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BRAIN TUMOR DETECTION USING MRI IMAGE PROCESSING

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ABSTRACT

Brain Tumor detection and identification based on analysis using MRI images is essential to assist medical doctors during the diagnosis and treatment process. This project proposes a new feature extraction using GLCM(Gray-Level Co-occurrence Matrix). This proposed method uses image processing to perform feature extraction on MRI images. This proposed method is compared against the traditional techniques. Based on the final performance of the project, we can evaluate whether the proposed application is a valid alternative to be used in real-time applications or not.

I. INTRODUCTION

The development of aberrant cells within the brain leads to the development of a brain tumour. Tumors can be classified into two categories: malignant (cancerous) tumours and benign (non-cancerous) tumours. Cancerous tumours can be separated into primary tumours, which begin inside the brain, and secondary tumours, or brain metastasis tumours, which have spread from somewhere else. Depending on where a section of the brain is affected, all types of brain tumours can cause a variety of symptoms. Headaches, seizures, eye issues, nausea, and mental disturbances are a few examples of these symptoms. MRIs are appropriate for tumour detection when all other tests are insufficiently informative. To provide precise images, an MRI scan takes advantage of the magnetic and radio wave properties. MRIs are most frequently prescribed by neurosurgeons because they give them enough information to spot even the smallest abnormalities.

II. METHODOLOGY

System Architecture

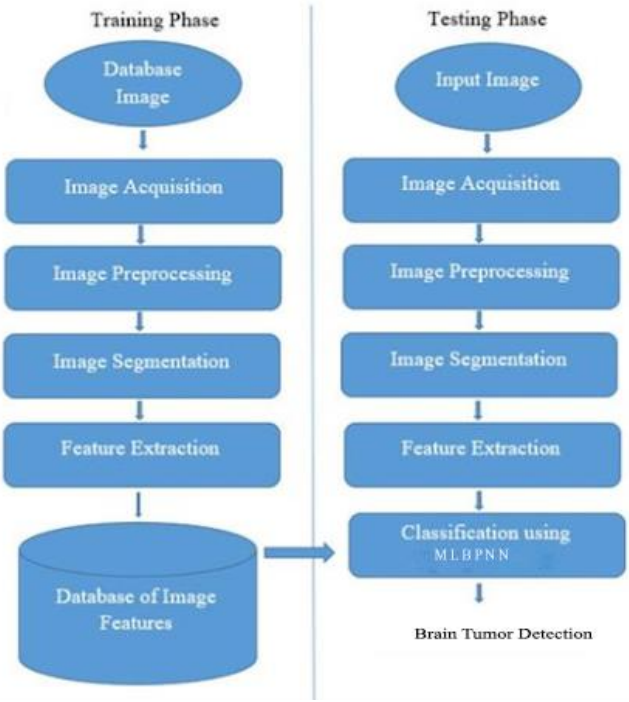

Figure 2.1: Architecture Diagram

Image acquisition: The MRI scan image is acquired from online dataset with sufficient lighting for learning and classification.

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Image pre-processing: The noise reduction using averaging filter, color transformation, and histogram equalization are used in the pre-processing of digital camera-acquired images.

Segmentation: There are numerous methods for segmenting images, including neural network-based, edge-based, cluster-based, and threshold-based methods.

Feature Extraction: The features must be extracted from the input photos. In order to achieve this, we can select only those pixels that are required and adequate to fully represent the segment.

Classification using MLBPNN: The Backpropagation neural network is a multilayered, feedforward neural network and is considered one of the simplest and most general methods used for supervised training of multilayered neural networks.

Use Case Diagram

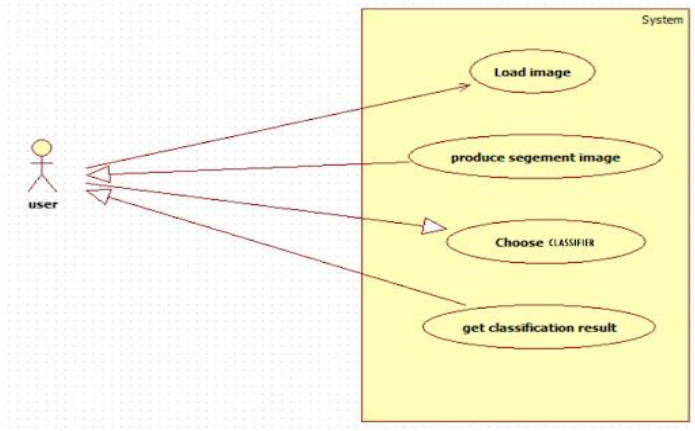

Figure 2.2: Use Case Diagram

Use case diagram shows us how the entities in the application are related to each other

