A Survey: Automated Brain Tumor Detection and Segmentation from MRI of Brain

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Abstract – Brain tumor detection and segmentation is one of the maximum tough and time consuming venture in medical image processing. MRI (Magnetic Resonance Imaging) is a scientific technique, specifically utilized by the radiologist for visualization of inner shape of the human frame without any surgical procedure. MRI provides considerable statistics approximately the human soft tissue, which helps in the prognosis of brain tumour. Accurate segmentation of MRI photo is critical for the diagnosis of brain tumor by means of pc aided medical tool. After suitable segmentation of mind MR photographs, tumor is assessed to malignant and benign, which is a difficult mission due to complexity and variation in tumor tissue characteristics like its form, size, grey stage intensities and vicinity. Taking in to account the aforesaid demanding situations, this study is focussed towards highlighting the energy and barriers of in advance proposed category techniques discussed within the cutting-edge literature. Besides summarizing the literature, the paper also affords a crucial evaluation of the surveyed literature which reveals new sides of research.

Index Terms – Brain tumor Detection, Image Segmentation, Magnetic Resonance Imaging, Pre-processing, Feature extraction etc.

1. INTRODUCTION

Cancer in a frame occurs when the cell within the body grows and divides in an uncontrollable way. If this happens in brain then it's far referred to as brain tumor. A mind tumor is a mass of pointless and abnormal cellular growing in the brain or it is able to be defined as an intracranial lesion which occupies area inside the skull and has a tendency to reason a rise in intracranial stress. Brain tumors are specially classified in to 2 i.e Benign and Malignant. Benign tumors are noncancerous and that they seldom grows back in which as malignant tumors are cancerous and that they swiftly grows and invade to the encompassing healthy brain tissue. The region of tumor in brain allows the man or woman to determine how the brain tumor consequences an individual everyday functioning. Brain tumor can be recognized with the aid of taking non-public and family medical records and also by physical exam, brain CT/MRI experiment, mind angiogram, spinal tap biopsy and many others. Diagnosis of mind tumor may be not on time because its symptom is just like symptom of different situation. There are numerous image processing method which include

histogram equalization, image segmentation, photograph enhancement, morphological operation, function choice and extraction and type.

2. MATERIALS AND METHODS

Xiao et al [1] proposed an approach to estimate features from the correlation among brain lateral ventricular (LaV) deformation and tumor and the extracted capabilities are implemented for tumor segmentation of MR photos. Proposed approach specifically consists of four tiers: pre-processing, function extraction, segmentation and category. In the first level, the difficulty of non standardization of depth, geometric non uniformity and redundant statistics in the history photograph and skull are addressed. Lateral ventricular deformation is used for characteristic extraction. In the segmentation component, unsupervised segmentation methods are used to for the evaluation of LaV deformation function on the mind tumor segmentation. In this paper the most frequently used techniques are K nearest neighbors (KNN) and traditional Fuzzy related C-suggest (FCM). The experimental results shows the relevancy between LaV deformation and tumor location. Comparative test have a look at on tumor segmentation recommend that, tumor segmentation accuracy improves when the extracted functions are correct. In the proposed gadget the Specificity and sensitivity received is 100%.The proposed brain tissue segmentation has a disadvantage of wrongly assigning a non CSF pixel to the cluster CSF. To remove this undesired pixel, a worldwide masks is carried out, there by means of leaving the place as extracted. Future scope of this paper is that, through incorporating the LaV deformation as a further function can be obtained for pattern recognition segmentation, thereby improving mind tissue segmentation.

Nandagopal and Rajamony [2], in their paper they provided a combination of wavelet statistical features(WST) and wavelet co-prevalence texture characteristic(WCT) acquired from degree discrete wavelet remodel is used for the classification of ordinary mind tissues in to benign and malignant. The proposed system consists of 4 phases: segmentation of vicinity of hobby, discrete wavelet decomposition, feature extraction and

characteristic selection and classification and assessment. The help vector machine is hired for brain tumor segmentation. A mixture of WST and WCT is used for characteristic extraction of tumor area extracted from two degree discrete wavelet rework. Genetic set of rules is used to pick out the most suitable texture features from the set of extracted functions. The probabilistic neural community is used to categories at abnormal mind tissue in to benign and malignant and the overall performance assessment is executed through comparing the class result of PNN with other neural network classifier. The class accuracy of the proposed device is 97.5%. However the main obstacle of this proposed system is that, it want new schooling for Gaussian SVM classifier each time there's alternate in photo facts set and this approach is carried out best to CT snap shots best. In destiny the work can be extended to different forms of imaging consisting of liver CT imaging, MRI imaging, ultrasound imaging and many others.

