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SEGMENTATION AND CLASSIFICATION OF BRAIN TUMOUR

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ABSTRACT

Malignant and benign types of tumour infiltrated in human brain are diagnosed with the help of MRI images. The proposed methodology uses fuzzy entropy clustering algorithm with the comparison of SVM, K- Nearest Neighbour and Naive Bayesian classification. The model aims at classifying the tumour region and segment the tumour from MRI images. Fuzzy entropy is the statistical measure of randomness in an image and pixel values that occurs in the probability. The MRI image database used is Whole Brain Atlas. The performance of SVM, K-NN and Naive Bayesian classifiers are compared and finally SVM classifier achieves better accuracy.

Keywords*:* Brain tumour, Fuzzy entropy clustering Algorithm.

1. INTRODUCTION

Magnetic Resonance Imaging (MRI) is a medical imaging technique used to visualize internal structures of the body. MRI makes use of the property of nuclear magnetic resonance (NMR) to image nuclei of atoms inside the body. Magnetic Resonance Imaging (MRI) is used in medicine to diagnose disorders of body structures that do not show up well on x-rays. Compared to imaging techniques that use x-rays, such as Computerized Axial Tomography (CAT), generates far more detailed three-dimensional images of the soft tissues of the body, especially of the nervous system from the brain to the spine.. MRI can also be used to observe and measure dynamic physiological changes inside a patient without cutting into or penetrating the body.

To produce an image, an MRI machine uses a powerful magnet to generate a magnetic field. When a patient lies within this field, the nuclei of atoms within the body align themselves with the magnetic field (much as iron filings line up around a magnet). Radio waves are then pulsed through the body, causing the nuclei to change their alignment with respect to the axis of the magnetic lines of force. As they return to their previous state after each pulse, they produce faint, distinctive radio signals; the rate at which they emit signals and the frequency of the signals depend on the type of atom, the temperature, the chemical environment, position, and other factors. These signals are detected by coils around the body and processed by a computer to produce images of internal structures. MRI holds yet another significant advantage over CAT in that exposure to potentially harmful x-ray radiation avoided.

MRI provides good contrast between the different soft tissues of the body, which makes it especially useful in imaging the brain, muscles, the heart, and cancers compared with other medical imaging techniques such as computed tomography (CT) or X-rays. Unlike CT scans or traditional X-rays, MRI does not use ionizing radiation.

Optical tomography is a biomedical imaging modality that uses scattered light as a probe of structural variations in the optical properties of tissue. In a typical experiment, a highly-scattering medium is illuminated by a narrow collimated beam and the light which propagates through the medium is collected by an array of detectors. There are many variants of this basic scenario. For instance, the source may be pulsed or time harmonic, coherent or incoherent, and the illumination may be spatially structured or multispectral.

Medical imaging is a widely expanding field of development and research. Techniques such as x-ray computed tomography (CT) and more recently magnetic resonance imaging (MRI) have revolutionized diagnosis and treatment of a wealth of illnesses. The contrast presented by a medical image is a consequence of the type of interactions occurring between the probing radiation and the different tissues that compose the body.

2. EXISTING WORK

Image segmentation is one of vital researching branches in medical image processing and analysis. Considering the characteristics of medical images. The existing system presents a fuzzy based support vector machine segmentation algorithm. The interests of the algorithm include the objective function, memberships and optimal weights selection and robustness to SVM classification the order of pixel processing. This method also holds for other segmentation applications in which background region is simple but target region is complex.

