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*Summary and Conclusion*

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## 5. SUMMARY AND CONCLUSION

Any uncontrolled growth of abnormal cells is called tumor. These abnormal cells that are formed within the brain are called brain tumors. Brain tumor can be classified into two categories: primary and secondary brain tumors. Primary brain tumors can arise from the cells, membranes around the brain or neurons in the brain. Secondary brain tumors are referred to as metastases which do not initiate in the brain. They occur when cancer cells break away from a primary tumor site elsewhere in the body and travel towards the brain through the blood system. The tumor should detect in the early stage otherwise it will leads to cancer.

Tumor detection can be done by using different techniques such as CT, X-Ray, and MRI. Among these, Magnetic resonance imaging (MRI) is an innovative medical imaging technique which is based on identifying the dissimilarities among tissues. It is used to detect and visualize exact size and location of the tumor in the internal structure of the body. Thus the proposed research method considered for the study helps to segment the tumor more accurately in less time.

The steps followed in this study for segmentation where,

- Image preprocessing,
- Clustering,
- Feature extraction,
- Segmentation

The MRI brain images are distorted and affected by noises. Image preprocessing method consists of removing the noise from the original MRI images as well as improving the finer details in the image. For noise removal, median filter was adopted and morphological operations were used to remove the skull.

Clustering consists of finding similarities between objects and grouping similar data objects into a cluster thus providing the objects that are similar to each other in the same cluster. Fuzzy C-Means technique is adopted in the study to cluster White Matter (WM), Gray Matter (GM), Cerebrospinal fluid (CSF) and background.

In feature extraction, only the relevant information which is considered as region for interest of the given MRI image is extracted. Thus it reduced the memory space and computation time. Three types of features of an image can be classified such as, Shaped based features, Intensity based features, and Texture based features. The intensity based features considered in this study could be classified such as, mean, variance, standard division, median, skewness, kurtosis, range, pixel orientation. In the proposed method mean standard division is used to extract the features.

Segmentation consists of partitioning an image space into non-overlapping and meaningful similar objects. This partition is based on similar attributes. Similar attributes are separated into groups. The MRI brain tumor segmentation is a challenging and time consuming process in the field of medical imaging since the intensities of the gray matter and white matter are very close in different tissues. Here, segmentation is used to extract the salient features of an image from the clusters. Various kinds of segmentation techniques are used such as Threshold techniques, Edge-based, region-based and statistical methods. Among these, Hierarchical Self Organizing Map (HSOM) was used for the study. To conclude the HSOM technique adopted for brain tumor segmentation resulted in reduction in execution time and considerable increase in classification accuracy.