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RESEARCH ARTICLE

SIMULATION OF CANCER CELLS GROWTH BY RECOGNIZING TEXTURE CHARACTERISTICS USING OPPONENT COLOR LOCAL BINARY PATTERN

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Abstract- The objective of the paper is to address the most important and challenging problems in oncology (lung cancer). Nowadays Lung cancer remains the leading cause of cancer related deaths. Developing an effective computer aided diagnosis (CAD) systems for lung cancer is of great clinical importance and can increase the patient's chance of survival. An opponent color local binary pattern (OCLBP) algorithm is used to test the relation between pixel and its neighbours by encoding this relation into a binary word and recognizing texture categories. The proposed work uses the OCLBP texture feature for segmentation. Texture is one of the important as well as useful tasks in image processing applications. Later using texture based segmentation this methodology adapted best results with efficient detection of cancer and severity levels as well.

Keywords: Texture Analysis, Computer Aided Diagnosis, Opponent color local binary pattern (OCLBP), Texture Categorization, Texture based segmentation.

I. INTRODUCTION

Lung cancer remains the leading reason for cancer connected deaths in U.S. In 2012;there have been approximately 229,47 new cases of respiratory organ cancer connected deaths. Early identification will improve the effective would like of treatment and increase the patient's probability of survival. Texture is key characteristic of a picture , that has tested quite difficult to this point, several strategies have been planned to describe it in a quantitative manner. Numerous so that the entire set has been recently named as a 'galaxy of texture features'. So texture is that the regular duplication of issue.

The pre-processing steps of lung recognition system consist including segmentation. Texture based segmentation technique and normalization done respectively. The main goal of the lung segmentation is to derive texture patterns using inter color channel combinations (OCLBP) to determine cancer detection and severity analysis. This is insensitive to noise, rotation invariant.

II. RELATED WORK

Literature survey is a review of an abstract accomplishment. It provides a way to study and get a clear understanding of critical points of current knowledge including substantive findings as well as theoretical and methodological contributions to a particular topic.

A. Texture description through histograms of equivalent patterns

Antonio Fernandez, Marcos X.Alvarez, Francesco Bianconi [1] described a general framework for texture analysis which we refer to as HEP (Histograms of Equivalent Patterns). The HEP, of which we give a clear and unambiguous mathematical definition, is based on partitioning the feature space associated to image patches of predefined shape and size. This task is approached by defining, a priori, suitable local or global functions of the pixels' intensities. The common trait of the methods belonging to the HEP is that each texture descriptor determines a partition of the grey-scale pattern space into equivalence classes. Such a partition is established a priori in the HEP, and is based on the definition of a local or global function (kernel function) of the pixel values. This approach is therefore alternative to those based on a posteriori space partitioning, which is typical of methods based on codebooks learnt from data. Diverse texture descriptors can be seen all to be examples of HEP. We have indeed revisited an example set of apparently diverse methods and showed that they can be represented in a very neat manner within the HEP.

B. Local Binary Patterns and Its Application to Facial Image Analysis: A Survey

Di Huang, Caifeng Shan, Mohsen Ardabilian, Yunhong Wang, presents a comprehensive survey of LBP methodology, including several more recent variations. LBP is one of the most powerful descriptors to represent local structures. During the development of LBP methodology, a large number of variations are designed to expand the scope of application, which offer better performance as well as improve the robustness in one or more aspects of the original LBP. ILBP, Hamming LBP, and ELBP enhance the discriminative ability of LBP; LTP and SLBP focus on improving the robustness of LBP on noisy images; MB-LBP, elongated LBP, TPLBP, and FPLBP, change the scale of LBP to provide other categories of local information; Gabor-wavelet-based LBP, CS-LBP, and LBP-HF combine other methods with LBP to bring in new merits. From this research work, we obtain the following points: 1) local- or component-oriented LBP representations are effective representations for facial image analysis, as they encode the information of facial configuration while providing local structure patterns; and 2) using the local- or component-oriented LBP facial representations, feature selection is particularly important for various tasks in facial image analysis, since this facial description scheme greatly increases the feature length. Meanwhile, similar to most of the texture-based techniques, LBP is sensitive to severe lighting changes, and to blurred and noisy images. The former case can be regarded as non-monotonic lighting variations, which normally occur in facial images due to 3-D facial volume structures, thereby leading to non-monotonic transformations, e.g., shadows and bright spots can typically occur and change their positions depending on lighting directions.

