International Journal of Computer Science and Mobile Computing

A Monthly Journal of Computer Science and Information Technology

Classification Approach for Brain Tumor Detection

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Abstract:- In the previous approach, weight based algorithm is used to classify the normal and cancer cells and it is been analyzed that weight based algorithm taken long time to classify the data. To classify the data in minimum amount of time HMM classifier is used for classification. The second issue with weight based algorithm is of accuracy. As due to weight calculation accuracy of classification is less which can be improved with the use of Bayesian classifier In the feature selection part on three features are used which are mass, density and margin . In the improvement more features like tissue color will be added which improve detection rate The simulation is performed in MATLAB and it is been analyzed that proposed technique performs well in terms of certain parameters.
Keywords: HMM, Brain Tumor Detection, MRI, Classification.

I.   INTRODUCTION

Images today are being used for sending as well as receiving information. The images are received from internet, satellites, cameras, and many other evolved technologies. The images that are available with some information in them are considered to be as raw images. These images have in them much useful information, which can be used for investigation purposes [1]. There is a lot of duplicity and copying of original data and using for personal issues and also for destroying others privacy. Image processing is known as the enhancement of raw images gathered from day-to-day lives that are collected from any kind of sources like satellites, cameras, internet, etc. such data can be useful either for scientific results or for the criminal investigations. By definition Image processing is computer imaging where application includes an individual in the visual circle. At the end of the day the image are to be analyzed and a followed up on by individuals [2]. It is a strategy in which the information from an image are digitized and different numerical operations are connected to the information by and large with a digital computer keeping in mind the end goal to make an enhanced image that is more valuable to human onlooker. All the activities of the parts of a human body are controlled by the brain which is an important part. Brain tumor is caused due to the growth of abnormal cells of brain [3]. These days, the diagnosis of brain tumor is very vital. The uncontrolled multiplication of cells is referred as tumor. A tumor is referred to as a cell that is rapidly partitioned from a micro calcification, Lump, distortion [4]. The process through which

the tumor generating cells move to other parts of the body is known as metastasis. From the regular tissue reinstate, the tumor initiates. The different types of brain tumors are meningioma and glioma. If the brain tumor is recognized at very early stage, it can be cured and treated. The intracranial pressure can be maximized due to which the brain can be destroyed permanently [5]. On the basis of size of tumor, location and its type, the symptoms of brain tumor reply. With the help of MRI and CT scan, the tumor can be detected. Within the brain, the brain angiogram procedure is applied within the blood vessels. The tumor part is then fed with blood. There are tissues or sample of cells included from the brain as per the procedure of biopsy. This is utilized at the time of surgical treatment such that the benign of cancerous brain tumor can be predicted. Due to few symptoms it is possible sometimes to delay or misuse the cancer diagnosis. Certain techniques are utilized for the detection of brain tumor at early age or in the later stage [6]. There are different factors that influence the reason for it furthermore there are various techniques proposed for its detection and removal. Here, there are certain image processing strategies that have been utilized as a part of distinguishing the tumor. The principle set-up systems for brain tumor control depend on prime counteractive action alongside early detection. There are two methods for brain tumor spreads in our body [7]. Tumor shapes in the tissues of brain. Early detection and appropriate medicinal registration are mandatory however in the meantime legitimate diet and sustenance additionally battles with malignant tumor cells. In human body, new cells are framed and old cells are vanishing every day. Sometimes new cells are created, become wildly and structure abnormal cell structure called tumor cells. Brain tumor diagnosis has turned into the need of great importance and examination works around there is highly testing [8]. These days there are many propelled procedures incorporated into mammography. Image enhancement is the fundamental step in image processing. Principle motivation behind image enhancement is to deliver better and quality image. Smoothing is utilized to diminish the noise, less blurring, produce a less pixelated image cleaning for the same size with no image size modification in the data. Filter is utilized to evacuate some unwanted signal or component in the image. Filters expel certain frequencies to smother meddling signals and lessen background noise. Noise is unwanted signals in the image [9]. Noise is not generally arbitrary and irregularity is a simulated term. Two plagues image acquisition are (1) Noise. (2) Blur (Out of center, Movements, Bad weather). Noise is dependably not terrible. To conquer these issues we utilize denoise. Denoise is to rectify the issue of outwardly obnoxious, awful compression and terrible examination. An image histogram offers graphical representation of tonal dispersion of gray values in digital picture. Enhancing the image quality is by utilizing the histogram equalization. Histogram equalization demonstrates the intensity values along aggregate range of value should be possible in images and background and foreground are splendid at a time.

