Artificial Neural Network as Kernel of Image Analysis Software

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***Abstract*—We developed an intelligent agent for image processing in this paper. The description of image processing analysis is provided and that of image feature analysis. Then we considered the construction of an intelligent agent for image processing using hybrid of Artificial Neural Network and Bayesian networks. The intelligent agent is made up of three levels and the image processing commands. In addition, we described the structure of an experimental version of intelligent agent for image processing.**

Key words: Image processing, Artificial Neural Network, Bayesian Networks, Intelligent agent

I. INTRODUCTION

Intelligent agent for image processing is needed. In a given domain, software application deals with the study of object in terms of their origin, structure, and functional properties (for instance, image processing tasks). The useful implications of such study are of key importance in scientific field since they consist of [8]. Currently human expertise are inadequate, if not impossible (at least at the moment), to imitate in computerized applications automated image analysis tools if we need a full widespread support of workplace in several ways [9]. The computerization of feature extraction process yields an objective, quantitative, detailed, and reproducible computation of morpho-functional uniqueness and allows the analysis of large quantity of images [10]. In the subsequent sections, the domain of image processing analysis is summarized and then the description of the proposed suite of intelligent agent for image processing is described in detail. The last section explains the testing of the intelligent agent.

II. IMAGE FEATURES FOR ANALYSIS

Basic features of image analysis that can be used for purpose of a technique of processing are described as follows; Common processing sequence for histological samples image analysis [12]. The segmentation process (i.e., extraction of homogeneous regions in image) is considered as a basic step for formal scene description [11]. It is necessary to define a correct set of features and feature characteristics for a suitable choice of segmentation methods. (see Fig. 1). All functions changes properties of image and is applied for specific processing cases. Each function is introduced in an interpreter table and can be supported by additional information.

III. CONSTRUCTION OF INTELLIGENT AGENT FOR IMAGE ANALYSIS

The construction of intelligent agent for image processing is done on three levels as shown in figure 2.

The first level is on the description of image properties based on the image marks data collected. The second level is on association of these image properties to the third level which is the weight commands.

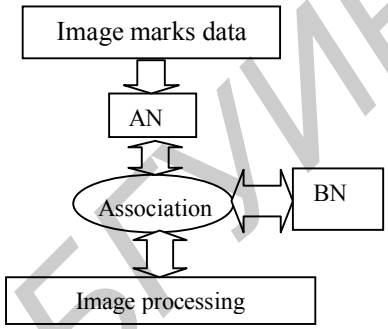

Fig 1. Scheme of image marks data filtering.

The Bayesian Networks (BN) is used in getting the best mage feature objects as indicated in figure 2 in The weight commands are based on the Bayesian networks. Bayes' formula is one of the helpful applications for probabilistic image processing based on the Bayesian network. Artificial Neural Networks (ANNs) are useful in information extraction from input image to be fed through the networks as its input parameters.[4,5]. We used ANN for image marks data as the input weights and vector signals quantization is intimately related to a simple basic algorithm for artificial neural network for description of image properties. The Bayesian probability is used in filtering the image marks for connection of the common marks [6, 7].solve tasks direction. The study process direction is used to go back and repeat the process until a good image result is achieved.

IV. ARCHITECTURE OF INTELLIGENT AGENT

A neural network is made up of numerous computational essentials which are neurons or nodes, extremely interconnected to each other. A weight is associated to each connection. Usually, nodes are organized into layers. However, different neural networks can be categorized as supervised or unsupervised (self-organizing) neural networks. The learning process itself contains three major steps, the arrangement of the input sample, and the computation of the output and the alteration of the weights by particular training rules. These steps are repetitive numerous times, until the network is said to be trained. [1]. The outline of the training steps of a Kohonen network containing *n* input and *m* output node are the following: (1) Give new input values $x_i, i = 1,...,n$. (2) Input nodes forward them to each output node.(3) Output nodes calculate the output values d_j by

$$d_j = \sum_{i=2}^{n} \left(x_i - w_{ij} \cdot a\right)^2 , \quad j = 1,2,...,m . \qquad (1)$$

Where w_{ij} is the weight associated to the connection from the i^{th} input node to the j^{th} output node.(4) The node by means of the minimum output dmin =min$\{d_j\}$ is the winning node. (5) The weights of the connections to the winning node as well as their neighbors are reorganized in a well defined method. (6) Go to step 1 until the network is trained.

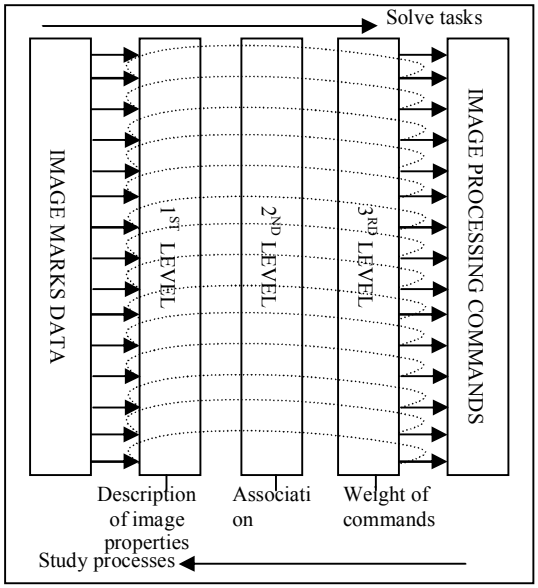

Fig.2. Architecture for BNN and ANN Intelligent Agent

The second level is on the association of the ANN to the Bayesian Network (BN). The BN is the third level. Bayesian networks (BNs) stand for a set of variables in the kind of nodes on a directed acyclic graph (DAG). It maps the conditional independencies of these variables [2,3]. A BN is a model of graphics mode, which can picture out compound probability distribution function of a set of variable. A BN is a directed acyclic graph (DAG) with a probability table for each node. Definition I: Bayesian equation is also called posterior probability equation, and it is broadly used. If the prior probability is P(Bi), and the extra information obtained by investigation is $P(A|B_i)$, where $i = 1,2,...,n$ then the posterior probability is:

$$P(B_i|A) = \frac{P(B_i) \cdot P(A|B_i)}{\sum_{k=1}^{n} P(B_k) \cdot P(A|B_k)} . \qquad (2)$$

A BN only defines joint probability as follows:

$$P_B(X_1,...,X_n) = \prod_{i=1}^{n} P_B(X_i|Pa_i) . \qquad (3)$$

We used the BN to link the first level in the study process, this is to adjust the image marks until a precise and accurate image objects are formed. After these processes, the third level uses the image processing commands to achieve a better image object.

V. CONCLUSION

We proposed the system for image analysis using intelligent agent for medical image processing and for analysis of image in this study. Also, we developed method of intelligent agent construction for image processing with possibilities for reconstruction of itself depending from the task. We developed the solution using a combined system of artificial neural networks and Bayesian networks. It was tested and the result shows that the intelligent agent for medical image analysis can be used for medical image processing. Furthermore, this intelligent agent can change your design and function and to adapt to the particular problem without reconstruction stage. Consequently, it changes itself. Nowadays, this intelligent agent architecture is distinctive in the field of image processing and analysis.

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