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Article

Machine Learning uses on Cancer Prognosis and Forecast

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A B S T R A C T

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 agreement of the source image, it is alteration of the innovative image to gray scale moreover use filter for noise elimination and use median filter for quality expansion is being given which is tracked by discovering stage subsequent with hits orgasmic indistinguishable image. At last, subdivision is proficient through watershed algorithm. This proposed methodology is useful in organising the reports mechanically in minor amount of time and investigation has caused in take out several less parameters of the tumor.

Keywords: CT and MRI Imaging, Segmentation, Watershed Algorithm

Introduction

Recently, the interest in biological and physiological image processing methods takes a most important position in two principal areas. The most significant 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 distinct as a two-dimensional function, F (x, y), where x and y are the value at an exact point. F is a finite quantity. We would continuously know that to characterise a picture is when it's collection of a finite number of elements, each of which structures a precise location and value. The setting for an MRI image with a grey level, they described the MRI results of patients who were identified with manifold 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.

The motivation of this research is to enhance the patient's cancer detection in proper manner because there is need to recognize the tumor in earlier stage to avoid the risk of cancer.

Aim: As Cancer is very dangerous disease there is need to

recognize it as soon as possible so in this research the system works on to minimizing the risk of cancer among patients.

Objectives: The objective of the Project is tumor detection in brain MRI images. The cause for searching of brain tumors is to give expected result through efficient diagnosis. The objective is to give an algorithm that guarantees the existence of a tumor by collecting many techniques to give a full proof technique of tumor detection in images of brain.

Our key Objective of medical imaging of Brain tumor is:

- To identify meaningful and most true information from these scans with minimum error.
- Lastly accomplish whether a tumor image is cancerous or not.

Scope of the research is the proposed work can be improved by taking many MRI scan images that are with various methods of extraction of features that can be elaborated for finding accurate results.

Literature Survey

[Sonali Bansal, et.al., 2019]- proposed research worked on feature extraction method, architectural operations and swarm ant lion optimization algorithm to optimize the complication and to boost the presentation. 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.[1]

[Parasuraman Kumar, et.al., 2019] Proposed research worked on ensemble Classifier Method. Ensemble 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 organised method.[2]

[Sharmila Agnal A, et.al., 2019]-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, analyse the performance.[3]

[Gopal S. Tandel, et.al., 2019]- 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.[4]

[Ali ARI, et.al., 2018] -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.[5]

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.

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 greatest significant 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. Here are two dissimilar 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 recognized numeral of indications 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.

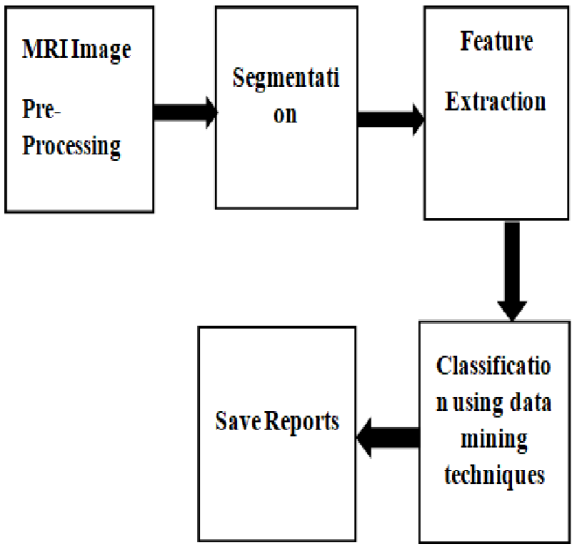

Figure 3.1 Block diagram of the system

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

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

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.

- 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.
- Watershed Algorithm: In image processing it is an alteration defined on a grayscale image. It is used in image processing primarily for Segmenting purpose.

Feature Extraction: Feature Extraction is a procedure of amplitude decrease 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:

- Standard Deviation:

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

- Median:

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

- Variance

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

Classification: This technique is used to obtain significant and relevant information about data to predict and analyse the same.

Applications

The main goal of the application is Cancer Detection:

- 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.
- This submission is cooperative to doctors as well as patient.
- The manual documentation is not fast, accurate and efficient to overawe those problem this request is design.

Results and Discussion

This proposed system classifies 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:

- Excellent MRI picture of brain.
- Change it into gray scale image.
- Consider three other sub plots for MRI of patient’s brain tumor alone and identified tumor.
- Implement and run the program.
- Final result will be a tumor region.

Figure 4.1.Working Dashboard

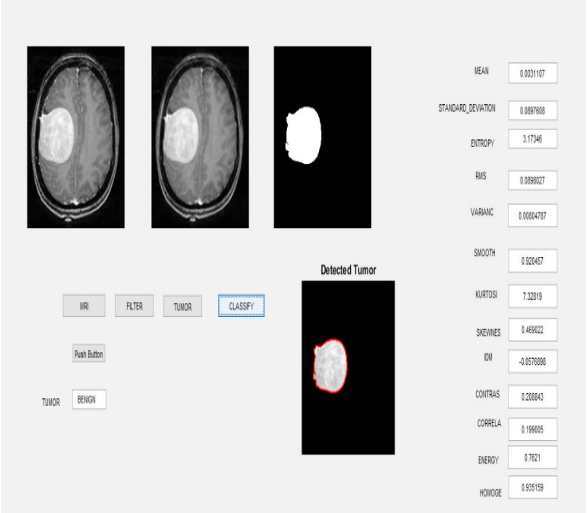

Figure 4.2.Dashboard after tumor detection

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

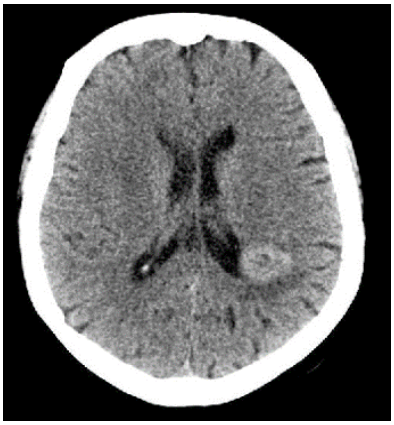

Figure 4.2.1 Original MRI images for brain tumor

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

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.

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.

Conclusion

The proposed work has remained applied to satisfy all specified requirements. The system is very expandable and easy to use for user. The system decreases 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.

Future Scope

In future, this programmed are frequently done more improved 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 geographies and by connecting with another classification model for collecting more exact outcomes.

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