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Machine Learning Applications on Cancer Prognosis and Prediction

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Abstract - *Detection and removal of Tumor was one of the major issues that is also a demanding issue within the field of medical speciality. Visualization methods had the disadvantage of being antagonistic and hence the MRI images were of great help to specialists in providing a better result. There are three stages that processing of tumor image works in that are pre-processing, segmenting tumor and apply operations on that tumor. After the accession of the source image, it is conversion of the original image to gray scale additionally use filter for noise removal and use median filter for quality development is being given which is followed by exploring stage resulting with hits orgasmic identical image. At last, segmentation is completed through watershed algorithm. This proposed methodology is useful in organizing the reports automatically in small amount of time and exploration has resulted in take out many less parameters of the tumor.*

Key Words*: *MRI Imaging, Segmentation, Watershed Algorithm.

1. INTRODUCTION

Recently, the interest in biological and physiological image processing methods takes a most important position in two principal areas. The most important one is an advancement of visual information for human studies and processing of biological and physiological image data for storage. A biomedical image at times is defined as a two-dimensional function, F (x, y), where x and y are the value at a specific point. F is a finite quantity. We should always know that to represent a picture is when it's collection of a finite number of elements, each of which features a specific location and value. The setting for an MRI image with a grey level, they reported the MRI results of patients who were diagnosed with multiple sclerosis in childhood. They take MRI images during the year to diagnose and study the progress of brain disorder. Biomedical images are as different because the areas of the physical body for instance to review soft tissue within the physical body we've to use the MRI scan for soft tissue images like Brain, liver and other soft tissue within the physical body. However, those curious about studying hard tissue like bone or cartilage should use X-ray for a tough tissue image instead of the MRI. The difference within the biomedical image is not just within the area but also different within the manner of processing. In other words, to process an MRI image it is necessary to use a different method than for processing an X-ray image.

2. LITERATURE SURVEY

Sonali Bansal, Shubpreet Kaur and Navdeep Kaur, 2019[1]- proposed research worked on feature extraction method, architectural operations and swarm ant lion optimization algorithm to optimize the complication and to boost the performance. It is a process of dividing a DI's into no. of segments. The segmentation is simple or modify the portrayal of image. It is a normally to identify objects in images.

Parasuraman Kumar, B. Vijay Kumar, 2019[2] Proposed research worked on Essemble Classifier Method. Essemble classifier is a merging of various classification techniques like feed forward artificial neural network, extreme learning machine and support vector machine. It is very well-organized method.

Sharmila Agnal A, Arun Deepak C, Venkatesh J, Sudarshan S, 2019[3]-Proposed research worked on prediction od durability of patients using deep learning and system using ANN classifier for classification. Proposed algorithm is in steps. First collect the data then visualize the data, after visualization the data they extract the features and classify by ANN. Lastly, analyze the performance.

Gopal S. Tandel, Mainak Biswas, 2019[4]- Proposed research worked on summarizing the pathophysiology of brain cancer images manner of brain cancer and automatic computer aided techniques for brain depiction of brain cancer in deep learning.

Ali ARI, Davat HANBAY, 2018[5] -Proposed research worked on deep learning techniques for brain tumor classification of brain tumor and detection system. There are three stages in proposed system that are pre-processing, extreme learning machine local receptive fields classification and extraction of tumor by image processing. ELM-LRF is use for categorizing MRI image as benign and malignant. For detecting tumor watershed segmentation was used. ELM-LRF is easy while comparing with ELM. The proposed system is essential.

3. METHODOLOGY

The proposed methodology is implemented to develop a system which can detect CANCER using numeric data and MRI patient's reports. In the brain tumor module, user will be provided with MRI reports of patient as an input depending on the symptoms of related cancer this system will predict whether the patient is malignant or benign.

The proposed system is a MATLAB based application with an efficient graphical user interface. The medical practitioner has to scan the hard copy of the MRI scan and save the soft copy in the image database. The user has to follow the steps of image processing by choosing various option such as image enhancement, image segmentation etc. After successful detection of tumor, its features like tumor's size area, perimeter will be displayed in output field as output. The proposed technique gives encouraging results for competences, exactness and precision.

3.1 Brain Tumor

Brain cancer has unusual growth and it can take place in any part of the brain. It's been quite complex noticing that which area of brain consists of cancer. The most important challenge for brain cancer is the segmentation of the brain tumor cells from the healthy area of the brain. Tumor happens when the brain tumor cells start splitting and rising unusually. It looks like a solid lump when it is detected with analytic biological imaging techniques.

As cancer cells split and copy themselves, they form into a bunch of cancerous cells called as a tumor. Tumors tells many symptoms such as pushing, crushing and destroying outer non-cancerous cells. There are two different types of brain tumor i.e. primary brain tumor and metastatic brain tumor. A brain tumor means atypical growth of cells within the brain. Some tumors are often cancerous or malignant hence they have to be identified and treated in time.