Kalbhani et al [3] in their paper, they delivered a way for the class of MR snap shots in to everyday and peculiar one. At first two degree, dimensional discrete wavelet transform (2D DWT) of the input photograph is calculated and wavelet coefficients of details sub band are modeled by way of Generalized Auto Regressive Conditional Hetroscedasticity (GARCH) statistical version. After function vector normalization, fundamental issue analysis (PCA) and Linear Discriminate Analysis (LDA) are used to extract the proper characteristic and to lessen the redundancy from the number one feature vectors. Finally the extracted feature are carried out to the K nearest neighbor (KNN) and help vector system (SVM) classifier separately to decide the normal or abnormal type images. The outcomes suggest that the proposed algorithm can gain high category charge and it desires most effective much less range of features for category. In the primary state of affairs the category accuracy carried out for KNN and SVM classifier are approximately 97.62% and 98.21% respectively and inside the 2nd scenario both classifiers obtain about 100% accuracy.

Sindhu mol et al[4], proposed a method to enhance the category of brain tumor from Magnetic Resonance Image based on spectral attitude primarily based characteristic extraction and spectral clustering impartial factor evaluation (SCICA). First the MR picture is split in to unique clusters through spectral distance based totally clustering. Independent component analysis (ICA) is performed on the clustered records at the side of help vector system (SVM). Here T1weighted, T2 weighted and proton density fluid inversion recovery picture were used for assessment. Comparative analysis is achieved with ICA primarily based SVM and different conventional classifiers to established the stability and efficiency of SC-ICA based totally category. The accuracy finished through the evaluation of ICA based totally SVM effects in 98% and 96.1% for reproduced lesion. Future work of the proposed approach can be delicate with an adaptive threshold selection scheme and the enlargement of multi spectral statistics with more informative

MRI collection; can be used for the evaluation of several brain tissues. The experimental consequences shows that the classification performance varies primarily based on the edge values selected. Low threshold values can enhance the category accuracy of local capabilities; however it could lead to over clustering, which adversely have an effect on the ordinary tissue evaluation. Feature extraction fee due to clustering in SCICA is every other issue.

Navarro et al[5] , in their paper provided a new technique for characteristic selection of dimensionality reduction and numerous off the shelf classifiers on diverse HMRS modalities i.e., long and brief echo times and an adhoc combination of both. In feature selection they're having entropy selection algorithm, that is a quick approach to generate a applicable subset of spectral frequency. Feature choice is accomplished in the classifier in an independent way inside the boot strap samples. Then a set of classifier is developed on the boot strap samples the use of formerly decided on set of features and the final results is the selection of a particular classifier for each data kind. A final version is acquired the use of boot strap pattern the use of iterative manner. The accuracy received for the proposed machine is 95%. Therefore the destiny research extends the usage of the proposed technique to different brain tumor type problems concerning exclusive pathologies and pathological grouping.

Saritha et al [6] in their paper proposes technique by means of integrating wavelet entropy based spider web plots and probabilistic neural community for the type of Brain MRI. The proposed method uses two steps for type i.e. wavelet entropy primarily based spider net plot for characteristic extraction and probabilistic neural network for classification. The obtained brain MRI, the feature extraction is achieved by means of wavelet rework and its entropy cost is calculated and spider web plot area calculation is carried out. With the assist of entropy cost classification using probabilistic neural community is computed. Probabilistic neural network affords a trendy answer for pattern category hassle and its classification accuracy is approximately a 100%. The problem of this method is that whenever there is a alternate in picture database, fresh training is needed.

Sumitra and Saxena [7]. In this paper they present a neural community method for the classification of magnetic resonance brain pix. The proposed strategies consist of specifically 3 levels: feature extraction, dimensionality reduction and type. The characteristic extraction is completed the use of PCA from MR images and important features which includes suggest, median, variance, correlation values of maximum and minimum intensity are extracted. In the classification level, the classifier primarily based on back propagation, neural network were developed. This classifier classifies the photograph as normal, benign and malignant. The end result suggests that the BPN classifier gives fast and correct

classification than any other neural network classifier. The category accuracy of testing records set of mind photograph is seventy three%. Its destiny works includes that the performance may be improved by growing the database.

