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BRAIN TUMOUR DETECTION USING K-MEANS CLUSTERING

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Abstract – In this paper, The brain tumour part which areas are affecting is identified. Tumour part extraction and its analysis are challenging tasks in Medical field because brain image is very complicated. During this project we are presenting a pre-processing technique to induce obviate noise within the MRI(Magnetic Resonance Image) and K-means clustering technique for cluster the tumour part. GLCM (Gray Level Co-occurrence Matrix) for feature extraction, MLP(Multi Layer Perceptron) which is a neural network algorithm for classification.

Keywords:-Brain tumour, Pre-processing, Feature extraction, Neural networks.

I. INTRODUCTION

A Magnetic Resonance Imaging (MRI) scan is a common procedure round the world. MRI uses a strong magnetic field and radio waves to make detailed images of the organs and tissues within the body. MRIs create more detailed pictures than CT scans and are the popular way to diagnose a tumour. A brain tumour, known as an intracranial tumor, The growth of abnormal cells in the tissues of the brain. Quite 150 different brain tumors are documented, but the two main groups of brain tumors are termed primary and metastatic**.**

First type of brain tumours can start from brain cells, the membranes around the brain (meninges), nerves, or glands. Primary tumors can arise from any cell type but most commonly arise from supporting cells called as giial cells rather than the neurons themselves. These tumours are called as gliomas. benign or malignant

Metastatic brain tumours include tumours that arise elsewhere within the body (such because the breast or lungs) and migrate to the brain, usually through the bloodstream. Metastatic tumors are considered cancer and are malignant. The symptoms caused by brain tumour depend on tumour dimensions, type, and placement. Some common symptoms of brain tumour are-Headache, Nausea, and Vomiting.

Problem Definition:

Difficult to detect future affected areas, Automatic defects detection in MR images is very important in many diagnostic and therapeutic applications. The problem is Brain tumours vary in size, shape, appearance, color, location, which is precisely the reason why tumour segmentation is challenging.

Solution for problem Definition:

The solution for this problem is using a combination of k-means, which is used for

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clustering, GLCM for feature extraction, MLP, neural network algorithm for classification of the given data in the dataset.

• K-means is used for clustering the tumour part.

• GLCM is used for extracting the image.

• MLP is used for the classification.

The paper is organized as follows. In section II. The pre-processing technique for removing noise within the image. In section III. The proposed algorithm k-means clustering for identifying the tumour part of the image. In section IV. Feature Extraction and in section V. Neural Networks for classification. In section VI. Finally, the conclusion.

II. PRE-PROCESSING

At first pre-processing technique is applied on the MRI image within the noise is removed. The noise within the image is difficult to induce obviate so additional noise is added which is Gaussian noise. It is caused by random variation in the signal, it's modeled by random values added to an image. This noise features a probability density function of the normal distribution. It is also called as Gaussian distribution. And then removing the whole noise by using the bilateral filter. Bilateral filtering is a technique may well be a way to smooth images while preserving edges.

The bilateral filter has several qualities that specify its success:

1. Its formulation is simple: Each pixel is replaced by an average of its neighbours. This aspect is an extremely important because it makes it easy to accumulate intuition about its behaviour, to adapt it to application- specific requirements, and to implement it.
2. It depends only on two parameters that indicate the size and contrast of the features to preserve.
3. It are often utilized durong a non-iterative manner. This makes the parameters easy to line since their effect is not cumulative over several iterations.

After removing the noise image is send to the k-means clustering technique.

III. K-MEANS CLUSTERING

K-means which is taken into account collectively of the foremost used clustering algorithms because of its simplicity.

Clustering: It's a way widely accustomed find groups of observations (called clusters) that share similar characteristics.

K-means are often defined because the task of identifying subgroups within the data specified data points within the identical subgroup (cluster) are very similar while data points in several clusters are very different. It is an unsupervised learning technique used for data classification. Unsupervised learning means is right any output variable to guide the training process and data is explored by algorithms to hunt out patterns.

K-means is true for getting to know the knowledge and providing insights on most data types. Whether it is a picture, a figure, or a segment or bit of text, K-means clustering algorithm is so flexible it can take almost everything to cluster.

K-means are accustomed cluster the tumour part within the MRI image of the brain.

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Algorithm:

1. K centroids are created randomly (based on the predefined value of K).
2. K-means allocates every data point in the dataset to the nearest centroid (minimizing Euclidean distances between them), meaning that a data point is considered to be in a particular cluster if that point is closer to that cluster's centroid in the data.
3. Then K-means recalculates the centroids by taking the mean of all data points assigned to that centroid's cluster, hence reducing the total intra-cluster variance to the previous step. The means in the K-means point out to averaging the data and finding the new centroid.
4. The algorithm iterates between steps 2 and 3 until some criteria are met (no changes in centroids value or no data points change clusters).

