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Review of Brain Tumor Detection Techniques

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Abstract: The bio-medical image processing is the application of image processing to process medical data. The techniques of feature extraction and machine learning are efficient techniques brain tumor detection. In this paper, various brain tumor detection techniques are reviewed analyzed in terms of certain parameters. It is analyzed that textual feature extraction and classification techniques give maximum accuracy for the brain tumor detection.
KEYWORDS: Brain tumor, Textual Feature analysis, Classification

Introduction

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 [1]. 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. Image processing system regard images as two dimensional signals and set of signals processing strategies are connected to them. It is most recent technologies and its applications in different parts of a business. Image Processing shapes center examination territory inside engineering and computer science teaches excessively. This research worried with digital image in which utilizing a computer to change the way of digital image [2]. Presently nowadays image processing innovation is utilized as a part of each territory like Biotechnology (planning drugs), Medicine (comparing DNA images for clinical and measurable

exploration), and Environmental. There are two sorts of strategies utilized for image processing to be specific, simple and digital image processing. Simple image processing can be utilized for the printed versions like printouts and photographs. Image examiners use different basics of interpretation while utilizing these visual strategies. Digital image processing procedures help in manipulation of the digital images by utilizing PCs. The three general stages that a wide range of data need to experience while utilizing digital strategy are pre-processing, enhancement, and display, information extraction [3]. Brain tumor is identified as a situation in which the cells existing within the cranium increases abnormally. The brain cancer or tumor initiates from the nerves coming out of the brain, brain cells and the vessels of blood in most of the cases. These tumors will only apply potentially harmful pressure. The malignant tumors are described as fast increasing tumors. These tumors are capable to extend in the surrounding brain. The normal brain cells can be destructed by the tumors because of the generation of inflammation, applying pressure on the brain parts and rising pressure into the head. The tumor that does not expand in an abrupt manner is known as a benign tumor. The healthy tissues surrounding this tumor are not affected and on the non-adjacent tissues, the tumor does not expand. A disease which is a precancerous stage is known as premalignant tumor [4]. This may lead to cancer if not treated properly. The type of tumor that becomes worse with the passage of time is known as malignancy. The person that suffers from this tumor dies eventually. A severe progressing disease is described using a medical term called malignant. In order to describe the cancer, the term malignant tumor is used. To enhance the quality of the brain images, different image preprocessing approaches are used. In segmentation process, an image is segmented in different regions. Afterimage segmentation, feature extraction is to be done to extract the pattern of assessable characteristics or features of the image. Different features i.e. statistical, texture, on the basis of color and image, etc. are extracted. Classification methods are executed for the classification of affected and non-affected pictures of brain [5]. These methods identify whether the abnormality present in the anomalous pictures is of malignant (cancerous) or benign (non-cancerous) type. In the present scenario, various techniques are available for imaging modalities such as X-Ray, Mammography, CT-Scan and Magnetic Resonance Imaging (MRI) are one of them. MRI gives image information about the anatomy and the entire composition of the brain or skull [6]. With the help of the MRI scan, information about the blood supply inside the brain can be obtained. Thus it can be said that for the recognition of anomaly, for examining the increasing of the ailment and for the diagnosis, MRI techniques have become a very important tool. Digital image processing field is used when the digital images are processed with the help of a computer. Removal of unwanted noise and image enhancement are the two main objectives of image preprocessing. The characteristics of the image are improved with the help of the image preprocessing techniques. Some linear and non-linear methods are used for the image preprocessing. A picture is divided into various segments during segmentation process [7]. These regions contain same qualities in terms of texture, color, intensity, contrast and gray level. Thus the main aim of segmentation is the division of the items present in a picture which are connected with other by some means. With the late upheaval of multimedia-empowered frameworks, the requirement for multimedia retrieval has expanded by leaps and bounds. Because of the multifaceted nature of multimedia contents, image comprehension is a troublesome albeit-fascinating theme of exploration, inside the domain of multimedia retrieval. Extracting profitable learning from a substantial scale multimedia store, normally alluded to as "multimedia mining", has recently caught up for lost time as a domain of enthusiasm amongst specialists. Image classification includes a number of things like image preprocessing, object division, characteristic extraction, image detection and much more. Image classification is specified as an extremely imperative and complex job.

Literature Review

Michele Tonutti, et al. [2017] proposed in this paper to infer a patient-particular deformation model for brain pathologies by consolidating the results of pre-computed finite element method (FEM) simulations with machine learning calculations. The models can be computed immediately and offer an accuracy comparable to FEM models [8]. The SVR models perform superior to the ANN's, with positional errors for SVR models reaching under 0.2 mm. The results represent an improvement over existing deformation models for real time applications, giving smaller errors and high patient-specificity. The proposed approach addresses the current needs of image-guided surgical systems and can possibly be employed to model the deformation of a soft tissue.

Kanwarpreet Kaur, et al. [2016] studied that he check of tumor patients is expanding step by step. Brain tumor, whose primary driver is the uncontrolled division of the phones, if recognized at a beginning period, will help a ton in curing it. This

paper shows a method for recognizing the tumor influenced images from the normal ones from the database. The procedure includes preprocessing, segmentation, highlight extraction and classification [9]. The area for the abnormal portion is likewise accurately calculated. GUI being easy to use can be utilized by anybody for the classification purpose. Further, the PET sweeps can likewise be utilized for the detection and classification purpose.