II.   LITERATURE REVIEW

Devendra Somwanshi, et.al (2016) presented brain tumor is a fatal disease whose detection and diagnosis at the early stage is required due to which a computer based image processing technique is utilized in this paper [10]. This computer based technique is MRI in which segmentation of images is done using which tumor size, location and shape can be detected easily. In the image processing, segmentation can be done using various techniques. There is an entropy based algorithmic techniques present in the threshold technique using which brain tumor can be detected at the early stage. They found threshold selection of images based on entropy methods approach very useful and effective in the diagnosis of brain tumor. On the basis of simulation results, they analyzed and compared techniques and concluded that havrda-charvat entropy performs better than any other entropy algorithms.

Manu Gupta, et.al (2016) presented on the basis of the selected statistical texture and morphological features, a new model for the diagnosis of brain tumor is presented in this paper [11]. Therefore, for the detection of tumor various classifiers are considered such as SVM with linear, RBF and polynomial kernels along with LDA and Naïve Bayes classifiers in this paper. The extracted dataset is splited into and testing set for which they utilize k-fold cross-validation for the classification of tumor. When the SVM classifier used with linear kernel, the maximum accuracy of 100% is achieved among all the classifiers. With the help of the proposed method doctors can detect brain tumor and can plan its treatment at the early stage for diagnosing tumor. In this paper, they tested the proposed model on the small dataset.

Luxit Kapoor, et.al (2017) presented with the advent in the technology, there is growth and demand of biomedical image processing field. The extraction of meaningful information and accurate information from these images with the least error possible is the main objective of medical imaging. MRI is considered as the most reliable and safe technique among various types of medical imaging processes available currently [12]. Therefore, the tumor can be segmented easily after processing MRI in it. There are several different techniques present in the tumor segmentation. In the four categories the whole process is categorized in order to detect brain tumor from an MRI such as Pre- Processing, Segmentation, Optimization and Feature Extraction. They surveyed in detailed and analyzed all the process in this paper.

Sanjivani Salwe, et.al (2016) proposed a new approach in order to detect affected mass in magnetic resonance images (MRI) [13]. Therefore, using this adaptive threshold component is further threshold. On the basis of obtained components, the original image is again reconstructed using proposed segmentation. At level one, the approximation component is unaltered. There is false detection of brain tumor due to presence of light in-homogeneity and due to hard tissues based on window based threshold for which windowing technique is used by which it is eliminated. On the basis of performed experiments, it is concluded images showed complete black region in the final segmented image showed by the normal patient while the region of interest after segmentation showed in malignant images after segmentation process.

Smita.A.Nagtode, et.al (2016) presented in this paper the utilization of discrete wavelet transform and probabilistic neural network by which brain tumor can be detected and classified. The appropriate results are provided by the variance of illumination and probabilistic neural network for classification due to the robustness of GW features against local distortions [14]. The proposed Gabor Wavelet approach is used to study all other images such as practical images in which advantage of wavelet transform used for face recognition that give exact outcomes. They proposed a two dimensional Gabor wavelet analysis application for brain images in this paper. In order to identify tumor at early stage, they classified a method for it in which images are classified into non-cancerous (benign) brain tumor and cancerous (malignant) brain tumor.

Rahul Singh, et.al (2016) presented the extraction of brain tumor in magnetic resonance (MR), for which an innovative and robust image segmentation approach was proposed in this paper. In order to classify a given MR brain image as benign or malignant, a novel technique is proposed by them. They implemented the wavelet transform in the initial stage followed by Laplacian Eigen maps (LE) in order to extract the features from given MR brain tumor image. This is done to restrict the dimensions of extracted features [15]. The Leave-one-out crosses validation (LOOCVCV) strategy also utilized by them in order to enhance generalization of K-SVM. On the basis of performed experiments, it is concluded that proposed method has better performance as compared to previously utilized methods in terms of computational and qualitative aspect. Therefore, with the help of this proposed method doctors can easily examine whether the tumors is benign or malignant.