C. Early Diagnosis of Lung Cancer with ANN, FCM and FMNN

Vinod Kumar, Kanwal Garg, Vijay Kher presents a diagnosis of lung cancer. In spite of enormous diversity in their demographic information, there are number of similar parameters causing to cancer. Oral cancer and lung cancer in males are noted as a few numbers, depending on its registry. Uncontrolled cell progress in lung tissues causes lung cancer disease. It is the most frequent incurable malignancy in both men and women. Lung cancer can completely recover by early detection and treatment survived patient. Artificial Neural Network (ANN), Fuzzy C-Mean (FCM) and Fuzzy Min-Max Neural network (FMNN) are very effective and helpful in cancer diagnosis for its several advantages. The motive behind that the fault tolerance, flexibility, non linearity are the factors of artificial neural network. In case of FCM, it provides finest findings for overlapped data set; data point may be connected with more than one cluster centre. Non-linear separability, soft and hard decision, less training time, online adaptation is the advantages of FMNN.

D. A Novel Approach of Cancerous Cells Detection from Lungs CT Scan Images

Nikita Pandey, Sayani Nandy presents a novel approach for detection of cancerous cells from Lungs CT scan images is proposed in this paper. Locating lung cancer at an early stage is a challenging task since there are few or no symptoms in this stage of the disease and majority of the cases are diagnosed in the later stages of the disease. Treating cancer in the early stages can provide more treatment options, less invasive surgery, and increases the survival rate. The majority of lung cancers originate as a small growth or nodule in the lung. Screening CT scans are extremely sensitive in detecting nodules as small as 2 or 3mm within the lungs. CT screening is efficient in locating majority of lung cancers. Lung CT Scan helps in detecting lung cancers at an early stage. This present work proposes a method to detect the cancerous cells effectively from the CT scan images by reducing the detection error made by the physicians' naked eye for medical study based on Sobel edge detection and label matrix. It also identifies the cells which might have been unnoticed by human eyes. Detection of lung cancer at an early stage can be difficult but using the proposed work detection becomes uncomplicated and the chances of the early treatment of the patient and therefore chances of survival of the patient increases.

III. EXISTING SYSTEM

LOCAL BINARY PATTERN

Local features have performed very well in many computer vision applications, such as image retrival, wide baseline matching, object reorganization; texture recognization. Local binary pattern (LBP) operator transforms an image into an array or image of integer labels describing micro-pattern, i.e. Pattern formed by a pixel and its immediate neighbours.

More specifically, LBP encodes the signs of the pixel element variations between a pixel and its neighbouring pixels to a binary code. The bar chart of such codes in an image block is commonly used for any analysis.

$$LBP_{R,N}(X,Y)=\sum_{i=0}^{N-1} s(n_i - n_c)2^i , \qquad s(x) = \begin{cases} 1, & x \geq 0 \\ 0, & otherwise \end{cases} \qquad (1)$$

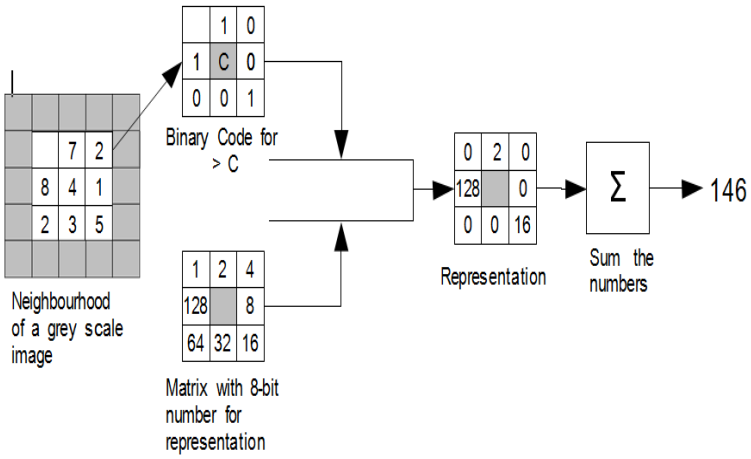

Fig 1: Local Binary Pattern Features for a Neighbourhood of 8 Pixels.