Jayachandran and Dhanasekharan [8] proposed a paper based on hybrid set of rules for detection of mind tumor in three magnetic resonance imaging the usage of statistical and guide vector machine classifier. The proposed method consists of 4 levels specifically noise discount, characteristic extraction, function discount and category. In the first stage anisotropic filter out is applied for noise discount and to make the image appropriate for extracting functions. In the second stage texture features are extracted the use of gray level co -occurrence matrix. In the 1/3 level extracted feature is reduced the usage of important element evaluation (PCA). In the ultimate stage the FSVM classifier is used to classify the difficulty as normal or odd photo. The type accuracy is approximately 95.80%. This paper is having the constraints of using predominant element evaluation, which reduces the lower dimensionality of the feel function.

Nantha Gopal and Sukanesh [9] in their paper offered a automatic software program device designed for segmentation and classification of benign and malignant tumor. In this, the author proposed a method for selecting both dominant run length and co-prevalence texture feature of wavelet approximation tumor area by way of a support vector machine (SVM).Two Dimensional Discrete Wavelet Decomposition is accomplished on the tumor place having noise. Of these Seventeen capabilities extracted, six features are selected using students t-take a look at. The decided on Features are fed to the classifiers for category .Here SVM and probabilistic neural community classifiers are used. The classification accuracy is evaluated using ok fold go validation technique. In this the classification accuracy acquired is ready 96.4.%. The experimental results show that by means of the use of SVM classifier excessive segmentation and classification accuracy can be obtained. However the paper has its own hindrance of having a brand new education set, each time there is alternate in the statistics set. This approach is relevant handiest to CT photographs. More over the paintings may be extended to different kind of imaging together with liver CT photos, MRI imaging and ultra sound imaging.

Deepa and Devi [10] in their paper they proposed an automated method that employ the functionality of returned propagation (BP) and Radial Basis Function (RBF) neural network function to categorize mind picture in to cancerous or non-cancerous one. The proposed system consists of two stages. First phase encompass texture feature extraction from brain MRI images the use of statistical features. In the 2nd segment, class of brain pictures on the premise of these texture function the usage of BPN and RBFN classifier is used for type. After classification tumor region is extracted from the ones snap shots and are

again categorized as malignant using the segmentation system. The fundamental barriers of the proposed device are in selecting the best functions to differentiate between classes. This can be triumph over by means of incorporating spatial vehicle correlation by using fusing at extraordinary level reduces MSE in case of RBFN. In destiny paintings can be extended in enhancing RBF the usage of spatial decomposition method i.e. like shrinking and kernel catching. For higher processing 2d level decomposition method may be applied for photograph wavelet.

Mustara & Suchalatha [11] of their paper they proposed a system for brain cancer detection and class. The photo processing technique like histogram equalization, image segmentation, photograph enhancement, morphological operation and function extraction were developed for the detection of brain MRI photographs. The texture characteristic extracted inside the detected tumor has been executed by way of the usage of grey degree co-prevalence matrix (GLCM). These functions are in comparison with the functions stored in the expertise base. Finally neuro fuzzy classifiers have been advanced for the popularity of various type of brain most cancers. The complete machine turned into examined in section first of all mastering/training phase and secondly recognition/testing segment by the usage of ANN classifiers.

Jafari and Shafaghi [12]. In their paper, they offered a hybrid technique for the detection of mind tumor tissue in magnetic resonance photograph primarily based on genetic algorithm and assist vector gadget. Proposed device consists of 4 levels. In the primary degree –pre-processing: noise removal and evaluation enhancing is accomplished. The second stage is segmentation. Skull stripping is executed with the help of morphological operations. The 0.33 level is characteristic choice and extraction. Feature choice is completed based on four categories- static capabilities, Fourier and wavelet transforms histogram and the combination of prior set. Feature selection is achieved by genetic algorithm. In the fourth degree, the chosen capabilities are fed as input to the support vector system classifier to detect ordinary and bizarre mind with an accuracy of eighty three.22%. The issue of this work is that wavelet remodel require huge storage and its computational price is high.