III.   RESEARCH METHODOLOGY

In this research work, technique will be proposed for the detection of brain cancer. The CT scan images are given as input and on that images region based segmentation will be applied with the technique of classification to classify cancer and non-cancer cells. The k-mean clustering will be applied for the region based segmentation and HMM will be applied to classify cancer and non-cancer cells. Algorithms for classification typically go through a sequence of steps, with a set of choices at each step. For many optimization problems, using dynamic programming to determine the best choices is overkill; simpler, more efficient algorithms will do. In order to model the generative sequences those are characterized through an underlying process that creates an observable sequence. It is a powerful statistical tool by which generative sequences are modeled. These sequences further can be characterized by a fundamental process generate an observable

sequence. In the various areas application of HMMs can be found in signal processing such as in speech processing. In the low level NLP tasks this process can be utilized which provide successful results such as part-of-speech tagging, phrase chunking, and extracting target information from documents. In the weighted automaton, a Markov chain is a special case according to which weights are probabilities. The state of the automaton it passing through is uniquely determined by the input sequence. This Markov chain is only useful for assigning probabilities to explicit sequences as inherently ambiguous issues are not represented by it. For both observed events and hidden events, one can provide its view that what one can think of causal factors in the probabilistic model as it is allowed by this model. It is the method which provides the probability of transitioning between any two states due to which it is called as fully connected or ergodic HMM. There are some cases in HMM in which zero probability exists in various transitions beBakis network tween states. For instance, from left to right the transition state proceed in the left-to-right HMMs also called as Bakis. There are no transitions happen from a higher-numbered state to a lower-numbered state in case of above mentioned method. There is zero probability if transitions occur from a higher-numbered state to a lower numbered state. With the help of this temporal processes like speech can be modeled by it.
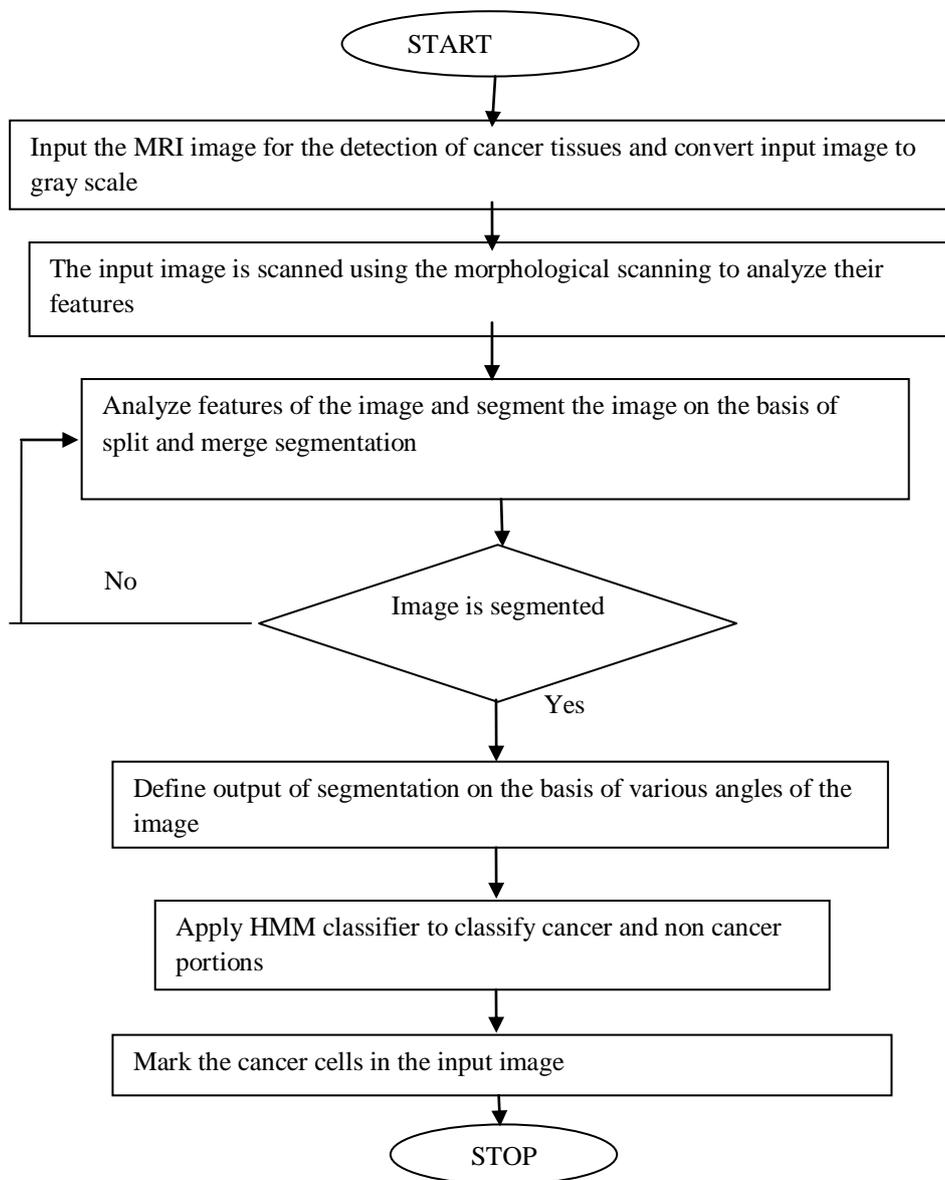