Sequence Diagram

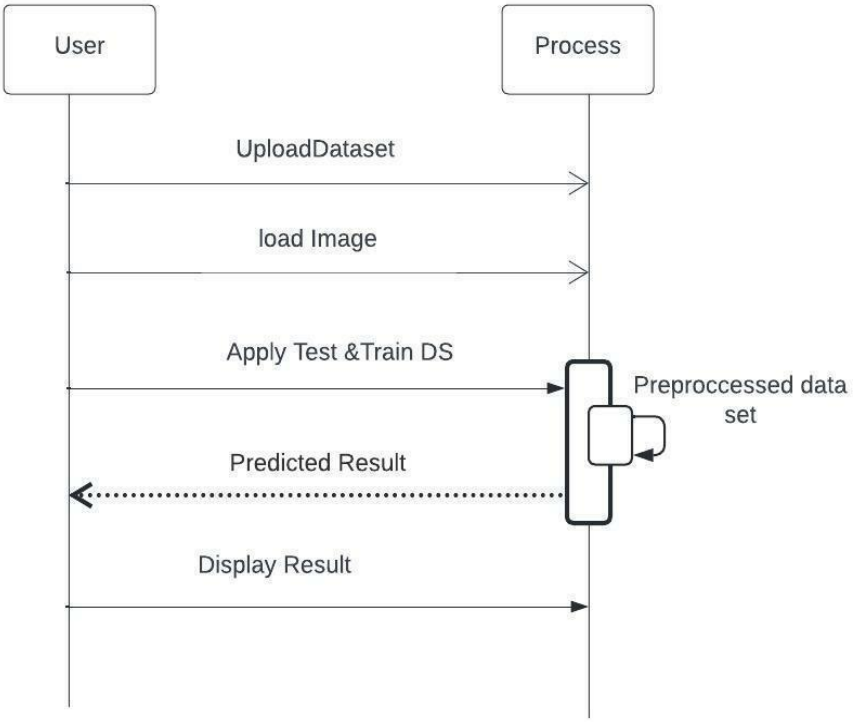

Figure 2.3: Sequence Diagram

A sequence diagram, also known as an event diagram, is a type of interaction diagram that depicts how different processes interact with one another and in what order.

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III. MODELING AND ANALYSIS

Python IDE	Python is a powerful, simple-to-learn programming language. It features effective high-level data structures and an easy-to-use but powerful object-oriented programming paradigm.
GLCM	The Gray Level Co-covariance Matrix (GLCM) frameworks are too utilized assess the surface highlights of the areas of intrigue. Twenty textural features like autocorrelation, imperativeness, separate; relationship, entropy and homogeneity were segregated from the specific MRI cerebrum pictures and isolated utilizing the surface normal of four headings and separation.
PIL/ Pillow	PIL(Python Imaging Library) is a free library for the Python programming language that adds support for opening, manipulating, and saving many different image file formats. The library contains basic image processing functionality, including point operations, filtering with a set of built-in convolution kernels, and colour space conversions.
Using openCV to Read and Display an image	Reading an image with the cv2.imread () function. cv2.IMREAD_COLOR: Loads a color image. cv2.IMREAD_GRAYSCALE: Loads an image in grayscale mode. Cv2.IMREAD UNCHANGED loads the image with the alpha channel intact. To display an image, we use the function cv2.imshow () to display an image in a window.

IV. RESULTS AND DISCUSSION

A brain tumor is an abnormal cell growth within the human brain. Digital MRI images are obtained for processing.

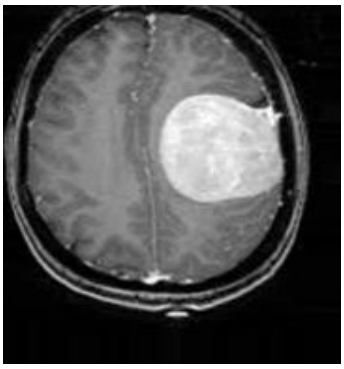

Figure 4.1: Example of a brain MRI image

To remove the Noise in the image during the pre-processing, a Standard Median Filter is used. By repeatedly re-conveying the dark properties, picture enhancement is accomplished with the aid of difference extending (Histogram Equalisation).

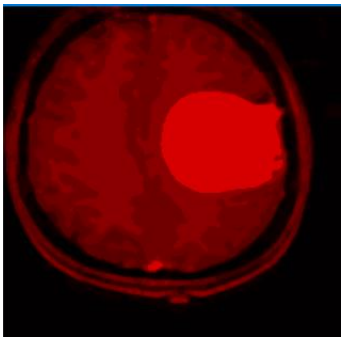

Figure 4.2: Image after noise removal and image enhancement

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Segmentation utilising Multi Fractal follows this. Then, classification is carried out with two methods: MLBPNN(machine learning based Back Propagating Neural Network) and Adaboost Classifier. While MLBPNN classifies tumours based on the tumour area, the Adaboost classifier classifies tumours based on intensity features.

Figure 4.3: Segmented Image

When compared to Adaboost, MLBPNN has the added benefit of being able to tell if a tumour is in an early or advanced stage. Finally, the effectiveness of the Back Propagating Neural Network and the Adaboost Classifier has been compared.

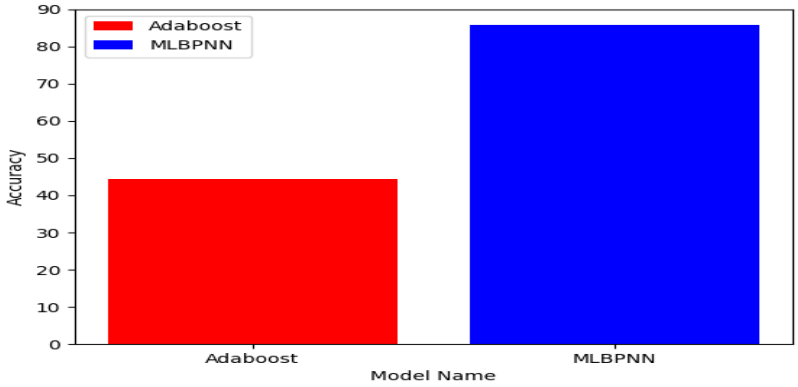

Figure 4.4: Graph comparing the accuracy of Adaboost and MLBPNN

V. CONCLUSION

When recognizing and segmenting the tumor image, the MLBPNN (machine learning-based Back Propagating Neural Network) system has significant practical utility. Based on their size, the tumor images are further divided into classes I and II. On a number of parameters, a comparison between the Adaboost Classifier and the MLBPNN has been done. It is clear from the results that MLBPNN is more effective than the Adaboost Classifier.

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