

## Neural Networks based on Extraction and Detection of Brain Tumor Analysis for MRI Images

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**Abstract** - In the segmentation of medical image the most significant and interesting factor is image segmentation. In this research work is the method of segmentation is explained in detail. There are two steps are having in this method. In the initial step, from the database of patients' the MRI brain image is developed, in this image, object and noise are eliminated when that binarization method is used for the image segmentation. This binarization method are done in the assist of Fuzzy C-Means clustering algorithm, therefore the algorithm act as an important role , in this minimum level of weight vector, a higher value of tumor pixels, computation speed is accomplished by the fuzzy c mean with vector quantization. The main goal of this research work is to provide Fuzzy C-Means (FCM) algorithm variation that gives image clustering using MRI brain tumor database. Both the information of local spatial and gray level is combined together in the proposed algorithm. This novel proposed algorithm is known as Fuzzy Local Information C-Means (FLICM). The demerits of fuzzy c-means algorithms are solved by using FLICM simultaneously improve the performance of clustering. The FLICM characteristic is the fuzzy local use similarity measure, directing to guarantee noise insensitiveness and image detail preservation. Moreover, the experiments of proposed algorithm executed on synthetic and real-world images demonstrates that FLICM algorithm is effective and efficient, given that robustness to noisy images.

**Keywords** - Flicm, Image processing, Binarization, Fuzzy and Brain Tumor.

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### I. INTRODUCTION

An image into digital form is converted by using image processing and also achieves some operations on it, with respect to acquire an improved image or some valuable information to extract from it. It is a category of signal dispensation in which input is image, such as video frame or photograph and output may be image or characteristics connected with that image. Generally the image processing system consist of handling images as two dimensional signals however applying already set signal processing methods to them. It is between quickly increasing knowledge today, with its applications in several business features. The fundamental research area is image processing methodology within engineering and computer science.

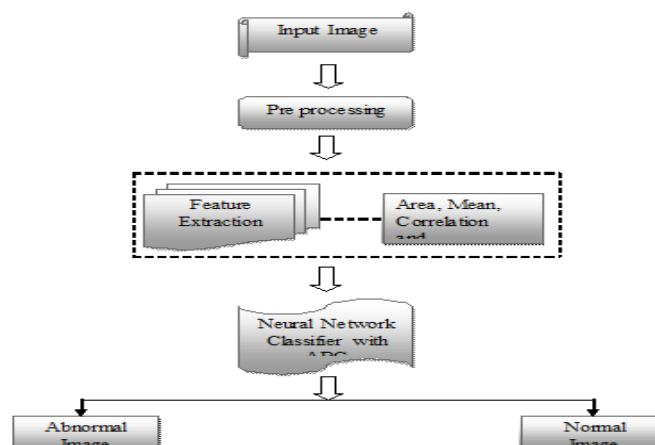


Fig-1:Architecture

**Image processing basically includes the following three steps.**

By using the optical scanner or by digital photography the image is imported.

- (i) The image is analyzing and manipulating and also the data compression and image
- (ii) Improvement and recognizing patterns are not to human eyes such as satellite photographs.
- (iii) Based on the image analysis the result of this process is altered image or report.

**Purpose of image processing**

The image processing goal is partitioned into 5 groups. They are:

- (i) Visualization - focus the objects that are not visible.
- (ii) Image sharpening and restoration - to generate a improved image.
- (iii) Image retrieval - try to find for the image of interest.
- (iv) Measurement of pattern – processing different objects in an image.
- (v) Image recognition – differentiate the objects in an image.

In the image processing there are two types of approaches are used namely analog and digital image processing. In the image processing the analog or visual methods are used for the hard copies such as printouts and photographs. There are different analysis are used by the image analysts for the period of the visual methods. The image processing is not just limited to region that has to be learned on analyst knowledge. In image processing the significant tool is association over visual methods. Therefore analysts put on a grouping of personal knowledge and collateral data to image processing.

In digital images manipulation are done by the use of digital processing methods by using computers. As raw data from imaging sensors from satellite platform having the insufficiencies and also acquire the uniqueness of information, it has to endure different processing phases. While using digital methods there are three phases that the entire data have to pre- processing, display enhancement and information extraction.

