to convert a signal into a continuous So the wavelet transforms are more efficient

V. CONCLUSION

To identify the various patterns in tumor images will be a hard task and it will be difficult to detect the cancer. Pattern recognition helps to find out whether an image received from a patient is normal or cancerous and also supports in early diagnosis and analysis. The various patterns which are found in these medical images will help the oncology department physicians to diagnose different types of cancers in various parts of the body of the patients and the pattern recognition is accomplished by supervised learning, unsupervised learning and fuzzy algorithms.

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