Rathi and Palani[13] in their paper they proposed a unique approach of characteristic selection and extraction. This technique in particular combines the intensity, texture, form based functions and classifies the tumor place as white rely(WM), gray remember(GM), CSF, ordinary and everyday vicinity. The help vector machine (SVM) classifier is used for the comparison of nonlinear approach with linear ones. Principal issue analysis (PCA) and linear discriminate evaluation (LDA) strategies are used to reduce the quantity of features. The characteristic selection using the proposed technique is extra useful than the present system, as it examine

the records in keeping with the grouping elegance variable and gives decreased characteristic set with high elegance accuracy. The classification accuracy acquired is 98.87%. This paper is having the constraints of using principal thing evaluation, which reduces the lower dimensionality of the feel characteristic.

Zarandi et al[14], of their paper presented a kind II fuzzy professional gadget for diagnosing human mind tumor the usage of T1 weighted MR pictures. The proposed gadget includes 4 modules: pre-processing, segmentation, characteristic extraction and approximate reasoning. A fuzzy rule base with the aid of aggregating the present filtering technique is used for preprocessing step, segmentation is performed with the aid of extending the probabilistic c suggest (PCM) technique with the aid of the usage of the kind II fuzzy principles, mahalanobis distance and kwon validity index. Feature extraction is completed via thresholding method and finally a kind II approximate reasoning method is advanced to apprehend the tumor grade in mind MRI. Experimental result indicates that the proposed device is advanced in recognizing the brain tumor and its grade than kind I fuzzy professional system. Its future works consist of, the use of parametric operator alternatively of general ones makes the device greater adaptive.

Zhang et al [15] in their paper they presented a neural community based totally technique to categorize a given MR brain picture as ordinary or unusual. This method first employs wavelet transform to extract characteristic from photograph and then applies the technique of primary element evaluation (PCA) to lessen the scale of features. The reduced features send back to again propagation neural network, with which scaled conjugate radiant (SCG) is followed to discover the optimum weight of neural network. The class accuracy of both schooling and check photo are one hundred%. In future the proposed approach can be hired for MR pictures with different comparison mechanisms such as T1W, proton density weighted.

Kharrat et al [16] of their paper they proposed a hybrid approach for the type of brain tissue in magnetic resonance picture (MRI) primarily based on genetic set of rules and guide vector device (SVM). The proposed technique has 3 steps:- characteristic extraction, characteristic choice and classification. In this a wavelet primarily based texture function is derived and ideal texture features are extracted from regular and tumor location by using the usage of spatial gray level dependence technique(SGLDM) and those features are given as input to SVM classifier. The premiere features are used to categorise the mind tissue into everyday, benign and malignant tumor and their overall performance is evaluated. The accuracy of the proposed system varies from 96.37 to 98.99%. This paper is having the constraints of getting fresh training set whenever there is change in image database.

Lashkari [17] this paper introduces a singular computerized brain tumor detection approach that uses T1,T2 weighted and PD, MR pictures to decide any abnormality in the brain tissue. The proposed technique especially consists of 4 tiers- pre-processing, feature extraction, characteristic selection, classification. In pre-processing stage the increase in contrast among ordinary and atypical mind tissue is achieved and DFT of the picture is computed. In the following stage, feature extraction is completed. Here non-statistical feature extraction particularly Gabour wavelet is used and the function choice is accomplished by kernel-F rating technique. These selected capabilities are then sent to the multilayer belief neural community for in addition class. However the gadget is having the hassle of using all the three modalities together with T1, T2 weighted and PD MR Images. Its future works consist of the integration of functions derived from fractural analysis which describes the neighborhood texture or ruggedness in terms of an envisioned price referred to as Hurst Coefficient.

Jain [18] in this paper he proposed a technique that classifies brain tumor primarily based on synthetic neural community. The proposed device consists of 3 levels: pre-processing, feature extraction, and classifier. In the pre-processing histogram equalization and morphological operations are performed for reinforcing and sprucing the binaries image. Feature extraction is finished by way of grey level co-occurrence matrix (GLCM). These extracted features are fed as enter to the BPN classifier for type. There the picture is classed in to ordinary or unusual photograph. The classification accuracy is about 96.84%. Future work may be carried out by using the use of a progressed artificial neural network with development of characteristic function will help to gain properly separated data.