**(i) Analog image processing**

By using the analog signals the analog image processing is performed. It is having the two dimensional analog signals process. By using the electrical signal the images are manipulated in this type of processing. The television image is the common example. The Digital image processing has controlled through the analog image processing with the time passage owing its wider range of applications.

**(ii) Digital image processing**

A digital system is developed by using digital image processing and it executes the digital image operations.

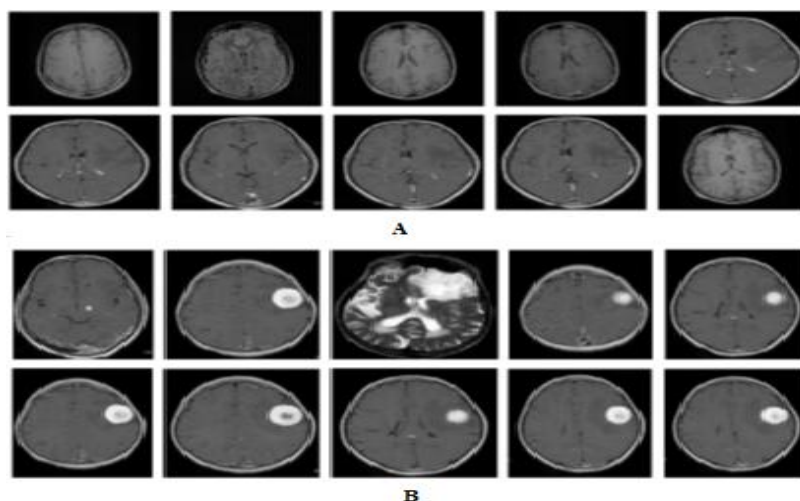


Fig-2 Sample Dataset

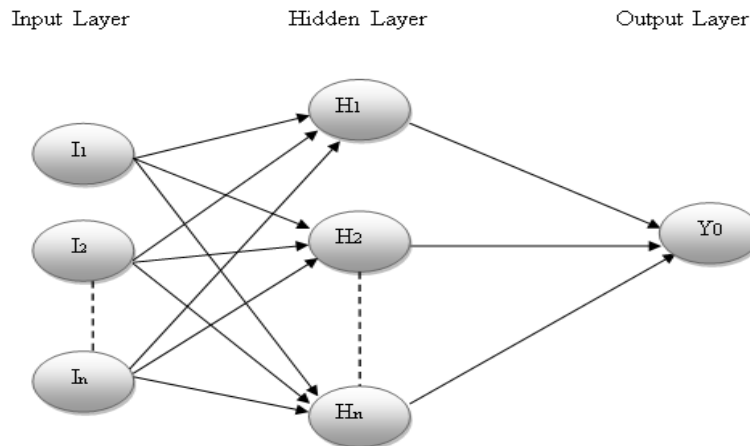


Fig-3 Neural Network

## II. RELATED WORK

In medical research and clinical practice from brain MR (Magnetic Resonance) images the Automated tumor segmentation can act as a very important role. Now the patients' tumors segment by hand on MRI images by the radiologists beforehand providing a treatment like radiation therapy. This segmentation process is difficult and costly. Except these images are segmented, on the other hand, it is very complex to retrieve the related images, for analysis. For instance, the tumor location is used by a clinician and it is permitting to retrieve historical cases appropriate to the analysis and cancers treatment in new patients. In brain MRI the tumors are segmented automatically and it is a most stimulating task. The image analysis and machine learning topic is explained in detail [7]. There are numerous tasks here, numerous consistent to the task of combining field knowledge. On the computational front, pixel labeling algorithms, like support vector classifiers, it is acquire local features (calculated within a window around a pixel), are not suitable to segment brain abnormality (tumor, edema, etc.). However, the global region-based features incorporation is non-trivial and computationally exhaustive [2].

Efforts have also been complete to combine pixel classification and region similarity (see [2], [5]). In this research the binary morphological level sets bounding box algorithm are proposed, a fast method for discovering a bounding box nearby the region of abnormality. It means Tumor and exact segmentation performance. There are two phases are having in the proposed algorithm. The location of brain tumor detection is the first-phase of the proposed algorithm. This process is done by using bounding box algorithm. In brain images the tumors crude segmentation is also performed. The facts are exploits by the bounding box method that a normal brain structure is symmetric – the left part and the right part can be partitioned by an axis of symmetry, and abnormalities (tumors, edema) usually disturb this symmetry.