3. PROPOSED APPROACH

$$\{ - \sum \sum uik \log uik\}.$$

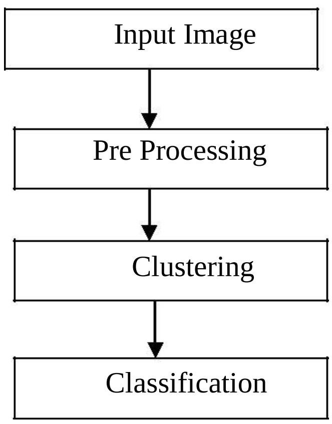

Fig. 1.block diagram of Method's Stages

Therefore, the structure of maximum entropy inference based on grades of membership *{uik}* maximiz The proposed system describes a revised scheme to extract the tumour region. To express maximum entropy-based fuzzy clustering, introduce the entropy criterion. Let X be a random variable with probability mass function $P(x) = P(X = x)$, and set of possible values $f\{xi;\ i = 1;\ :\ :\ :\ ;\ n\}$. The entropy of random variable X is denoted by $H(X)$ and is denoted by

$$H(X) = -\sum P(x) \log P(x)$$

4. METHODOLOGY

A. Pre-processing

The original image is converted into true colour image RGB to the gray scale intensity image I. The rgb2gray function converts RGB images to gray scale by eliminating the hue and saturation information while retaining the luminance. The noise removal method performs median filtering of the image *A* in two dimensions. Each output pixel contains the median value in a 3-by-3 neighbourhood around the corresponding pixel in the input image. medfilt2 pads the image with 0's on the edges, so the median values for points within one-half the width of the neighbourhood ([m n]/2) of the edges might appear distorted. The region properties measurements for the set of properties specified by properties for each connected component (object) in the binary image, BW. stats is struct array containing a struct for each object in the image..

B. Clustering

Fuzzy entropy-based thresholding method has become one of the frequently used segmentation.. Fuzzy entropy is the special case of the generalized fuzzy entropy, so it is natural to apply the generalized fuzzy entropy to image segmentation problems. We sample the parameter m in the internal (0,1) with a step of 0.1,then for each image, nine segmentation results can be obtained. When m = 0.5 , the result is the very one of fuzzy entropy-based method. are no scaled matches of Q that start in D[i] and thus the iteration ends. Experiments verified that in most datasets, if there are no scaled matches starting at the point D[i], the set M becomes empty at a relatively small t. Therefore, the algorithm can proceed in the next iteration. *C. Classification*

The SVM is a supervised learning approach for segmentation, where the only domain specific knowledge required is to select a specific image descriptor. With that and a set of training segmentations, algorithm will automatically learn a discriminative model to segment a new image, without any user intervention.

A kernelized structural support vector machine approach to learn discriminatively the mapping from image to a segmentation mask. To combine high level object similarity information (via image descriptors) with multiple low level segmentation cues into a novel kernel function used in the structured SVM framework. Traditional segmentation regularizations, such as the pair-wise smoothness, are preserved in our framework and explicitly enforced during the learning process.

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k-nearest neighbours algorithm (k-NN) is a non-parametric method used for classification and regression. In both cases, the input consists of the k closest training examples in the feature space. The output depends on whether k-NN is used for classification or regression: In k-NN classification, the output is a class membership.

A Bayes classifier is a simple probabilistic classifier based on applying Bayes' theorem (from Bayesian statistics) with strong (naive) independence assumptions. A more descriptive term for the underlying probability model would be "independent feature model". In simple terms, a naive Bayes classifier assumes that the presence (or absence) of a particular feature of a class is unrelated to the presence (or absence) of any other feature. An advantage of the naive Bayes classifier is that it requires a small amount of training data to estimate the parameters (means and variances of the variables) necessary for classification.

5. RESULTS AND DISCUSSION

Original Image

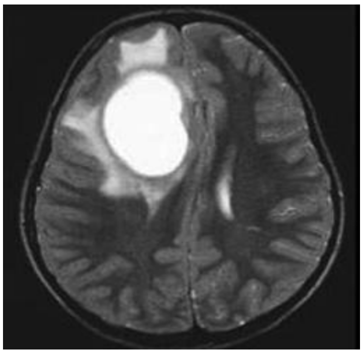
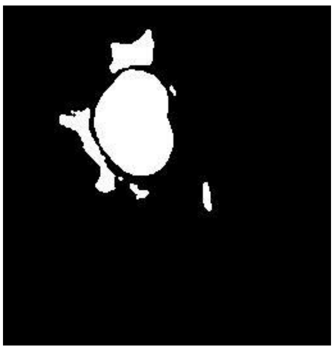