If gray level of the neighbouring pixel is higher or equal, the value is set to one, otherwise zero. The descriptor describes the result over the neighbourhood as a binary number.Although LBP has gained much popularity of its simplicity and robustness to illuminations variations, its sensitivity to noise, the operator produces long histograms limits the performance. Another variation binary rotation invariant and noise tolerant (BRINT) overcome the difficulties of LBP. The construction of the local BRINT descriptor is analogous to the sampling scheme within the original LBP approach whereas computing this descriptor, we tend to sample pixels constituents around a central pixel xc, but on any circle of radius r, we tend to prohibit the quantity of points sampled to be a multiple of eight, so p = 8q for positive integer q. So the neighbours of xc sampled on radius r are $x_{r,8q} = [x_{r,8q,0}, \ldots, x_{r,8q,8q-1}]^T$.

In contrast to original LBP, we transform the neighbour vector xr, 8q by local averaging along an arc, such that the number of neighbours is always eight. Although the existing system as advantages, it lack in texture analysis this can be derived efficiently using a novel approach OCLBP.

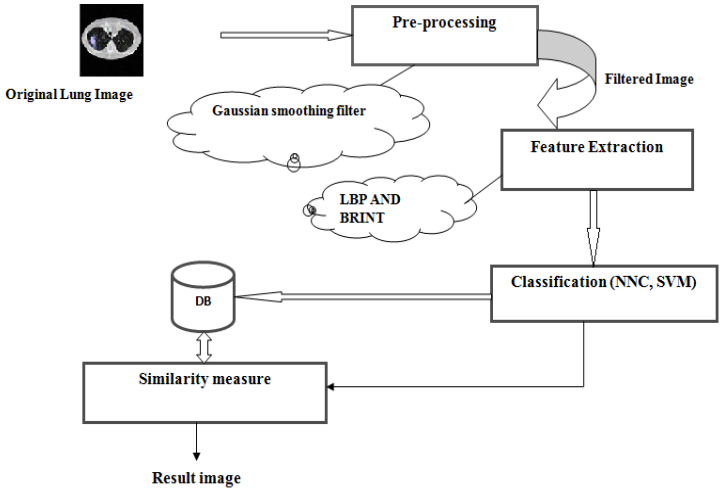

Fig 2: Existing System Architecture

IV. PROPOSED SYSTEM

To describe color and texture jointly OCLBP (Opponent Color Local Binary Pattern) was defined. In OCLBP the operator is employed on every color channel severally, and so for pairs of color channels in order that the center pixel is taken from one channel and the neighboring pixels from the opposite. Opposing pairs like R-G and G-R are extremely redundant, therefore either of them will be used for analysis. Thus LBP operator is applied on each color channel separately and in addition each pair of color channels for collecting opponent color patterns. By using primary colors, the following combinations are

Number of inter-channel LBP histograms=3

Number of intra-channel LBP histograms=6

Six out of nine (R, G, B, R-G, R-B, G-B) are extracted and concatenated into a single distribution. Based on this algorithm the feature is extracted then the lung image is segmented into two separate component based on component labeling method, which differentiate the cancer affected lung and normal lung. Here the Doc can take the symptoms of a patient as input and supported his symptoms correct diagnostic treatment are to be prescribed to a patient every symptom has its own priority worth and Doc can assign membership values to the linguistic variables i.e. No cancer, low, medium, and high, so finally supported threshold worth and distinction measure the severity of non small cell lung is derived. The performance analysis is finished supported the execution time taken to find the quantity of infected pixels that makes the projected system additional economical.