### Concept of bounding box algorithm

After the basic principle of bounding box (bb) is a principle of change detection, in which a region of change (d) is identified on a test image (i), while compared with a reference image (r) as demonstrated in fig. 1(a). Subsequently the symmetry axis is discovered axial MR slice, the left (or the right) half serves as the test image i, and the right (or the left) half supplies as the reference image r. at this point The change (d) region is limited to be an axis-parallel rectangle, which basically targets to limit the irregularity.

In the brain or central spine the abnormal growth of tissue is a brain tumor. It can be interrupt suitable brain function and generates an increasing pressure in the brain. This research work proposed a current complete methodologies review of detection of brain tumor over the Magnetic Resonance Imaging (MRI) method used in various levels of Computer Aided Detection system (CAD). It will give a brain tumor brief background and non-invasive brain tumor image with respect to provide a complete field vision. Finally, this work ends with a discussion of concise and gives a direction toward the new trend of more enhanced research brain image segmentation and tumor detection studies.

In the brain the abnormal cells collection is known as brain tumor. A tumor may cause a cancer, and the effect of this tumor is death and this is answerable for around 13% of all deaths world-wide. In the world the rate of cancer incidence is increasing at an alarming rate. Therefore the tumor detection is very important role. In medical imaging the accurate tumor detection is done by using radiology. In the diagnostic imaging modalities MRI is the most flexible and it is keeping the capacity to describe a wide range of parameters in the

living subject and give delicate spatial resolution. The Magnetic Resonance Imaging (MRI) creates the brain tumor identification and it is have many levels. Segmentation is recognized to be an important then problematic

step in medical imaging classification and analysis. Therefore, it is highly important that segmentation of the MRI images must be complete exactly earlier requesting the computer to organize the exact analysis. This appraisal presents a Magnetic Resonance Imaging (MRI)-based medical image analysis overview for brain tumor studies.

### **Brain tumor**

In the brain or central spine the abnormal growth of tissue is known as brain tumor. It can interrupt appropriate brain function and produces a growing pressure in the brain. Owing to the enhanced pressure on the brain, some brain tissues are removed, hard up in contradiction of the skull or are answerable for the destruction of the nerves of the other healthy brain tissues. Both the brain and spinal cord tumors are dissimilar for everyone. They system in altered areas, improved from various cell types, and may have various treatment selections. Researchers have categorized brain tumor according to:

- (i) The type and grade (how destructive it is),
- (ii) Whether it is a primary or a secondary tumor,
- (iii) If it is cancerous (malignant) or not (benign), and
- (iv) Where in the brain the tumor is positioned.

The minimum aggressive kind of brain tumor is frequently called a benign brain tumor. They initiate from cells within or do not have cancer cells, produce slowly, and usually have clear borders that do not distribute into other tissue. They may develop to a certain extent large earlier producing any symptoms. Suppose all the tumors are removed and then incline not to return. The important neurological symptoms can cause based on their size, and position near other structures in the brain. Some kind tumors can growth to become malignant.

Malignant brain tumors have cancer cells and frequently do not have clear borders. They are measured to be life-threatening for the reason that they produce quickly and enter neighboring brain tissue. Even though malignant brain tumors very hardly distribute to other parts of the body, they can distribute all over the brain or to the spine. The surgery, chemotherapy and radiation are used to treat the tumors, they but may persist later treatment.

