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Human Brain Detection System to Identify and Detect the Premature Condition of Disease and Provide the Remedy

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ABSTRACT
In the modern situation, the diagnosis of disease in brain at its premature condition is a tuff task. Most of the person are failed to get the symptoms for which they can't able to predict and hence they have to spend more treatment cost and even if they get died. Hence, to identify the disease at its first stage we have to identify and detect the status of the brain for which we need to develop such a device which is ready to produce the significant signal on which we can able to predict the disease. We are going to propose a human-computer interface (HCI) system that includes an enabler for controlling gadgets based on signal analysis of brain activities transmitted from the enabler to the gadgets. The enabler is inserted in a user's ear and includes a recorder that records brain signals. A processing unit of the system, which is inserted in a gadget, commands the gadget based on decoding the recorded brain signals. The proposed device and system could facilitate a brain-machine interface to control the gadget from electroencephalography signals in the user's brain.
Keywords:- Brain, Disease, HCL, Signals.

I. INTRODUCTION

HCI has been primarily implemented by monitoring direct manipulation of devices such as mice, keyboards, pens, touch surfaces, etc. However, as digital information becomes more integrated into everyday life, situations arise where it may be inconvenient to use hands to directly manipulate a gadget. For example, a driver might find it useful to interact with a vehicle navigation system without removing hands from the steering wheel[1]. It is predicted that the future of HCI is moving toward compact and convenient hands-free devices. As we know that the BRAIN is the most important part of central nervous system. If in the brain any disease is going to happen, then it is very difficult to identify at it's premature stage. One of the case is Tumor. Here in this paper we are going to identify and detect the present of Tumor present in the brain. The main task of the doctors is to detect the tumor which is a time consuming for which they feel burden[4]. Brain tumor is an intracranial solid neoplasm. The only optimal solution for this problem is the use of 'Image Segmentation'.

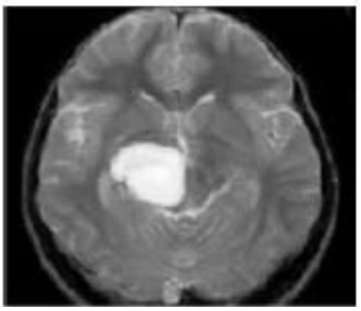


Figure-1: Example of an MRI showing the presence of tumor in brain

Notably, in a recent report [2], IBM has predicted that at least in the next five years, mind-reading technologies for controlling gadgets would be available in the communication market. In the IBM report it is predicted that "if you just need to think about calling someone, it happens…or you can control the cursor on a computer screen just by thinking about where you want to move it."

II. IMAGE SEGMENTATION

Image segmentation is the most important concept to identify the status of the brain[1]. It is used in MRI and through that, the doctor can easily predict the condition of the brain. The main functionality of the image segmentation is to,

• Partition an image into meaningful regions with respect to a particular application.

• The segmentation might be grey level, colour, texture, depth or motion.

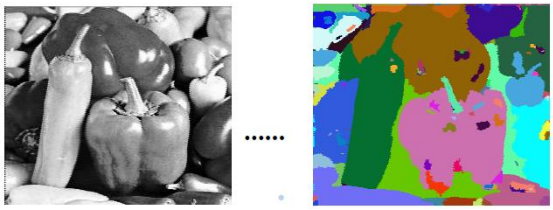


Figure-2: Aspect view of image segmentation.

III. EXISTING METHODS

In the traditional days the older methods are being used to identify and detect the status of the brain [2]. But these methods are having lot of problems. Some of the important methods are discussed as below.

1. **Fusion based**: in this approach, the overlapping of the train image of the victim over a test image of same age group, thereby detecting the tumor.

Demerits:

- The overlapping creates complexity due to different dimensions of both images.
- Time consuming process.

2. **Canny Based**: To overcome the problem of detecting the edges, the better way is the use of Canny based edge detection.