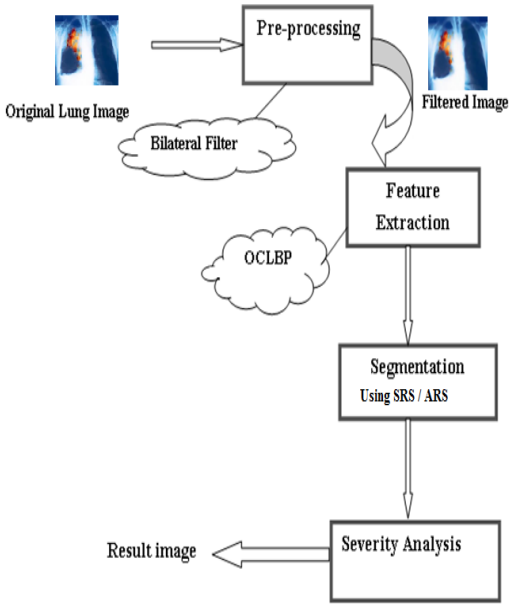

Fig 3: Proposed System Architecture

V. METHODOLOGY

A. Preprocessing

In this module, the amount of carcinoma pictures is collected from any of the health care organization. The carcinoma pictures could also be taken by CT or imaging scan device. Imaging knowledge consists of multiple channels of freelance however geometrically registered medically important knowledge, it analogous to multispectral remote sensing knowledge. A noise reduction procedure is required to enhance the standard of carcinoma pictures, as a result of there are lots of artifacts (e.g. attenuations, speckles, shadow and signal dropout) in carcinoma pictures. Bilateral filter that has been well-tried to be AN economical and effective technique for noise reduction.

B. Feature Extraction Using OCLBP

In this module, the input image was taken. After that, Opponent Color Local Binary Pattern operator accustomed extract the options within the carcinoma image. In OCLBP the operator is employed on every color channel severally, so for pairs of color channels in order that the middle picture element is taken from one channel and also the neighboring pixels from the opposite. Opposing pairs like R-G and G-R are extremely redundant, therefore either of them will be used for analysis therefore LBP operator is applied on every color channel severally and additionally every combine of color channels for assembling opponent color patterns. Based on the comparison OCLBP provides the cancer level of the carcinoma image.

C. Texture based segmentation

Using the patterns and contrast measure generated using opponent color local binary pattern each texture feature is segmented. This can be then validated using simultaneous registration segmentation (SRS) and Artificial registration segmentation (ARS). Looking on the image domain, we have a tendency to use a special segmentation potential. For CT scan images we have a tendency to use threshold primarily based potential.

Thus SRS is more accurate and less dependent on the registration in comparison to an repititive optimization

D. Severity analysis

To find the severity of carcinoma, think about a carcinoma of four stages. The algorithm program makes an attempt to classify the pixels at first into 4 stages. Here the physician will take the symptoms of a patient as input and supported his symptoms correct diagnostic treatment are prescribed to a patient. Every symptom has its own priority worth and physician will assign membership values to the linguistic variables i.e. No cancer, low, medium, and high.

VI. RESULTS AND DISCUSSIONS

MATLAB 7.0.1 Software is extensively used for the study of lungs cancer detection from CT scan images. Concerned images obtained in the result are shown in Figure 1.

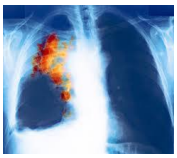

Fig 4: Original Lungs with Cancer

Fig 4 represent the input image with cancer .Here the image is preprocessed to improve the image Quality.

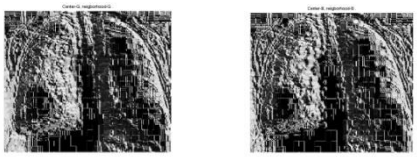

Fig 5: OCLBP texture extractions

Fig 5 extract the texture features using opponent color local binary pattern with 6 combinations of primary colors (R,G,B).

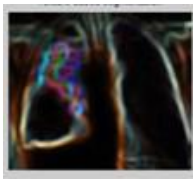

Fig 6: Texture based segmentation

Fig 6 based on patterns extracted textures are mapped to segment the lung

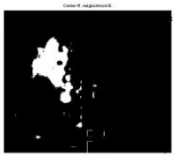

Fig 7 Cancer Status Detected image

Fig 7 finally the lung cancer status are identified to No cancer, Low, High levels based on threshold parameters.

VII. CONCLUSION

The Opponent Local Binary Pattern (OCLBP) approach is used to analyze the severity of lung cancer. Initially, the noise image is preprocessed using bilateral filter to increase the resolution and quality of an image. These are done based on the spatial and color closness. Then filtered image is subjected to feature extraction. In this phase texture features are extracted based on the texture features (contrast measure, Threshold, weights).This can be done using OCLBP algorithm, thus resulting image is scaling contrasted and texture extracted image.

Based on this feature extraction the image is segmented using texture based segmentation methods. These are done based on the Simultaneous registration segmentation (SRS) and Artificial registration segmentation (ARS). This approach improves the efficiency of severity analysis. In severity analysis, whether the cancer level is mild, moderate or severe, is should be identified. This shows the exact level of lung cancer.

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