### **III. BACKGROUND STUDY**

The brain tumor risk factors are brain tumors are caused mostly by radiation-induced brain tumors are by radiation to the head provided to treat other cancers. They happen most often in people who received radiation to the brain as children as portion of their leukemia treatment. Usually these brain tumors are implementing nearby 10 to 15 years subsequently the radiation. The tumor are induced by the radiation are still fairly rare, then because of the increased risk and also other effects, radiation therapy to the head is only specified later carefully weighing the merits and risks. In the brain or head other possible cancers involved from the other patients, the radiation therapy merits far compensate the threat of increasing brain tumor years later. The probable threat from coverage to imaging tests that use radiation, like x-rays or ct scans. The cell phones give off radiofrequency (rf) rays, an energy form on the electromagnetic spectrum among fm radio waves and these are used in the microwave ovens, radar, and satellite stations. The ionizing radiation are not provided by the cell phones, the kind that can cause cancer by destructive the DNA inside cells. Up to now, there have been anxieties that the phones, whose antennae are built-in and it is located near to the head while being used, might somehow increase the threat of brain tumors. The image preprocessing methodologies are concentrated by the proposed work. For example, filtering and segmentation method. From brain tumor image the noise are removed by using filtering method. To segment and partition the region is done by using segmentation. The proposed algorithm is based on filtering of brain images which is used for removing the noise through an image and segmented with filtering images. In this phase image is improved in the way that finer details are developed and noise is removed from the image. The initial step is to obtain the MRI image and pre-processing application. The input MRI (Magnetic Resonance Imaging) brain tumor images are also included in the pre-processing. A brain input image with tumor and process with a filtering methodology. The image is analyzed with proper brain tumor and finds the most affected region. The segmentation process is done with the image and examines with a proper result to identify the tumor. This MRI methodology has dependence through reduction magnetically-excited hydrogen nuclei of water molecules properties in the body. Merits of MRI is generating better soft tissue contrast than x-rays which directs to high quality images production, mostly in brain and spinal cord scans. Hence, the tumor is identified by using mri scanning methods. The median filter has to be distributed with mask for better image, to accomplish this we are using sober operator.

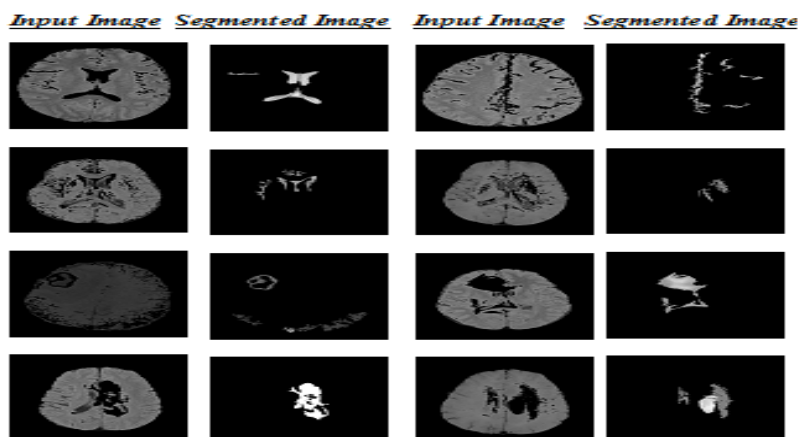


Fig-4 Results

### Spatial filtering

At a center point the adjacent pixels values are available in the spatial filtering process. There are two types of filtering process namely Linear and non-linear filtering. The overall linear filtering concept is also used in statistics, data analysis, and mechanical engineering between other fields and technologies. These are non-causal filters and filters in more than one dimension like these are used in image processing; these filters are topic to various constraints most important to various design methods. The image output is weighted with an input pixels sum in linear filtering. The form of fir (finite impulse response) filtering is a spatial filtering. The filter sub image value is denoted as coefficients, rather than pixels. The filtering operations that are executed directly on the pixels of an image are known as spatial filtering.

### Segmentation

A digital image is divided into the multiple regions by using segmentation in image analysis, and it is a process of finding an object or pattern in the provided work space. The Segmentation is the process of dividing an image into non-intersecting regions like the every region is homogeneous and the combination of no two adjacent regions is homogeneous. The significant goal of the digital image segmentation is the division of the image into mutually exclusive and exhausted region. The goal of segmentation is to differ and reduce the input image cooperation into something which is more significant and lighter to analyze. The brain tumor segmentation from Magnetic Resonance (MR) images is a dynamic process for treatment planning, monitoring of therapy, analyzing effectiveness of radiation and drug treatments, and reviewing the variances of healthy subjects and subjects with tumor. There are several segmentation methodologies which are helpful in identifying useful in finding separated area in an image. Following are the methods obtainable for segmentation process namely Threshold, region based, edge based, clustering method.

### Tumor detection

Suppose the brain image has the tumor region, this image is required to do preprocessing. With respect to identify the tumor, we assign a spatial filtering algorithm method. Filtering means that the required structural features of the real source permit through the filter, for the period of detrimental features are blocked. The spatial filtering is a methodology that you can assist to smooth, blur, sharpen, or discover the edges of an image. Another name of spatial filtering is neighborhood processing. The neighborhood processing is a proper name since you describe a center point and execute a process by using filters to only those pixels in determined neighborhood of that center point. This process result is one value, and it becomes center point's value position in the altered image. In the image the entire point is handled with its neighbors.

