LITERATURE REVIEW

A novel method for simultaneous segmentation and registration is presented in [1]. This algorithm can be carried out by a statistical modeling framework. First, the authors segment the medical volume data using the geometric active model with level set theory and then extract the region of an object from a given volume data. Second, they use a hidden Markov model and the conditional likelihood function to statistically model a problem that aligns the extracted object with other volume data.

An automated system that extracts metabolic disease related features and subsequently classifies them for diagnostic purposes is introduced in [2]. The algorithm consists of two main components; the feature extraction, and the fuzzy classification. The DWI image features are extracted first; they constitute a feature vector length of twenty-two which will be the input to the fuzzy classifier. In the second part, the features are related to disease categories implementing fuzzy relations and membership functions.

An attempt has been made in [3] to determine the degree of malignancy of brain tumors using artificial intelligence. Significant shape-based boundary features and texture features are extracted from region of interests of tumor and fed to the classifier. In the classification block, input images are analyzed using two simple approaches (shape based and texture based). The ultimate classifier is an adaptive neuro-fuzzy classifier for uncertainty management appears due to the insufficient information of brain lesions. In the detection block, tumor blocks are identified and marked as second opinion of radiologists.

In [4], a segmentation method for brain MR images using an ant colony optimization (ACO) algorithm is proposed. This is a relatively new meta-heuristic algorithm and a successful paradigm of all the algorithms which take advantage of the insect’s behaviour. It has been applied to solve many optimization problems with good discretion, parallel, robustness and positive feedback. As an advanced optimization algorithm, only recently, researchers began to apply ACO to image processing tasks. Hence, we segment the MR brain image using ant colony optimization algorithm.

An automatic left ventricle (LV) segmentation algorithm is presented for quantification of cardiac output and myocardial mass in clinical practice [5]. The LV endocardium is first segmented using region growth with iterative thresholding by detecting the effusion into the surrounding myocardium and tissues. Then the epicardium is extracted using the active contour
model guided by the endocardial border and the myocardial signal information estimated by iterative thresholding. This iterative thresholding and active contour model with adaptation (ITHACA) algorithm was compared to manual tracing used in clinical practice and the commercial MASS Analysis software (General Electric) in 38 patients, with Institutional Review Board (IRB) approval.

The detection of cartilage loss due to disease progression in Osteoarthritis remains a challenging problem. The sensitivity of detection from 3D MR images can be improved significantly by focusing on regions of ‘at risk’ cartilage defined consistently across subjects and time-points. These regions in a frame of reference are defined based on the bones, which require that the bone surfaces are segmented in each image, and that anatomical correspondence is established between these surfaces. Previous results has shown that this can be achieved automatically using surface-based Active Appearance Models (AAMs) of the bones. In [6], a method for refining the segmentations and correspondences by building a volumetric appearance model using the minimum message length principle is described.

Brain structural volumes can be used for automatically classifying subjects into categories like controls and patients. One of the recent papers [7] aims to automatically separate patients with temporal lobe epilepsy (TLE) with and without hippocampal atrophy on MRI, pTLE and nTLE, from controls, and determine the epileptogenic side.

Authors from [8] segregate the image based on levels of intensity, because diseased portion of the MRI image will have a different intensity value with that of a non diseased multimodal MRI image. They use entropy maximization to get the range of gray level of diseased cells of MRI image. The range is optimized using particle swarm optimization (PSO) algorithm and further fine tuned using the concept of variable mask in which the mask is incrementally applied on the region of interest. Depending on the similarity of the neighbourhood pixels the mask is incremented.