El-Dahshan et al [19] in their paper affords a hybrid technique for the class of Magnetic Resonance Images (MRI). The proposed technique consists of three tiers: characteristic extraction, dimensionality reduction and type. In the primary stage characteristic extraction is accomplished with the aid of Discrete Wavelet Transform (DWT). In the second one stage, the feature of Magnetic Resonance Image has been reduced with the aid of the use of Principal Component Analysis (PCA). In the category degree two classifiers had been developed. The first classifier is based totally on feed forward returned propagation artificial neural network (FP-ANN) and the second one classifiers were used to categorize topics as ordinary or peculiar MRI human picture. A classification of ninety seven% and ninety eight% has been obtained by means of FP-ANN and K-NN respectively. The consequences indicate that the proposed method is robust and effective as compared with different latest work. The drawback of this painting is that it calls for fresh training on every occasion while ever, there's a exchange within the photograph information base. In destiny the work may be prolonged for the evolved technique for processing the pathological mind tissue.

Georgiadis et al[20] hired a software device for discrimination between metastatic and number one brain tumor on MRI. The look at hired a Modified Probabilistic Neural Network classifier (PNN) and incorporating a nonlinear least rectangular characteristic transformation (LSFT) in to the PNN classifier. In this six capabilities are extracted from the T1 weighted image. In this they accrued an awesome classification accuracy of ninety five.24% for discriminating between metastatic and primary tumor and 93.48% for distinguishing from meningiomas in the first stage and inside the 2nd level classification accuracy is 100%.Selecting the ROI throughout the pixel. In the primary degree gliomas and menigiomas have been grouped in to primary mind tumor with the help of 1/3 diploma LSFT PNN classifier and inside the subsequent stage the primary mind tumor is once more classified in to gliomas and meningiomas with the help of second diploma LSFT PNN. The delivered benefit of this method is the stepped forward performance, improved class separability and dimensionality reduction. Limitation of this painting is that, external go validation approach is used to keep away from over becoming condition and it has very less discriminate accuracy.

Selvaraj et al. [21] proposed an intelligent classification method for the identity of normal and abnormal mind slices. An advanced classification method, primarily based on least rectangular aid vector gadget (LS-SVM) becomes proposed. The capabilities to be categorized are derived from the slices. This classifier the usage of linear in addition to nonlinear radial basis function (RBF) kernels are as compared with other classifiers like SVM with linear and nonlinear RBF kernels, RBF classifiers, Multilayer perceptron"s (MLP) classifier and KNN classifier. The class accuracy is set ninety eight.64%. In future this may be used further for the type of snap shots with special pathological situations, disease status and brands.

Lin et al [22] of their paper they introduce a way for precise correct and green quantification of brain tumor thru MR imaging. The reason of this work is to construct a computerized system to assess its effectiveness for habitual clinical paintings. In this the picture (FLAIR, T1 and T2) are processed independently. The steps concerned are

a) MRI picture are first standardized for every protocol and subsequent operation is done on the standardized photograph. The segmentation is finished thru fuzzy connectedness algorithm. b) The FLAIR images are segmented to compute the volume of edema. c). T1 and T1E images are registered and a different image is obtained. d).The difference image is segmented. e) All segmented region volumes are computed. However the limitations in this method that it runs automatically except for the choice of a volume of interest and seed point. A user verification step must be added to ensure the quality.

3. CONCLUSION

In this paper we've done a partial survey of numerous category techniques for MRI brain photo. A comparative examine is made on numerous strategies. After evaluation of famous approach it's miles simply shown the various strategies which can come across the tumor successfully and offer correct end result. This paintings will be prolonged for brand spanking new set of rules for mind tumor detection to be able to provide greater efficient end result than the prevailing techniques in close to future. Computational time may also be considered to examine this approach correctly. As the diagnosis tumor is a complex and sensitive project, accuracy and reliability are usually assigned a whole lot significance .Hence an elaborate methodology that high lighting fixtures new vistas for developing extra sturdy image segmentation method is much sought.