## IV. PROPOSED METHODOLOGY

### a) Problem description

In the central nervous system the brain is the most important part. Brain tumor is an intracranial solid neoplasm. In the brain the abnormal and uncontrolled cell division is known as tumors. In this research work the brain image axial view is used (2d) from MRI scan since MRI scan is a reduced amount of destructive than ct brain scan. A patient is exposed to various analytic methods to control the symptoms. Methodologies such as acting a biopsy, imaging, like taking an MRI or ct scan of the brain will be completed. In biopsy, the brain tissue is taken as the specimen by a pathologist beneath consideration for validating the tumor presence. At the tissue cells a pathologist aspect in a microscope to examine the abnormality presence.

However the method of biopsy will demonstrates that tumor presence and its pathology, while doctors go for surgery, the doctors must know the extent and the exact position of tumor in the brain, and it can be identified by taking MRI scan of the patient as MRI doesn't contain the use of harmful radiations while compared to CT scan. In hospitals the conventional method is to partition the medical image beneath consideration, and also it is based on the physician can observe the image beneath consideration to acquire the necessary region extracted out, which is made hard because of minute variations and resemblance among the real and affected biological portion in the image.

The absence of radiologists and the higher volume of MRI to be examined create these evaluations labor intensive and also cost expensive. It is based on the knowledge of the expert observing the images. Among 10 and 30% of tumors the evaluation indicates that are wasted by the radiologists for the period of the routine screening. For the period of the medical images acquisition, there are prospects that the medical image one gets might be corrupted because of difficulties that can happen for the period of the acquisition stage.\

Therefore the new image may not be appropriate for examination. The digital image partition or segmentation into related regions with a key goal to shorten the image beneath consideration into something that is more meaningful and simple to analyze visually and it is known as Image segmentation. In the medical image analysis the most important part is Image segmentation. Image segmentation methods can be categorized as threshold, region based, supervised and unsupervised classification methods.

The clustering methods are used to detect the tumor in the brain MRI images. The group of pixels in which the entire pixels in the particular group distinct by a same association and this is known as cluster. Another name of clustering is unsupervised classification methodology. Automatically the algorithm categorizes objects based on user certain measures. At this point the k-means clustering algorithm for image segmentation monitored by morphological filtering is used for tumor detection from the brain MRI images.

### **Magnetic resonance imaging**

In the atom Protons and neutrons of the nucleus have an angular motion and this is called as a spin. While the numerous particles of subatomic in a nucleus are even these spins will cancel. This is creates the magnetic resonance imaging basis. The powerful magnets are used by the Magnetic Resonance Imaging (MRI) scanner to separate and stimulate hydrogen nuclei (single proton) in human tissue, and it is also generates a signal that can be identified and it is encoded spatially, ensuing in images of the body. The Radio Frequency (RF) plus is generated by the MRI machine that exactly binds only to hydrogen. The pulse is transferred by the system to that the particular region of the body that required to be investigated. In that area Owing to the RF pulse, protons engage the energy required to create them spin in a various direction. This is called as the MRI resonance. In a specific direction at the larmour frequency the protons are generated by the RF pulse. Based on the certain tissue this frequency is identified being imaged and the asset of the main magnetic field. There are three electromagnetic fields are used by the MRI: static field is a very strong static magnetic field which separates the hydrogen nuclei; the gradient field is a pathetic time-varying field used for spatial encoding; and a weak radio frequency field for manipulation of the hydrogen nuclei to create determinate signals which are composed over radio frequency antenna.

### **Median filtering for noise removal**

The noise removal is done by the Median filter and it is a non-linear filtering procedure. The salt and pepper noise is removed by the median filtering from the converted gray scale image. The center pixel value is replaced with the median of the intensity values in the nearby pixel. In the existence of impulse noise specifically the median filters are efficient. This noise is also known as salt and pepper noise since of its presence as white and black dots protected on image. From MRI images the salt and pepper noise is removed by using the median filter.