- **Benign**: Tumors are harmless cells that get bigger gradually in the brain. It is usually constant at one place and does not transmit. Most of the benign brain cell removal procedures and make histogram similar to detection of tumors by MRI scans.
- **Malignant**: A tumor is a cancerous cell that transmits to other zones of the brain. Most of the times tumors are secondary but it can be primary too.

Tumor happened when the cells were splitting and rising unusually. It's seemed to be solid when it recognized with analytic medical imaging methods. The actual reason of brain tumors is neither clear nor is actual symptoms known. Thus, people can suffer from it without getting known about this danger.

When tumor extend in any part of brain then it is known as brain tumor. Now when brain tumor can recognize number of symptoms including seizure, mood changing, difficulty in walking and hearing, vision, and muscular movement etc.

The following technique can be used to capture the image of the tumor by CT scan, MRI.

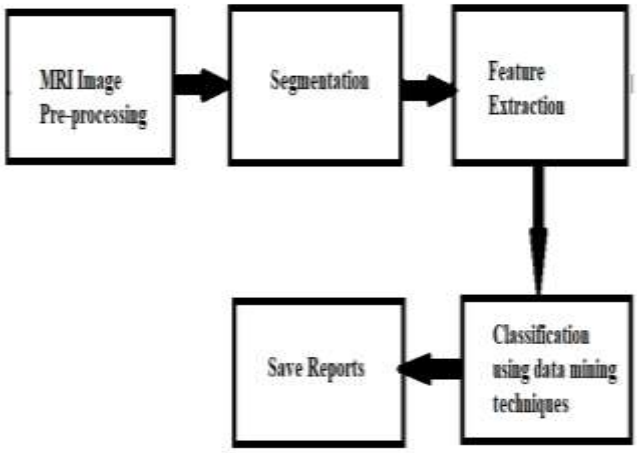

Fig 3.1: Block diagram of the system

3.1.1 MRI: It is a technique for imaging, it uses a magnetic field and radio waves to form images of the organs and tissues in the body.

3.1.2 Image processing: It is the manipulation of images using different algorithms. It uses software and provides clear images so that we can get proper conclusion. In our project the software used for image processing is MATLAB.

3.1.3 Segmentation: It is the process of splitting an image into many segments. It is always used to identify objects in images. For this we have used Fuzzy C-Means Algorithm and Watershed Algorithm.

1) **Fuzzy C-Means Algorithm:** It is a clustering method in which each data item be the property of a cluster to a-bit part of extent that already defined i.e. the items can be a member of more than one group.
2) **Watershed Algorithm:** In image processing it is an alteration defined on a grayscale image. It is used in image processing primarily for Segmenting purpose.

3.1.4 Feature Extraction: Feature Extraction is a process of amplitude reduction by which an underdone data is reduced for processing. It selects or combine variables into features, reduce data that must be processed.

At this step, the area of the highlighted tumor or the image provides the attribute values. Mean, Median, Standard Deviation, Smoothness, Variance and may more may fall under the attributes.

Some of the mathematical formulas are mentioned:

1) **Standard Deviation:**

$$\tilde{f}(x,y)=\sqrt{\frac{1}{mn-1}\sum_{(r,c)\in W}\left(g(r,c)-\frac{1}{mn-1}\sum_{(r,c)\in W}g(r,c)\right)^2}$$

2) **Median:**

$$\tilde{f}(x,y)=median\{g(r,c)|(r,c)\in W\}$$

3) **Variance:**

$$\tilde{f}(x,y)=\frac{1}{mn-1}\sum_{(r,c)\in W}\left(g(r,c)-\frac{1}{mn-1}\sum_{(r,c)\in W}g(r,c)\right)^2$$

3.1.5 Classification: This technique is used to obtain important and relevant information about data to predict and analyze the same.

3.2 Applications

The main goal of the application is Cancer Detection-

1) The main reason behind the growth of this application is to deliver proper treatment as soon as possible and defend the human life which is in danger.

2) This application is cooperative to doctors as well as patient.

3) The manual documentation is not fast, accurate and efficient. to overawed those problem this request is design.

4. RESULT AND DISCUSSION

This proposed system identifies brain tumor from MRI reports using segmentation program in MATLAB with the help of GUI Programming. Using the "guide" of MATLAB, we will produce other steps of image processing executing at an equal time with image segmentation. Use of MATLAB GUIDE (GUI) helps with image segmentation and makes it easy to personalize it to all or any other MRI image features.

The various levels required during this method are, first is pre-processing of given image then segmentation is required then the morphological operation is done on the chosen MRI image.

The important steps are:

1) Excellent MRI picture of brain.
2) Change it into gray scale image.
3) Consider three other sub plots for MRI of patient's brain tumor alone and identified tumor.
4) Implement and run the program.
5) Final result will be a tumor region.