Smita.A.Nagtode, et al. [2016] presented brain tumor detection and classification utilizing discrete wavelet transform and Probabilistic neural system. The 2D Gabor wavelet (GW) analysis and Probabilistic neural system analysis has been for the most part utilized as a part of face identification. Attributable to the robustness of GW highlights against local distortions, variance of illumination and Probabilistic neural system give the proper results of classification [10]. In this paper, a two dimensional Gabor wavelet analysis application for brain images, for early identification of tumor and a method for brain tumor classification, where images are classified into non-cancerous (benign) brain tumor and cancerous (malignant) brain tumor. The system can be intended to recognize and classify alternate types of tumors too with couple of changes.

Yi Feng Wu, et al. [2015] designed a professional method that can realize the comprehensive fitting of the uniaxial tension, biaxial tension, planar tension and straightforward shear experimental data of rubbers based on the Ogden model and the Levenberg-Marquardt nonlinear advancement calculation. The test data from Treloar was fitted exceptionally well, and the determined parameters by utilizing this method were proved to be right and practical in the numerical verification in ANSYS [11]. Besides, the limitations of the underlying values set for the undetermined parameters in the hyper-viscoelastic model were investigated, and the validity and the practicability of the evaluated parameters were likewise verified in ANSYS.

Kazemi K., et al. [2014] performed performance evaluation of three generally utilized brain segmentation software packages SPM8, FSL and Brainsuite. Segmentation with SPM8 has been performed in three frameworks: I) default segmentation, ii) SPM8 New-segmentation and iii) modified version utilizing hidden Markov random field [12]. The calculated similarity between the segmented tissues utilizing different tools and corresponding ground truth demonstrates variations in segmentation results implemented in SPM8-VBM toolbox. Consequently, in this study, evaluation of finish segmentation framework comprising of pre-processing and segmentation of these packages is performed. The achieved results can assist the clients in choosing an appropriate segmentation software package for the neuroimaging application of interest.

G. Kharmega Sundararaj, et al. [2014] studied that Computer Tomography (CT) Images are broadly utilized as a part of the intracranical hematoma and discharge. In this paper we have developed another approach for programmed classification of brain tumor in CT images. The proposed method comprises of four stages specifically preprocessing, include extraction, and highlight reduction and classification [13]. In the classification stage, two classifiers are utilized for classify the experimental images into normal and abnormal. The first classifier is based on k-closest neighbor and second is Linear SVM. Classification rate is over 94% in case of Linear SVM and 92% in case of k-NN. A similar method can be intelligently extended to different types of CT images too. The stated results demonstrate that the proposed method can make an accurate and strong classifier.

D. Sridhar, et al. [2013] proposed another method for Brain Tumor Classification utilizing Probabilistic Neural Network with Discrete Cosine Transformation. Operator assisted classification methods are impractical for a lot of data and are additionally non reproducible [14]. Thus, in this paper the Probabilistic Neural Network with Discrete Cosine Transform was connected for Brain Tumor Classification. Decision making was performed in two steps, I) Dimensionality reduction and Feature extraction utilizing the Discrete Cosine Transform and ii) classification utilizing Probabilistic Neural Network (PNN). Evaluation was performed on image data base of 20 Brain Tumor images. The proposed method gives quick and better recognition rate when compared to past classifiers. The principle advantage of this method is its high speed processing ability and low computational requirements.

Table of Comparison

Authors Names	Year	Description	Outcomes
Michele Tonutti, Gauthier Gras, Guang-Zhong Yang	2017	A patient-particular deformation model was designed for brain pathologies by consolidating the results of pre-computed finite element method (FEM) simulations with machine learning calculations.	The results represent an improvement over existing deformation models for real time applications, giving smaller errors and high patient-specificity.
Kanwarpreet Kaur, Gurjot Kaur, Jaspreet Kaur	2016	This paper shows a method for recognizing the tumor influenced images from the normal ones from the database.	The area for the abnormal portion is likewise accurately calculated. GUI being easy to use can be utilized by anybody for the classification purpose.
Smita.A.Nagtode, Bhakti B. Potdukhe, Pradnya Morey	2016	In this paper, a two dimensional Gabor wavelet analysis application for brain images, for early identification of tumor and a method for brain tumor classification, where images are classified into non-cancerous (benign) brain tumor and cancerous (malignant) brain tumor.	The system can be intended to recognize and classify alternate types of tumors too with couple of changes.
Yi Feng Wu, Ai Qun Li and Hao Wang	2015	A professional method is designed that can realize the comprehensive fitting of the uniaxial tension, biaxial tension, planar tension and straightforward shear experimental data of rubbers based on the Ogden model and the Levenberg-Marquardt nonlinear advancement calculation.	Besides, the limitations of the underlying values set for the undetermined parameters in the hyper-viscoelastic model were investigated, and the validity and the practicability of the evaluated parameters were likewise verified in ANSYS.
Kazemi K., Noorizadeh N.	2014	Performance evaluation of three generally utilized brain segmentation software packages SPM8, FSL and Brainsuite was presented.	The achieved results can assist the clients in choosing an appropriate segmentation software package for the neuroimaging application of interest.
G. Kharmega Sundararaj, Dr. V. Balamurugan	2014	In this paper another approach was designed for programmed classification of brain tumor in CT images.	Classification rate is over 94% in case of Linear SVM and 92% in case of k-NN. A similar method can be intelligently extended to different types of CT images too.
D. Sridhar, Murali Krishna	2013	In this paper the Probabilistic Neural Network with Discrete Cosine Transform was connected for Brain Tumor Classification. Decision making was performed.	The proposed method gives quick and better recognition rate when compared to past classifiers.

Conclusion

In this paper, it is concluded that brain tumor detection has the three major phases which are segmentation, feature extraction and classification. The region based segmentation approach, textual based feature analysis and classification give maximum accuracy for brain tumor detection. In future novel hybrid classification method will designed for the brain tumor detection.

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