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No	Author	Year	Methods used	Limitation	Accuracy
1	Xiao et al	2013	K nearest neighbors (KNN) and conventional Fuzzy connected C-mean (FCM).	They wrongly assign, a non CSF pixel to the cluster. Undesired pixel are removed by placing a global mask , there by leaving the region as extracted one.	100%
2	Nandagopal & Rajamony	2013	SVM is used for segmentation. A combination of WST and WCT is used for feature extraction. Genetic algorithm is used to select the optimal texture feature. PNN is used for classification.	Whenever there is change in image data set, It need new training set for Gaussian SVM classifier .This method is applied only to CT images.	97.5%
3	Kalbhani et al	2013	2D DWT of the input image is calculated fist. Then the features are extracted by PCA and LDA. The extracted feature are applied to KNN and SVM classifier for classification	they cannot model asymmetric with respect to the sign of past values	97.62% and 98.21%
4	Sindhu mol et al	2013	It is based on spectral angle based feature extraction and spectral clustering independent component analysis (SC-ICA)	Low threshold value can lead to over clustering. Cost of Feature extraction due to clustering is high.	98% & 96.1%

5	Navarro et al	2013	It introduce a new method for feature selection and dimensionality reduction by using off the shelf classifiers on various HMRS modalities	There are many issues involving different pathologies and pathological grouping.	95%
6	Saritha et al	2013	Approach is by integrating wavelet entropy based spider web plots and probabilistic neural network for the classification of Brain MRI	Whenever there is an increase in image database fresh training is required.	100%
7	Sumitra and Saxena	2013	Uses a neural network technique for the classification of MRI images. The feature extraction is done by using PCA Over	Over discriminate accuracy is less. Determination of Unique feature vector is not possible	73%
8	Jayachandran and Dhanasekhara	2013	Based on hybrid algorithm for detection of brain tumor MRI using statistical and SVM classifier.	Principal component analysis, reduces the lower dimensionality of the texture feature	95.3%
9	Nantha Gopal and Sukanesh	2012	Dominant run length and co-occurrence texture feature are selected by SVM. Features are extracted and selected using students t-test. The Features selected are then fed to the SVM and PNN classifiers.	Whenever there is change in the data set, it requires a new training set and this method is applied only to CT images	96.4%
10	Deepa and Devi	2012	This methods exploit the capability of back propagation and Radial Basis Function neural network function to classify brain image.	Difficulty in selecting the optimal features to distinguish between classes	98.6%
11	Mustara & Suchalatha	2012	The texture feature is extracted by using GLCM. These features are compared with the stored features in knowledge base. Finally aneuro fuzzy classifiers is used for classification.	Computational cost is high.	97.6%
12	Jafari and Shafaghi	2012	Hybrid approach for the detection of brain tumor tissue in magnetic resonance image based on genetic algorithm and support vector machine	Wavelet transform require large storage and its computational cost is high.	83.22%
13	Rathi and Palani	2012	They combines the intensity, texture, shape based features and classifies the tumor as white matter, gray matter, CSF, abnormal and normal area. The classifier used is support vector machine (SVM) By	By using principal component analysis, which reduces the lower dimensionality of the texture feature.	98.87%

14	Zarandi et al	2011	A type II fuzzy expert system for diagnosing human brain tumor.	High computational cost Complexity and optimization	98.5%
15	Zhang et al	2011	Neural network based method to classify a given MR brain image	It require fresh training set whenever there is an increase in image data base	100%
16	Kharrat et al	2010	based on genetic algorithm and support vector machine (SVM) and feature selection is done by using SGLDM	It requires fresh training set whenever there is change in image database.	98.97%
17	Lashkari	2010	In pre-processing contrast normalization is done and DFT of the image is computed. feature extraction is done by kernel-F score and multilayer perception neural network is used for classification	It uses all the 3 modalities such as T1, T2 weighted and PD MR Images as a result it is time consuming.	96.37% to 98.77%
18	Jain	2010	In pre-processing histogram equalization and morphological operations are done. Feature extraction is done by GLCM. These extracted features are fed to the BPN classifier for classification	When a new image is used for classification only that selected features are extracted and trained classifier is used for classification	96.84%
19	El-Dahshan et al	2010	Feature extraction is done by DWT and the feature are reduced by PCA. Two classifiers are used for classification i.e. FP-ANN and KNN.	Is that it requires fresh training each time when ever, there is a change in the image data base.	97% and 98%
20	Georgiadis et al	2008	incorporating a nonlinear least square feature transformation (LSFT) in to a modified PNN classifier	External cross validation method is used to avoid over fitting condition and it has very less discriminate accuracy	95.25% 93.48%
21	Selvaraj et al.	2007	An advanced classification technique based on least square support vector machine (LS-SVM) is used.	More time consuming	98.64%

Table1: Comparison of Different Methods