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ScienceDirect

Procedia Computer Science 85 (2016) 455 – 462

Procedia Computer Science

International Conference on Computational Modeling and Security (CMS 2016)

Hybrid Genetic Algorithm for Medical Image Feature Extraction and selection

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Abstract

For a hybrid medical image retrieval system, a genetic algorithm (GA) approach is presented for the selection of dimensionality reduced set of features. This system was developed in three phases. In first phase, three distinct algorithm are used to extract the vital features from the images. The algorithm devised for the extraction of the features are Texton based contour gradient extraction algorithm, Intrinsic pattern extraction algorithm and modified shift invariant feature transformation algorithm. In the second phase to identify the potential feature vector GA based feature selection is done, using a hybrid approach of "Branch and Bound Algorithm" and "Artificial Bee Colony Algorithm" using the breast cancer, Brain tumour and thyroid images. The Chi Square distance measurement is used to assess the similarity between query images and database images. A fitness function with respect Minimum description length principle were used as initial requirement for genetic algorithm. In the third phase to improve the performance of the hybrid content based medical image retrieval system diverse density based relevance feedback method is used. The term hybrid is used as this system can be used to retrieve any kind of medical image such as breast cancer, brain tumour, lung cancer, thyroid cancer and so on. This machine learning based feature selection method is used to reduce the existing system dimensionality problem. The experimental result shows that the GA driven image retrieval system selects optimal subset of feature to identify the right set of images.

Peer-review under responsibility of the Organizing Committee of CMS 2016

Keywords: Feature Extraction, Feature Selection, Texton, Genetic Algorithm

Peer-review under responsibility of the Organizing Committee of CMS 2016
doi:10.1016/j.procs.2016.05.192

1 Introduction

For browsing, searching and retrieving relevant images form the large datasets image retrieval system algorithm were used. Due to the advancement in the medical field a huge volume of medical images are generated tremendously in medical centers using many advanced medical equipment's. Thus to aid the expertise in medical field analysis content based medical image retrieval is one of the most revolving research area. So that, for analysis the similarity in diagnosis methodology can be synchronized by comparing the patient's current medical image with the medical database to retrieve the medical diagnosis history.

The aim of feature selection algorithm is to find the relevant of features that produces the best recognition rate and least computational effort. As high dimensionality features can increase system complexity, which also leads to higher recognition rate. There is a need to use some complex feature extraction algorithm which should not be depend on other features. So, the selection of subset of best features is important. For the selection of effective feature on the run we need to device a learning model in the training phase. In this paper instead of use high complicated model, we use minimum description length principle based genetic algorithm (GA). Genetic algorithm is a search heuristic, which routinely used to generate solution for searching problem. In a GA [1-3] for a better solutions, the population of candidate solution (feature vector) are optimized iteratively. The iteration process, which is also called as generation will usually starts from a population of randomly generated candidate solution. In each iteration, the fitness of each candidate solution are evaluated using an objective function, for an optimized solution. Thus new set of population of candidate solution are generated using the objective solution for the next iteration. This algorithm is terminated either a satisfactory fitness level has been achieved for the population or a maximum number of generations has been produced.

2 Technical approach

To improve the performance of the proposed hybrid content based medical image retrieval system, a hybrid approach of genetic approach algorithm is used for feature selection. This feature selection method reduces the data dimensionality issues while selecting the optimal features and thus improves system performance. Distance measurement using Chi Square distance is used for assessing the similarity between database images and the query images. The proposed system employs the diversity density based relevance feedback approach for improving the performance of the system. Relevance feedback refines the query image feature selection method for retrieving most similar images to query image. The overall system design of the proposed concept in shown in Fig.1. The whole system are explained in sub section such as feature extraction, feature selection and diverse density based relevance feedback