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Medical Imaging: A Brief Review

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Abstract: ***The probing of the human body is done using different modalities of medical imaging. The explications of various images require different methods of image processing which enhance their visual interpretation. These image analysis methods may provide images for different application using automated or semi-automated methods. The processed images may be widely used for data mining, feature selection etc by retaining the underline information and eliminating the irrelevant features. These techniques do not focus on the acquisition of the images. Computations and analysis of various images is the main thrust of MIP (Medical Image Processing) techniques. In general MIP can be categorised further into different physiological modelling or segmentation or registration of the image .This paper presents a survey on various feature selection methods used in medical imaging wherein most of the techniques and methods like Screening, Scanning, Selecting, etc. are summarized.***

Keywords: ***Medical images, selection of features, processing***

1. INTRODUCTION

Medical imaging (MI) is the process of creating viewable depictions of the interior of body organs or tissues for the purpose of clinical analysis and medical intervention. It intends to treat and diagnose different internal structures within the skin or bones by exposing them to various imaging techniques [1-2]. MI forms the base of normal anatomy and physiology and helps to identify the possible abnormalities. While pathology mainly consists and allows procedures to remove organs or parts of human body, the techniques of MI allow scanning the tissue abnormalities before any surgical process. This can be achieved through various Content Based Image Retrieval (CBIR) techniques. A general block diagram of the selection techniques used by CBIR is shown in Figure 1 [16]. Such techniques include steps of capturing, enhancement, segmentation, etc as shown in Figure 2[17].

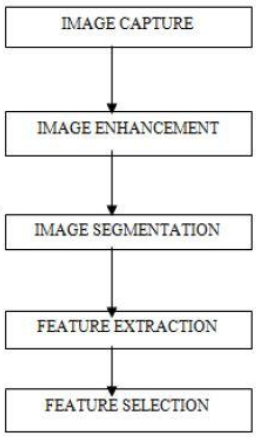

Fig 1: Flow Process in MIP

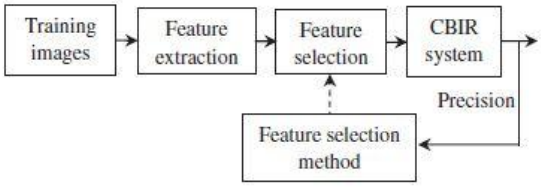

Fig 2: Block Diagram of a CBIR system

Medical imaging is often distinguished to cog nominate a set of techniques which help in assembling detailed images of the internal organs of the body through inoffensive mechanisms. MI techniques help to relate the abnormal conditions or symptoms (effects) with different modalities of unhealthy state (causes) of tissues and organs. The field of MI offers various advantages of providing applications in the areas of Telemedicine, Biomedical Engineering, Aerial Imaging, etc. However, these techniques also suffer from various challenges too. Thus, a brief study is presented and concluded in this paper in Sections 2 and 3 respectively.

2. WORK DONE:

[Ref No]	Area Focussed	Description of work	Merits	Limitations	Future Scope
[3]	Image resampling, discrete samples, Nearest Neighbour Interpolation (NNI)	Two Dimension interpolations were reconstructed for a continuous signal using discrete samples. The NNI method was the easiest way to approximate the sync function by a spatially limited kernel .			
[4]	Image retrieval in medical applications (IRMA) technique was used for content based applications.	The technique of IRMA was used to categorize, register, select and extract the features, index, identify and retrieve the different processing	Query completion was satisfactory	Prior knowledge of image and its content was required.	

		steps of the image.			
[5]	A Content based Image Retrieval (CBIR) approach was used to implement	A large database for images was used which was suitable for a communication system with a distributed architecture. The system of IRMA supported fast prototyping and fast integration of various analysis methods.	The technique offered practical applications in various medical areas.	The narrow gap between an image imprint and its description still existed.	
[6]	The principle of machine learning was used to select features of the image using risk based prediction method. and concepts of Support vector machine(SVM).	The performance of the proposed method was improved by using two feature selection methods. While the former used the principle of multi class, the latter used SVM.			Outlier detection of features may be considered.
[7]	Hybrid technique of feature selection using Confocal Scanning Laser Tomography (CSLT) was used for analysis of optical images.	The methods of image processing and data mining were combined to make clinical decisions in eye problems of glaucoma. Classifiers were training to distinguish healthy and diseased optic nerves of patients.	Classification accuracy was maintained at minimum number of moments also.		Rule induction algorithms may be planned for further work.
[8]	A new embedded	Many relevant	Classification		ESFS may be

	feature selection method ESFS was used for categorization of images.	features were added incrementally for selection of features of the image. Evidence theory was used to represent the features by mass functions.	accuracy was improved and computational cost was also low.		used as a hierarchical classifier,
[9]	Classifiers of image were used to select features for mammography with the help of statistical techniques.	A hybrid approach with reduced features was used to detect tumours in breasts using the algorithm of decision trees.	Reduced computation cost, different applications of image analysis		Data mining may be used for classification
[10]	Different areas of continuing research in various applications were addressed.	The paper focussed upon various health issues in women and their diagnosis tools, namely mammography, osteoporosis, bone density, etc.	Many common parameters were used to highlight the deficiencies.		Early symptoms may also be used for further study
[11]	SVM and optimization method using Ant Colony(ACO) for extracting Histogram and Morphology Features	ACO was used to extract the features or data of the images by building a solution incrementally with the help of artificial ants. The different features	High efficiency, Good classification accuracy		Parallel combination of classifier, more feature selection by increasing the training data

		extracted step wise related to the shape, morphology, Histogram and correlogram			
[12]	Content-Based Image Retrieval, Comparing images using Color Coherence Vector, Biased Discriminative Euclidean Embedding.	The visual contents of the image are utilized to search for like images in other databases on the basis of colour, shape and textual features upon a large scale. The histogram based technique used the Tree and Pyramidal structured wavelet transforms.	Euclidean distance method was used to retrieve images		Other wavelet transforms may be used for CBIR.
[13]	Feature selection, CART (Classification and Regression Tree) classifier, CHAID (Chi-squared Automatic Interaction Detection) classifier, QUEST (Quick, Unbiased, Efficient Statistical Tree) decision tree classifier, Ensemble Model	Feature selection consists of three steps. Screening, Ranking, Selecting, A classification method called CHAID was used for decision tree building by using statistics of chi-square for identification of optimal splits. Another method using a sequence of rules called as QUEST was based on sequence of	Accuracy of 93.84% was achieved.		Experimentation using ionosphere data set may be endorsed.