Demerits:

- Not support color images.
- This leads to increase in time to reach the optimal solution

IV. PROPOSED METHOD

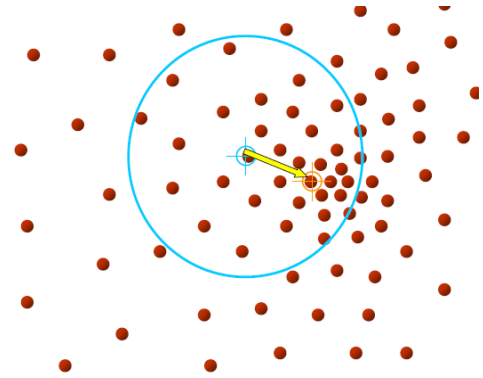
This method is the proposed method we are going to have here, which includes the following.
'k-means clustering +watershed, optimized k-means +genetic algorithm and optimized C- means +genetic algorithm'.
At the end of process the tumor is extracted from the MRI image and also its exact position and shape are determined in colour.

Figure-3: Proposed structure

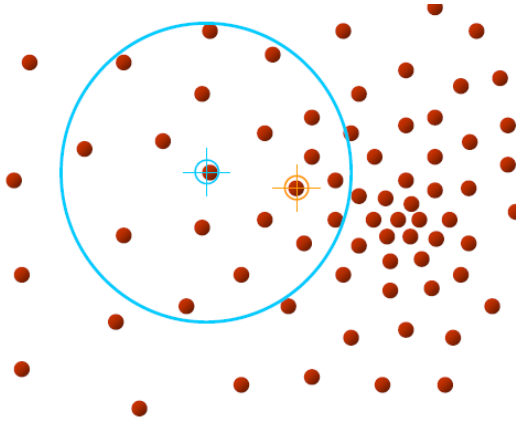
V. CLUSTERING

A cluster is a group of node where one node is used to handle the other nodes. The node who directs the other nodes is called as a master node and the other followers are called as slave node [3]. In general, the clustering is defined as,

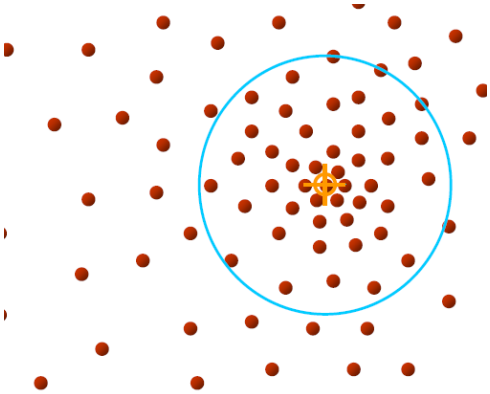
• A process of collection of objects which are similar between them while dissimilar objects belong to other clusters.
• A clustering technique is used to obtain a partition of N objects using a suitable measure such as resemblance function as a distance measure 'd'. The schematic diagram is as showed below.



Stage (i)



Stage (ii)



Stage (iii)

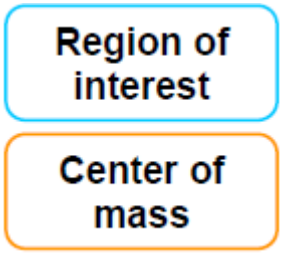


Figure-4: Clustering Process

Final Cluster diagram is as showed below.

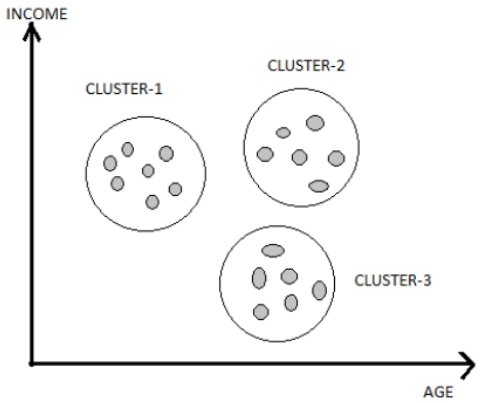
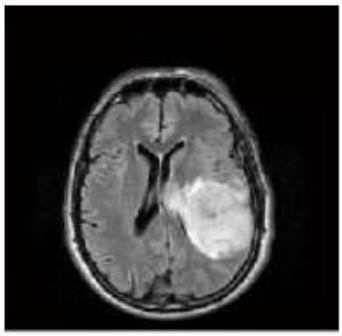