Figure 1: Proposed Flowchart

IV. EXPERIMENTAL RESULTS

The proposed research is implemented in MATLAB and the proposed and existing approaches are compared with each other to perform a simulation analysis.
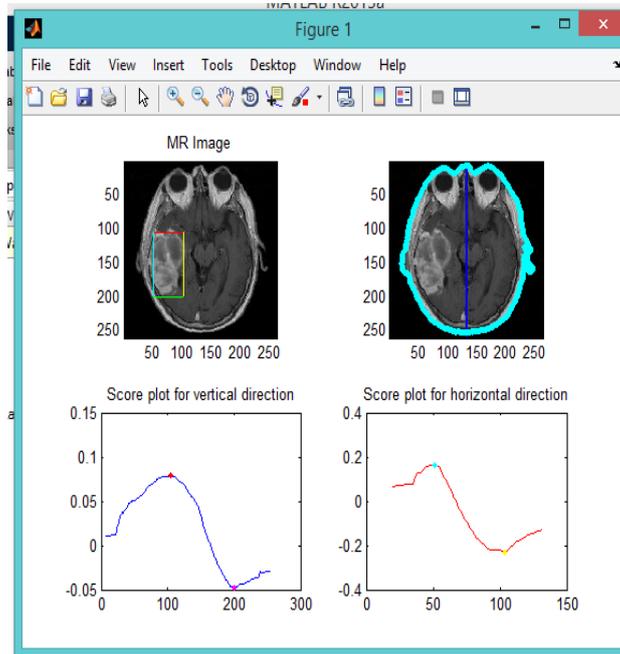

Figure 2: Tumor detection from the MR image

As shown in the figure 2, the image which is given as input is segmented to detect boundary of the image. The segmented image is given as input to remove noise from the image. The input image is analyzed horizontally and vertically to analyze image features. In the last step technique of neural networks is applied to detect tumor portion from the image.
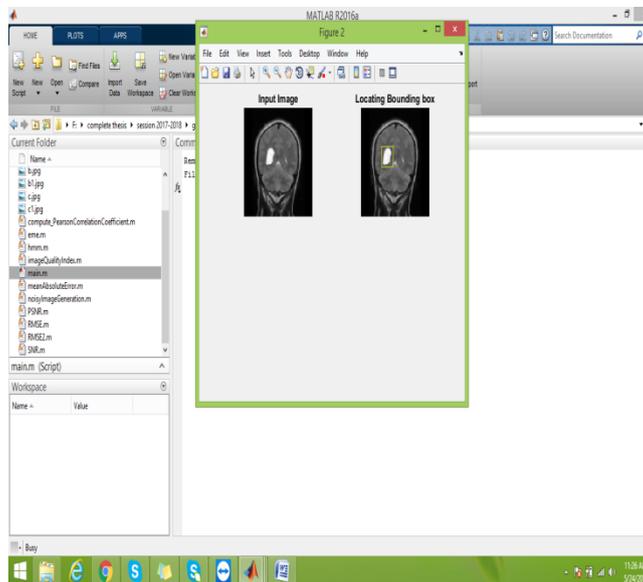