		different rules.It was used to evaluate the value of predictor variables based upon certain significance tests. Lastly, an ensemble combined the outputs of different classifiers into one composite classification.			
[14]	Many feature selection methods were proposed in the past. The selection method depends on the learning type (supervised or unsupervised) and the algorithm used. Most feature selection (evaluation function) methods were used in all algorithms (filter or wrapper), but there were some which were meant exclusively for wrapper methods or filter methods.	Particle swarm optimization (PSO) was used to optimize the features obtained with the help of structures formed by Information Gain. The classifiers of neural network helped in training the extracted features.	Reduced processing time, 98.27% efficiency achieved		
[15]	Bi orthogonal Wavelets, Active contour model, Set Partitioning in Hierarchical Trees (SPIHT), Embedded zero tree wavelet (EZW)	Medical images were compressed using bi orthogonal spline wavelets which used different filters for decomposition and	PSNR (Peak Signal to Noise Ratio) up to 40 dB was achieved.		

		reconstruction. The Region of Interest (ROI) was segmented using Active Contours. Set Partitioning in Hierarchical Trees (SPIHT) and Embedded Zero Tree wavelet (EZW) were also used for compressing the image.			
[16]	Screen, Scan and Selection	The paper discovered that the selection algorithm calculated the authenticity of medical images through their efficient role as predictors.		Missing values in predictors	Hybridization of selected features may be performed.
[17]	A hybrid approach using MGSA (Mixed Gravitational Search Algorithm) was employed along with an image retrieval technique for the feature selection method.	Feature parameters were optimized for achieving highest precision of CBIR systems using adaptive feature extraction techniques. Discrete Wavelet Transform (DWT) was used with MGSA as an effective case study.	Highly effective as 1000 set of colour images of 10 different categories were used in the study		
[18]	Study of Detection methods used for tumour detection brain through MRI	The paper proved a milestone study related to			

	and mammogram.	different steps of enhancement, segmentation, classifiers, selection and Extraction of features for the purpose of tumour detection.			
[19]	Segmentation and Registration of Images	The paper proposed to identify and give the concept of most relevant problems in medical image processing. The solutions were offered by assessing different strategies.	MI can be performed either by the physician (visual assessment) or by a MIP application (computer assessment), or in a combination of both (usually as computer-supported assessment by the physician).		
[20]	Detection of Lung Cancer	A standard database of Lung Images was used for the recognition of cancer cells using the three techniques of screening, ranking and selection	Set of 1000 images was used for effectiveness		
[21]	Discretization of data for selecting and extracting data	A new algorithm namely NANO was used to select and discretize the supervised features in one step. It was	High sensitivity and accuracy ranging in 96-98%		Performance may be improved further

		based on mean global inconsistency and measures of cut points to enhance the speed of the diagnosis framework for medical images.			
[22]	Content-based Image Retrieval techniques are used that retrieve images based on their content.	Feature selection of past cases is performed by comparing the present case images with those stored in the database. The digital imaging and communications in the medical standard allow storing textual descriptions known as metadata.			
[23]	Artificial Bee Colony (ABC) was used for feature selection in CT Scan images.	A comparative analysis was done for images segmented using Otsu algorithm and ABC. The classifiers used were k-NN and SVM.	97 to 100% accuracy was achieved using SVM	Data sets may be biased	
[24]	Representation and Extraction of Features, for Classification of images	The study presented in the paper helped to diagnose different diseases of human body. Different classification techniques with	NN and SVM have classified images amongst different modalities with high accuracy and sensitivity	Data complexity.	Computer aided diagnosis may be used to improve performance and robustness.

		their pros and cons were discussed for various data sets.			
[25]	Feature selection algorithms(scanning screening and ranking)	Four different feature selection algorithm were used with an adaptive fuzzy prediction model.	The feature selection algorithms have better performance concerning the empirical method.	Errors due to fractional motion error.	Real patient data can be used to improve result accuracy
[26]	CBIR methods, visual pattern exploration	The study suggests effective technologies using CAD systems for the ease of relieving workload of medical fraternity. Various state of art approaches using machine learning, computer vision, etc have been discussed to summarize the challenges and solutions of analysis of medical images on a large scale.			Deep learning may be used for future work
[27]	Principle Component Analysis (PCA)	High dimension data sets were used for challenging classification of Biomedical images in the study of the paper.	Due to the introduction of Ant Colony optimization, it extracted the most useful and relevant features from	High complexity	It also improved diagnostic quality more advanced feature extraction and selection methods are used for

			the image and also improved the system accuracy with a decrease in the system complexity.		segmentation and Xray images. Further, improve the performance of (CT) images and phenotypes, Features are necessary

3. CONCLUSION

The study concludes the authenticity of medical image processing algorithms using various content based image retrieval techniques. Such methods involve the use of predictors for selecting and extracting key features of images for the purpose of successful diagnosis of harmful diseases. The future work emphasizes on use of hybrid methods to improve the performance of retrieved images in real time.

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