### **Image segmentation**

The process of separating a digital image into multiple segments is known as image segmentation. Usually the image segmentation to discover objects and boundaries in image, image segmentation is the processes of assigning a label to each pixel in an image like pixels with the similar label distribute the particularvisual characteristics.

The brain MRI images segmentation have been recommended for recognition of tumors by using clustering methods. The cluster is a pixel group in which the entire pixels in a particular group defined by a same association. Another name of clustering is unsupervised classification method. Automatically the algorithm categorizes objects based on user certain measures. At this point the k-means clustering process for image segmentation followed by morphological filtering is used for detection of tumor from the brain MRI images.

The human brain MRI scans images makes the input images for the methodology in which the grey scale MRI input images are reserved as the input. In the stage of preprocessing the RGB color input image transformed into the grey scale image. Suppose the noise is being eliminated by using the median filter. The k-means clustering methods are used to segment the preprocessed image. After the application of k-means clustering algorithm [15] there is some difficulties of happening of mis clustered regions. In this case the morphological filtering is introduced which is implemented subsequently the image is segmented by using k-means clustering algorithm.

### **Image acquisition**

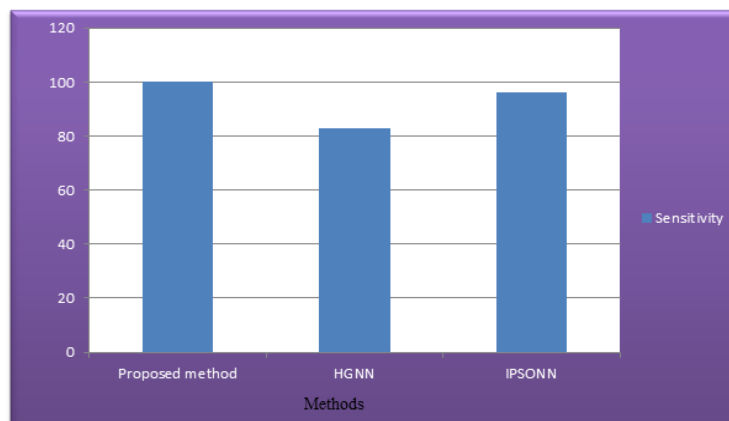
The MRI scanned images are demonstrated in a in a two dimensional matrices having pixels as its components. These environments are associated to matrix size and its field of view. In Mat Lab Images are retained and shown as a gray level image of size 256\*256. The gray level image entries are ranging from 0 to 255. In this case the complete black color is represented as 0 and pure white color is represented as 255. Entries within these ranges differ in intensity from black to white. In this research the goal 30 female and 30 male patients were investigated, the patients have ages ranging from 20 to 60 years. The MRI scans were recorded in the formats of database of images in jpeg image.

### **Preprocessing**

In this process the image is improved for the reason that the improved detail is enhanced and removes the noise from the image. The enhanced noise reduction methods can provide the best possible results. Enhancement will result in more noticeable edges and an improved image is obtained, the noise will be removed therefore decreasing the image effect of blurring. Moreover the image enhancement, the image segmentation will also be assigned. This image enhancement will assist to identify the edges and enlightening the entire image quality. The edge detection will direct to identify the specified tumor location. In the preprocessing stage monitored the following steps: 1) the developed MRI scanned images, reserved in database is transformed to gray scale image of size 255\*255; 2) Image is processed to eliminate any noise existing. The noisy image visual quality will not be acceptable; 3) the fewer noisy, high quality images are then functioned by a high pass filter to improve and to identify the edge; 4) The improved image is then added to new image for further improvement.

## **V. RESULTS AND DISCUSSION**

The objects or patterns categorization is the process of clustering like samples going to similar group are more alike than that of going to dissimilar group. There is more number of clustering methodologies like hard clustering and fuzzy clustering, every one having individual different features. The methodologies segmentation result is hard in hard clustering. It means the every image pixel goes to correctly one cluster. Consequently the troubles such as reduced dissimilarity, overlapping intensities, noise make this segmentation a complex task. The soft segmentation method is a Fuzzy clustering method and it is learned and efficiently assigned in image segmentation. Between the fuzzy clustering methods, Fuzzy C-Means (FCM) has robust characteristics and recollects more information compared to the hard clustering methodologies and therefore it is used in the image segmentation. This algorithm is proposed by allocating membership to every data point consistent to the entire cluster center, on the basis of distances among the cluster center and the data points. In this case the data is adjacent to the cluster center more is its membership in the direction of the specific cluster center. Noticeably, synopsis of association of all the data point should be equivalent to one.