Figure 3: HMM Classifier

As shown in figure 3, the images which are given as input are the MRI images from which tumor need to detect. In this figure the HMM classifier is applied for the tumor detection.
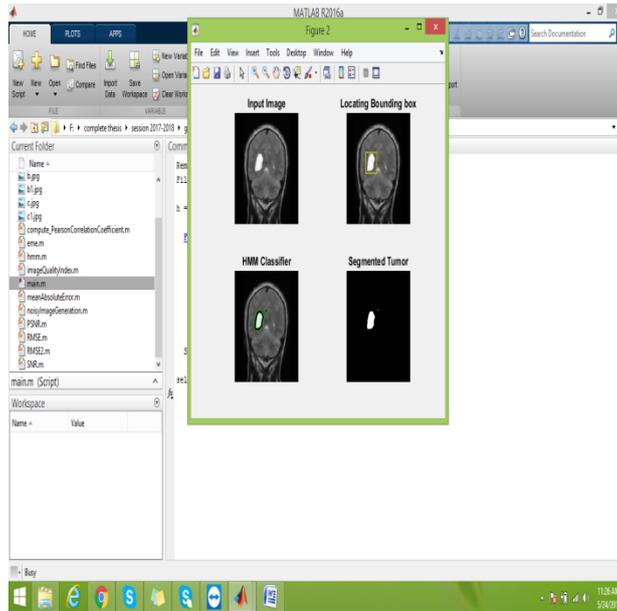
Figure 4: Segmentation of Tumor

As shown in figure 4, the HMM classifier is applied in this work which can scan whole image diagonally and detect segment portion. The segmented portion is marked with the yellow color.
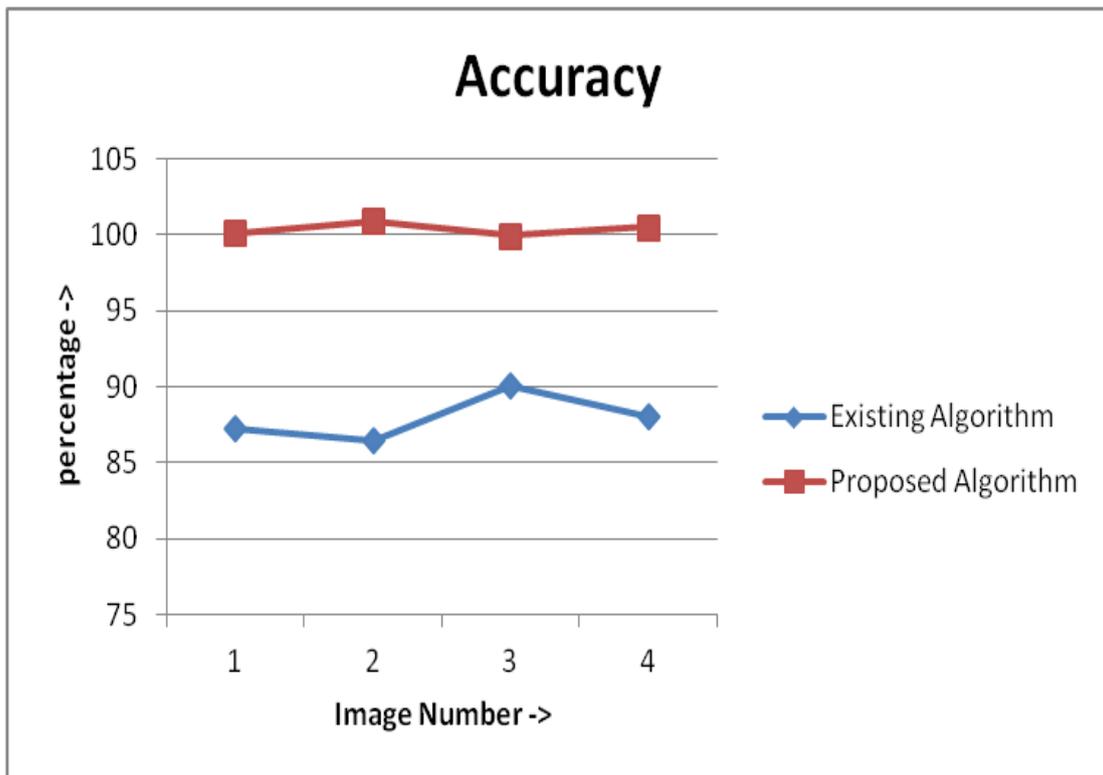