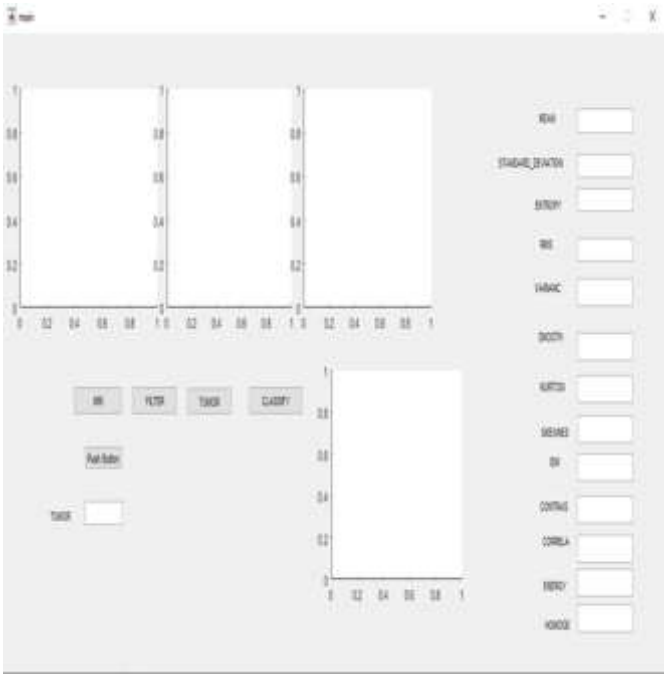

Fig 4.1: Working Dashboard

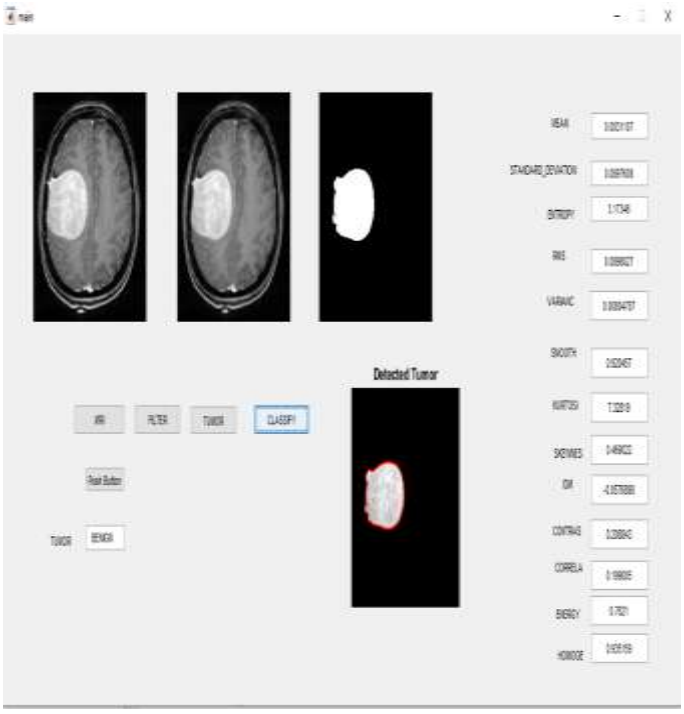

Fig 4.2: Dashboard after tumor detection

4.1.1 MRI Button: We can input MRI image from our database through this button.

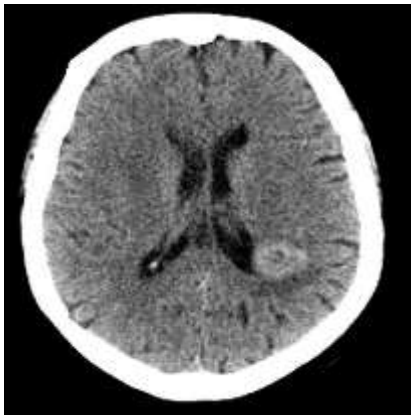

Fig 4.1.1 Original MRI images for brain tumor

4.1.2 Filter Button: We can use this button to get cleaner image by removing noisy data from the image.

4.1.3 Tumor Button: Using this button we get only the image of tumor i.e. the affected area and the unaffected area gets neglected or ignored. The unaffected area gets blackened.

4.1.4 Classify Button: Using this button the affected area i.e. tumor gets highlighted. Methods that we use to detect brain tumor from MRI images are Watershed Algorithm, segmentation and contour of the image.

5. FUTURE SCOPE

In future, this programmed are often done more enhanced so that tumor is often classified consistent with its type.

Also, tumor growth is often verified by plotting graph which can be obtained by doing a research of sequential images of tumor affected patient.

As we all know that once we use different test for identification of tumor, we choose this, we might say in future because the system will be more enhanced so this method should be used for detecting brain tumor.

Recent work can be improved by considering many MRI images together with many methods of extracting features and by connecting with another classification model for collecting more exact outcomes.

6. CONCLUSIONS

The proposed work has been implemented to satisfy all specified requirements.

The system is very expandable and easy to use for user. The system reduces the matter resulting within the previously implemented manual system and it reduces the human errors to zero.

We are ready to extract tumor from different brain MRI reports from our database and are ready to identify that it is affected by tumor or not with zero error factor.

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