Fig 2 Original Image



Fuzzy Processed Output

SVM Classifier

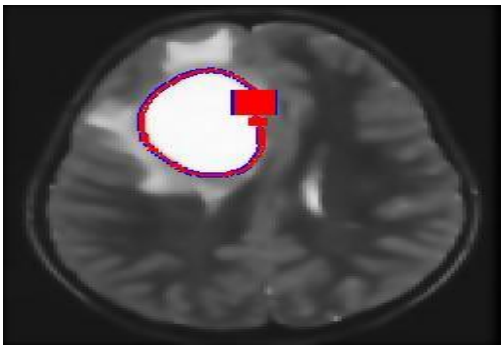


Fig 3 Fuzzy Processed Output

Segmented Fig4SVMOutput Tumor

Fig 5 Segmented Tumour

ACCURACY OF THECLASSIFIERS

SVM Classification Accuracy = 92 %

Naive Bayesian Classification Accuracy = 65%

KNN Classification Accuracy = 83%

CONCLUSION

B The proposed method uses Fuzzy entropy clustering algorithm with the comparison of SVM, K-NN, Naive Bayesian classifier. The performance of the proposed methodology was analyzed with publicly available Brain Image Atlas dataset of 10 images. The accuracy of SVM,K - NN and Naive Bayesian are 92% ,83% and 65% respectively. Finally SVM gives better accuracy of 92%.

REFERENCES

[1] Subhranil Koleya, Anup K. Sadhub, Pabitra, Mitrac, Basabi “Delineation and diagnosis of brain tumors from post contrastT1-weighted MR images using rough granular computing”, ELSEVIER,2016,pp.453-465

[2]Nagaraja Shettya, Mervin A. Herbertb, Raviraj Shettya, “Soft computing techniques during drilling of bi-directional carbonfiber reinforced compositeNagaraja ”, ELSEVIER,2016,pp.466-478

[3]Vishnuvarthanan, M. Pallikonda Rajasekaranb, P. Subbaraj, “An unsupervised learning method with a clustering approach for tumor identification and tissue segmentation in magnetic resonance brain images”, ELSEVIER,2015,pp.190-212

[4]Ashraf K. Helmya, Gh. S. El-Taweel,“Image segmentation scheme based on SOM–PCNN in frequency domain”, ELSEVIER,2015,pp.405-415.

[5] Quratul Aina, M. Arfan Jaffar , Tae-Sun Choi, “Fuzzy anisotropic diffusion based segmentation and texture based ensemble classification of braintumor’’,ELSEVIER,2014,pp.330-340.

[6] Sanjay Agarwal, Rutuparna Panda, Lingraj Dora “A study on fuzzy clustering for magnetic resonance brain image segmentation using soft computing approaches ”, ELSEVIER,2014,pp.522-533

[7]M.A. Jaffar, A. Hussain, A.M. Mirza, A. Chaudhry, "Fuzzy entropy and morphology based fully automated segmentation of brain from CT scan images", 2009, pp 4993–5002, ISSN: 1349-4198.

[8] H.Y. Yu, J.L. Fan, "Three-level Image segmentation based on maximum fuzzy partition entropy of 2-D histogram and quantum genetic algorithm", ICIC, 2008, pp 484– 493.

[9] E. Candes, L. Demanet, D. Donoho, L. Ying, Fast Discrete Curvelet Transforms, SIAM Multi scale Model, Simulation, 2006.

[10] V. Grau, A.U.J. Mewes, M. Alcaniz, R. Kikinis, S.K. Warfield, "Improved watershed transform for medical image segmentation using prior information", IEEE Trans. Med. Imaging, Vol 4, 2004, pp 447–458.