Figure 5: Accuracy analysis

As shown in figure 10, the accuracy of the proposed and existing algorithm is compared for the performance analysis. The accuracy of proposed algorithm is due to use of HMM classifier as compared to existing algorithm.
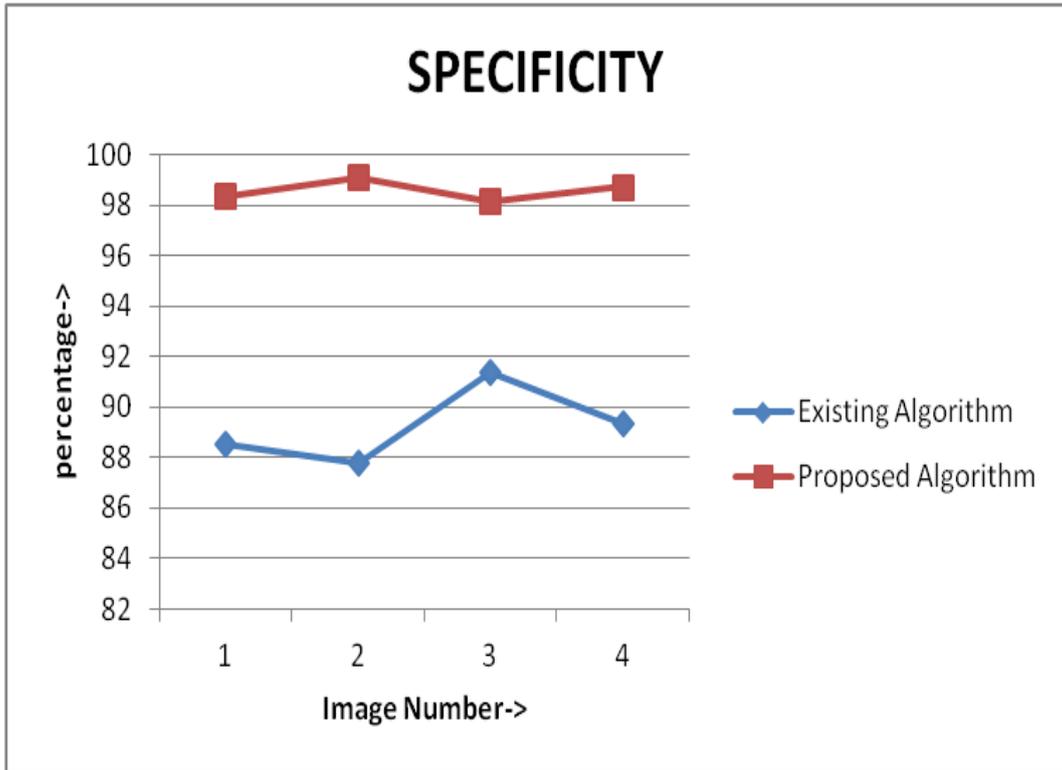
Figure 6: Specificity analysis

As shown in figure 6, the specificity of the proposed and existing algorithm is compared for the performance analysis. The specificity of proposed algorithm is due to use of HMM classifier as compared to existing algorithm.