**Fig-5** Results of Proposed methods for Sensitivity

The clustering analysis process main goal is to partition a provided set of data or objects into a cluster, where the subsets or a group represented. There are two properties are in the partition. The initial one is Homogeneity inside clusters and the second one is Heterogeneity between the clusters. The data, which goes to one cluster means it is known as Homogeneity inside clusters. The data, which goes to dissimilar clusters means then it is known as Heterogeneity between the clusters. The actual data distribution does not reflected by the membership functions in the input and the output spaces. They may not be appropriate for fuzzy pattern recognition. To construct a membership functions from the data accessible, a clustering methodology may be used to data partition, and after that it generates membership functions from the subsequent clustering. The clustering process to acquire a partition  $p$  of a set  $e$  of  $n$  objects  $x_i$  ( $i=1, 2, \dots, n$ ), using the resemblance or dissemblance portion, like a distance measure  $d$ . the set of disjoint subsets of  $e$  is a partition  $p$  and the element  $p_s$  of  $p$  is known as cluster and the clusters centers are known as centroid or prototypes. There are more methodologies have been established for clustering data. In this report c-means clustering is used. It's a simple unsupervised learning method which can be used for data grouping or categorization while the number of the clusters is known.

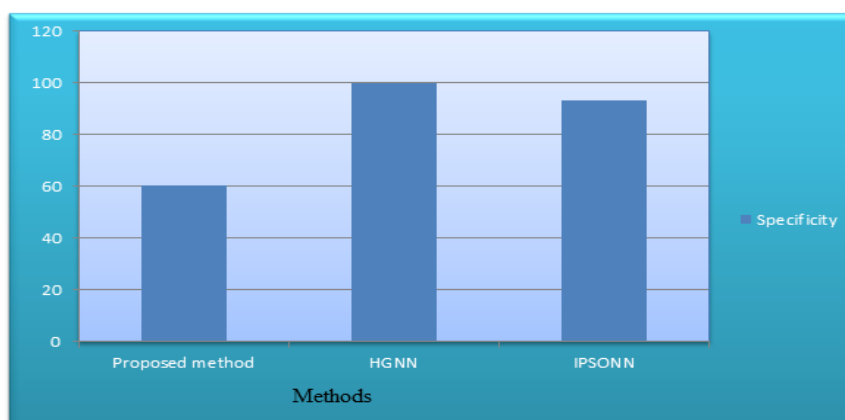


Fig-6 Results of Proposed methods for specificity

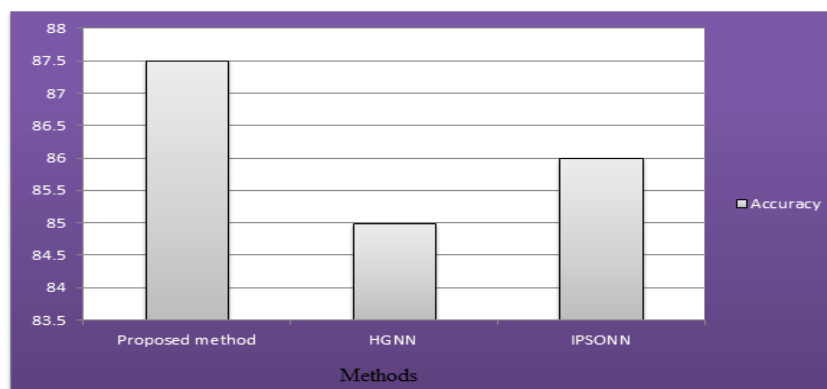


Fig-7 Results of Proposed methods for Accuracy

## VI. CONCLUSION

In this research, the trouble of physical pattern is removed. Subsequently very fewer inputs are provided; any persons can use the application. The pixel value is identified to be inappropriate in certain rectangular area; the overall region is eliminated for additional pixel comparison. This results in fast work and their entire recognition time is decreased. The end users are necessary to have lowest working experience in systems to execute this software. The application decreases recognition time and assist in enhancing the error free and effective patterns identification. The application is verified well consequently that the end users use this software for their entire pattern recognition related operations.

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