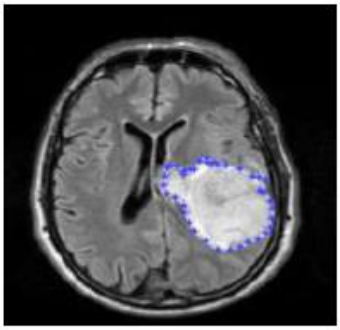
Figure : Clustering Technique

K-means clustering:

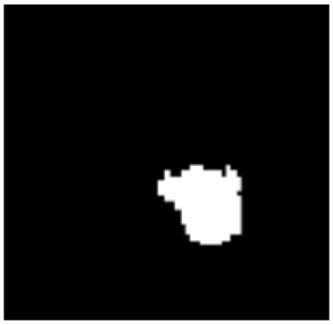
k-means clustering aims to partition n observations into 'K' clusters in which each observation belongs to the cluster with the nearest mean.



(a) original image



(b) expert selection



(c) K-means selection

VI. WATERSHED ALGORITHM

Watershed algorithm is used in image process primarily for segmentation purposes.
• This algorithm can be used if the foreground and background of the image can be identified.

MERITS:

- It works best to capture the weak edges.
- Watershed algorithm improves the primary results of segmentation of tumour done by k-means.

K-means clustering with watershed

MERITS:

- If variables are huge, then K-Means most of the times computationally faster than, if we keep k small.

- Watershed algorithm improves the primary results of segmentation of tumour done by k-means.

DEMERITS:

- Difficult to predict K-Value & k-means cannot find nonconvex clusters.
- Different initial partitions can result in different final clusters.
- This method does not work well with clusters of different size and different density.

C-means clustering

• It is well known that the output of K-Means algorithm depends hardly on the initial seeds number as well as the final clusters number.
• Therefore to avoid such obstacle FCM is suggested.
• The fuzzy C-means relax the condition by allowing the feature vector to have multiple membership grades to multiple cluster.

VII. GENETIC ALGORITHM

• The term genetic is derived from Greek word 'genesis' which means 'to grow 'or 'to become'.
• The implementation of Genetic algorithm begins with an initial population of chromosomes which are randomly selected.

MERIT:

- It is the best optimizing tool.
- It gives best result when used with Fuzzy c-means Clustering

C-means clustering with Genetic algorithm

MERITS:

- This method considers only image intensity.
- Unlike k-means where data point must exclusively belong to one cluster center here data point is assigned to 2 or more clusters.

DEMERITS:

- Aprior specification of the number of clusters.
- We get the better result but at the expense of more number of iteration

VIII. FUTURE SCOPE

In terms of the near-future

- As Medical image segmentation plays a very important role in the field of image guided surgeries.
- By creating Three dimensional (3D) anatomical models from individual patients, training, planning, and computer guidance during surgery is improved.

IX. CONCLUSION

In conclusion, based on the discussion presented in this paper, it appears that the trend in the future of the HCI devices and systems is moving toward providing systems and devices that could efficiently convey the brain signals to command gadgets, while a user is thinking about commanding the gadgets. Recently, among researchers in industry and academia, several attempts have been made to enhance the brain-reading interface technologies. However, as set forth in this paper, each of these devices and systems suffers from deficiencies that refrains the field from achieving maturity. Indeed, it appears that much more research is needed to achieve to a point of commercializing these systems and devices that could be affordable and comfortable for the users.

About the Author:

Prof. Amar Nath Singh is presently working at Amity University, Ranchi, Jharkhand as a reader in the department of Computer Science and Engineering. His research area is Underground Mines and Surface mining using Artificial Intelligence, Fuzzy Logic. His research area includes cloud computing, WSN, Machine Learning and Data Science. He has produced more than 60 M.Tech scholars till date.

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