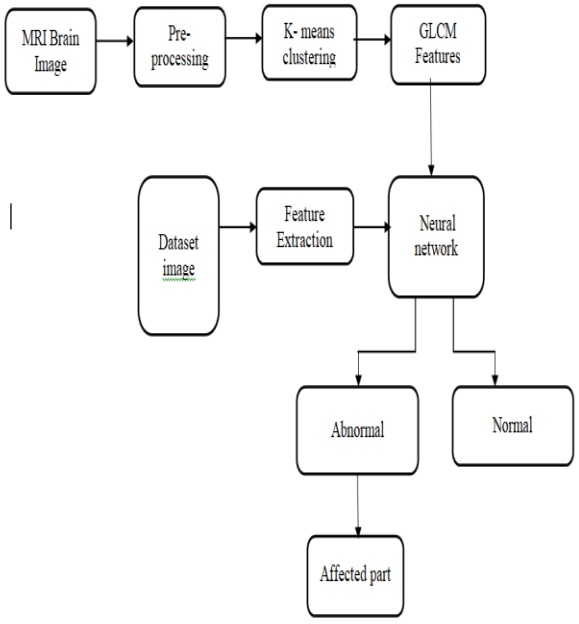

Fig. Process diagram

Steps:

1. Here first we will take an MRI image.
2. Later we will perform pre-processing, In pre-processing we will remove noise by Gaussian filter.
3. Next the image is send to the k-Means cluster, where several clusters are formed.
4. Later the clustered image is sent to the GLGM Feature extraction, here matrices are formed.
5. Then the image processed to neural networks, where the image is classified into normal or abnormal.

VI. FEATURE EXTRACTION

Feature extraction methods are accustomed get the foremost important features within the image to cut back the measure and complexity within the image analysis. GLCM (Gray Level Co-occurrence Matrix) is one among the feature extraction methods.

It is the foremost classical second-order statistical method for texture analysis. An image is composed of pixels each with an intensity, The Gray Level Co-occurrence Matrix is a tabulation of how often different combinations of gray levels co-occur in an image section. Also noted as co-occurrence distribution. Texture feature calculation uses the contents of the GLCM to produce a measure of the variation in intensity at the pixel of interest.

Properties of GLCM:

1. GLCM is a square matrix. The identical number of rows and columns as a quantization level of the image (image

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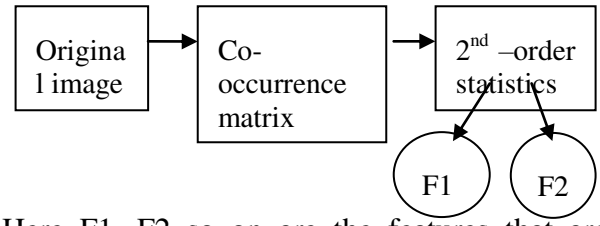
should be resampled to not more than 4 bit).

2. GLCM can be calculated at any angle (direction) and at any offset. Angles like 0, 4, 90, 135, 180, 225, 270, 315 degrees.
3. The GLCM matrix is symmetrical around diagonal.
4. Symmetry are going to be achieved if each pair pixel is counted twice, once forward and once backward. East and West: Horizontal matrix. North and south: Vertical matrix
5. The symmetrical matrix is to be normalized to convert it into probabilities.



Here F1, F2 so on are the features that are calculated on Co-occurrence matrix.

Features:

11 features are calculated on the co-occurrence matrix. A number of them are:

- Contrast
- Correlation
- Variance
- Average etc;

V. NEURAL NETWORKS

Neural networks is the subpart of deep learning, In neural networking each perceptron is connected to one another like neurons in our brain. A perceptron is a single neuron model that connected to other neuron to form larger neural networks. It is a field that investigates how simple models of biological brains is accustomed solve difficult computational tasks like predictive modeling tasks.

Multi-Layer Perceptron(MLP):

The Multi-Layer Perceptron (MLPs) breaks this restriction and classifies datasets that aren't linearly separable. They do this by employing a more robust and complex architecture to learn regression and classification models for difficult datasets. A multilayer perceptron is a perceptron with multiple layers. It has an input layer, output layer, hidden layer. Each neuron communicate on activation function

Algorithm:

1. Just as with the perceptron, the inputs are pushed forward through the MLP by taking the dot product of the input with the weights that exist between the input layer and the hidden layer. This dot product give a value at the hidden layer. We don't push this value forward as we would with a perceptron though.
2. MLPs utilize activation functions at each of their calculated layers. Push the calculated output at the current layer through any of the activation functions.
3. Once the calculated output at the hidden layer has been pushed through the activation function, push it to the subseqent layer in the MLP by taking the dot product with the corresponding weights.
4. Repeat steps two and three until the output layer is reached.

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5. At the output layer, The calculations will either be used for a backpropagation algorithm that gcorresponds to the activation function that was selected for the MLP in case of training or a decision will be made based on the output in case of testing.

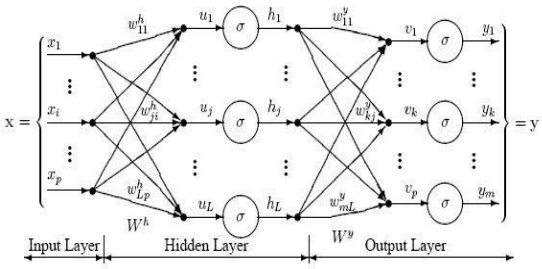

Fig: MLP Model

By applying the MLP on the image of the brain tumour it classifies weather the image is normal or abnormal.

VI. CONCLUSION

In this paper, MRI images of the brain are given those of both normal and abnormal tumour images. First pre-processing techniques are applied to the image and then tumour part is cluster by the k-means algorithm. The feature extraction method GLCM is applied. Finally, the Neural network algorithm MLP is applied to the image to classify the information. the final output showed the image with the affected area by the tumour part within the image

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