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Design and Development of Expert System for image Analysis

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Description

The known fact of wide impression of digitization on every aspect makes us refer to the artificial intelligence in lowering the difficulty of analyzing a medical image. Considering that the neural network applications in computer aided diagnosis represents the main stream of computational intelligence in medical imaging, it focuses on recent neural network developments. Keeping in mind the extremity of the requirement of how much perfectly it analyzes an image that well it can be justified, providing a clear view on the developments made by Mathematical morphology, back propagation neural networks in computer-aided detection, diagnosis and simulation describing number of applications. Representative techniques and algorithms are explained in detail illustrating how neural networks with fixed structure and training procedure could be applied to resolve a medical imaging problem followed by getting analyzed, processed and characterized by it. In the concluding section, an emphasis of comparisons among many neural network applications is included to provide the extent of neural computation in medical imaging. Morphological operators, Medical image, Lung cancer, edge detection Back propagation neural networks. Cancer is a class of diseases characterized by out-of-control cell growth. There are over 100 different types of cancer, and each is classified by the type of cell that is initially affected. Lung cancer is most common type of cancer. Cigarette smoking is the principal risk factor for development of lung cancer. Passive exposure to tobacco smoke also can cause lung cancer. There are two types of lung cancer, which grow and spread differently, are the small cell lung cancers (SCLC) and non-small cell lung cancers (NSCLC). The stage of lung cancer refers to the extent to which the cancer has spread in the body. We felt it is not too good to completely rely on filters whose ideality is not practically possible and for this reason we make use of gradient operators also in the process of gathering information related to cancer. Detection and diagnosis of lung diseases are presented in detail in section. The definitions of operators in mathematical morphology are given in section. Back propagation of neural networks is in section. The new algorithm is proposed in detail in section. Results and discussion of the new model are presented in section. Making use of improved computer-aided diagnosis (CAD) scheme developed by Xu et al. the automated detection of lung nodules in digital chest images is retrieved to extract the image which is to be given as the input. In the CAD scheme, nodule candidates were selected initially by multiple gray-level thresholds of the difference image subtraction of a signal enhanced image and a signal suppressed image and then classified into six groups.

Diagnosis Procedure

Automatic pathological diagnosis procedure proposed neural ensemble-based detection (NED) that utilizes an ANN ensemble to identify lung cancer cells in the specimen images of needle biopsies obtained from the bodies of the subjects to be diagnosed. An ANN ensemble is a learning paradigm where several ANNs are jointly used to solve a problem. The ensemble is built on two-level ensemble architecture and the predictions of those individual networks are combined by plurality voting. Developed a computer-aided diagnosis scheme for automated detection of lung nodules in digital chest radiographs based on a combination of morphological features and the wavelet snake. In their scheme, an ANN was used to efficiently reduce false positives by using the combined features. The scheme was applied to a publicly available database of digital chest images for pulmonary nodules. Trained a computer aided cytological diagnosis (CACD) system to recognize expression of the cancer biomarkers histone H2AX in lung cancer cells and then tested the accuracy of this system to distinguish re-sected lung cancer from pre- neoplastic and normal tissues. The major characteristics of CACD algorithms are to adapt detection parameters according to cellular image contents. Coppini described a neural network-based system for the computer-aided detection of lung nodules in chest radiograms. The approach is based on multi-scale processing and feed-forward neural networks that allow an efficient use of a priori knowledge about the shape of nodules and the background structure. The field of mathematical morphology contributes a wide range of operators to image processing, all based around a few simple mathematical concepts from set theory. The operators are particularly useful for the analysis of binary images and common usages include edge detection, noise removal, image enhancement and image segmentation. Structure element: Morphological techniques typically probe an image with a small shape or template known as a structuring element. The structuring element is positioned at all possible locations in the image and it is compared with the corresponding neighborhood of pixels. Erosion: The erosion "shrinks" an image according to the shape of the structuring element, removing objects that are smaller than the shape. The dilation step in the opening operation restored the vertical strokes, but the other strokes of the characters are missing. To get the entire characters containing vertical strokes morphological reconstruction can be used. For binary images, reconstruction starts from a set of starting pixels (or "seed" pixels) and then grows in flood-fill fashion to include complete connected components. To get ready to use reconstruction, first define a "marker" image. This is the image containing the starting or seed locations. For our text example, the marker images will be the output of the erosion. Next, define mask image. The flood-filling will be constrained to spread only to foreground pixels in the mask image. We can use the original text image as our reconstruction mask. Finally, call “reconstruct” to perform the operation. Performing morphological reconstruction, using the eroded image as the marker and the original image as the mask, is called "opening by reconstruction.

Image Segmentation

However, image segmentation (IS) is still an actual field of research, regarding automatic methods of image processing. IS is

generally defined as the process that partitions an image into regions, each of them fulfilling a given criteria, which can be from the image domain and feature space. From image seg- mentation methods, we expect the extraction of a set of objects present on an image, as we visually detect them. In other words, it is expected that a segmentation method acts as artificial intelligence on the identification of objects on a scene. However, the objective of the segmentation may be quite subjective, de- pending upon the detail and features we are expecting. For in- stance, on the segmentation of an image of a human body, one may be interested in delineating the whole body as a single object, or its constituent parts, which may become itself quite sub- jective. Regarding remote sensing applications, this aspect may become even more complex. Enhancement step prior further processing. By image enhance- ment which is itself a largely subjective process it is intended to obtain an image with less detail than the original version, nearest to the object identification which is performed by the human eye. Although typically more mathematical and com- plex, restoration algorithms may provide the exploitation of the detailed characteristics of an image and its degradation. Despite the main purpose of image restoration methods is to model and remove the degradation, these methods may also be used with other purposes. One may view the image objects which have some texture as a kind of degradation. Therefore, it is intended to remove that degra- dation, which is assumed to be additive random noise. The objective is to transform the original image in order to take advantage of the psychophys- ical aspects of the human visual system. The Wiener filter is one of the solutions among several other possible alternatives.