Figure 7: Sensitivity analysis

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As shown in figure 7, the sensitivity of the proposed and existing algorithm is compared for the performance analysis. The sensitivity of proposed algorithm is due to use of HMM classifier as compared to existing algorithm.
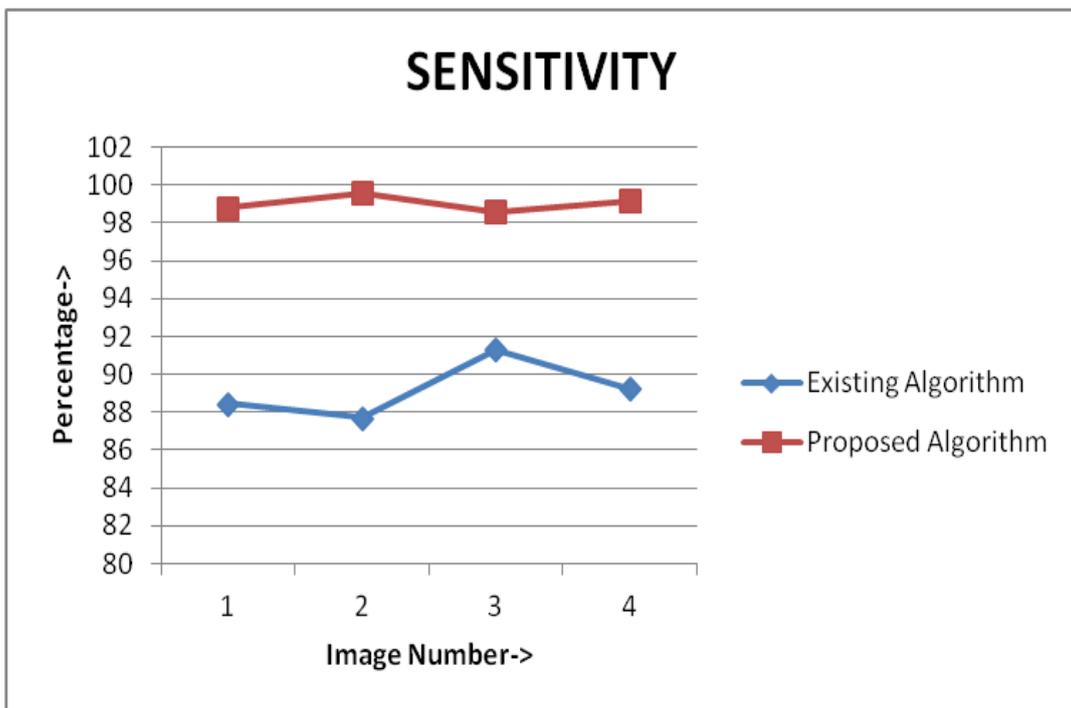
TABLE I
ACCURACY ANALYSIS

Number	Existing	Proposed
Image 1	87.206	100.
Image 2	86.466	100.
Image 3	90.047	99.
Image 4	88.006	100.

TABLE II
SPECIFICITY ANALYSIS

Number	Existing	Proposed
Image 1	88.526	98.342
Image 2	87.786	99.094
Image 3	91.367	98.162
Image 4	89.326	98.725

TABLE III
SENSITIVITY ANALYSIS

Number	Existing	Proposed
Image 1	88.436	98.782
Image 2	87.696	99.534
Image 3	91.277	98.602
Image 4	89.236	99.165

V.   CONCLUSION

In this work, it is been concluded that to detect breast cancer various techniques has been proposed in the previous times. The most efficient technique of brain cancer detection is based on morphological scanning, split and merge segmentation and on nearest neighbor classifier. In this work, to improve efficiency of the breast cancer detection SVM classifier is replaced with HMM classifier. The split and merge segmentation will split the input image on the basis of their properties. The output of split and merge segmentation is given as input to HMM classifier which will classify the features of the basis of their properties. The cancer and non cancer cells are marked with different colors. The simulation is performed in MATLAB and it is been analyzed that proposed technique performs well in terms of fault detection rate and accuracy.

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