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Retinal Fundus Image Registration Via Vascular Structure Graph Matching

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ABSTRACT

The optimal transport theory enables great flexibility in modelling problems related to image registration. As different optimization resources successfully used as the choice of suitable matching models to align the images. The proposed method in this paper is automated framework for multimodal fundus image registration and using a both color images and grayscale images and graph matching schemes into a functional and easy methodology. Then our method is used to predict the diseases accurately. Then these methods are used to predict the disease is affected or not affected by using a comparison method. These methodologies are validated by a comprehensive set of comparisons against competing and well-established image registration methods. By using real medical datasets and classic measures typically employed as a benchmark by the medical imaging community our proposed method is mostly used in medical field. 'It is used to easily detect the diseases.

Keywords–Retinal image registration, Image alignment, Blood vessel Detection, Optimal Transport.

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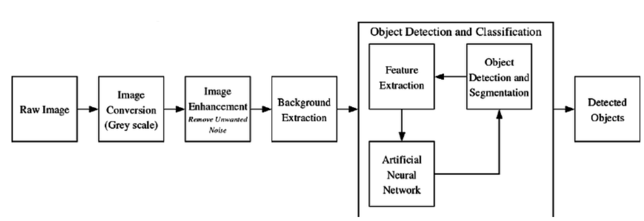
INTRODUCTION

The World Health Organization (WHO) estimated that 39 million people in the world are blind, 285 million are visually impaired and 246 million have low vision degree in 2012.Considering all these disorders, glaucoma, a serious disease that affects the eyes, is considered The second leading cause of blindness worldwide. According to the American Academy of Ophthalmology, glaucoma is a complicated condition that damages the optic nerve. It occurs when a fluid (called aqueous) builds up in the front part of the eye, increasing the pressure on it. In general, the glaucoma pathology can be broadly classified into two types: the "open-angle", And the "closed-angle" (or "angle closure"), both of them described regarding the angle delimit Between the iris and cornea. The open-angle case, more drastic, appears suddenly leading to the Loss of vision quickly while the closed-angle tends to advance at a slower rate progressively. As the medical diagnosis is mostly accomplished by the human inquiry for glaucoma and other eye Disorders, the use of image processing algorithms became a necessity especially when Ophthalmologists need to manage a large set of fundus images. Such computing apparatus has paved the way for clinicians and medical specialist's to cover more patients while still seeking for greater diagnostic accuracy. However, in practice the evolution of eye diseases is identify and Track performed to Retinal images for using Medical inspection. Moreover, these visual Inspections are quite Time-demanding, as they Depend on the physician experience in order to succeed, noticing that finally some pathology can be detected and treated over an examination required.

Image processing mainly include the following steps:

- Importing the image via image acquisition tools;
- Analysing and manipulating the image;
- Output in which result can be altered image or a report which is based on analysing that image**.**

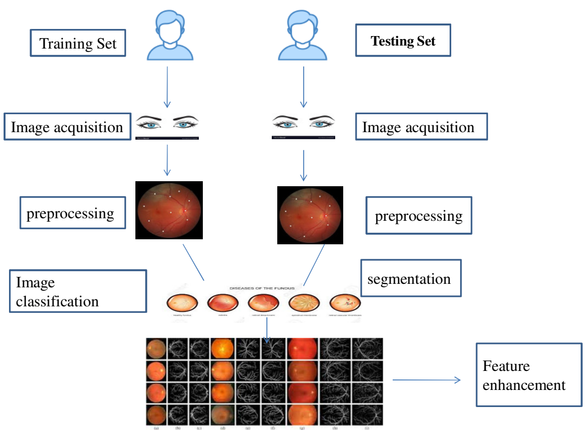
Overview of Image Processing:



PROPOSED SYSTEM

In this paper we discuss about the eye disease detection by using a method at retina Fundus images. Now a day's many people are affected at more eye disease. So using that situation many doctors and hospitals are easily theft more money from patients. The common Peoples are mostly affected by this problem. We propose the method is used to predict the disease accurately. Then it detects all the eye disease easily. That is used to detect the entire eye related diseases and its provide more accuracy. Then the detection of eye disease at less computation time. Our proposed method is used to predict all the eye related diseases like that Glaucoma, Age-related macular degeneration, Diabetic retinopathy, Retinitis pigments and So on. They are easily detected and its used accurately identifies the diseases in less processing time.

ARCHITECHTURE



SVM -ALGORITHM

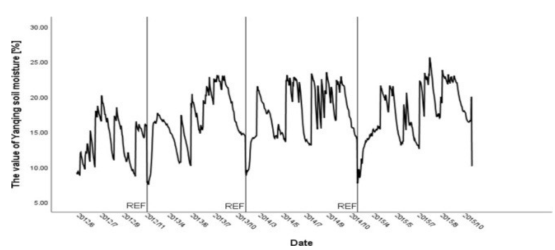
- SVM is Support Vector Machine.
- It is machine learning algorithm. The SVM is used in both classification and Regression.
- It is used to predicting and classifying data. It is used as a kernel trick technique (used to find boundary).
- It have a large datasets. Works well with even unstructured and semi structured data like text, image and trees.
- Python languages are used to write in algorithm

DNN ALGORITHM

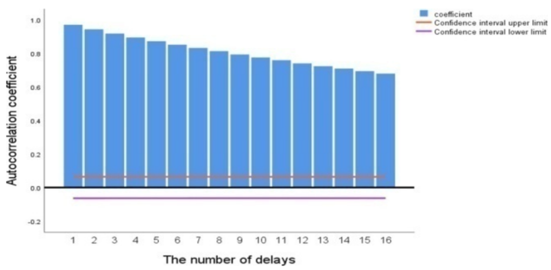
In 2006, Hinton proposed Deep Learning (DL) is rapidly developed by using Artificial Intelligence, to increase the capability of big data and multi-feature data which uses a multiple hidden layer structure. The strong computing power has been successful in traditional neural networks, and applied in image recognition, search engines, stock price predictions, and other fields. In recent years, it has been introduced DL into soil particle size and soil texture of a nonlinear and extremely complex nature of soil to predict the problems in a low accuracy. The prediction model is optimizing the soil moisture through deep learning. It achieves the powerful data processing to high-precision prediction.

DATA PROCESSING AND ANALYSIS

Different sources of meteorological data and soil moisture data result in different data formats and lengths. Data integration and matching is required. The deep learning model requires a large amount of data for training purposes and a long time-span data set to ensure complete data characteristics. The method involves selecting the training set and test set according to the amount of soil moisture data from 2012 to 2016. The integrated data contains missing values. If the missing value is included, and induces a large error, it will cause interference in the model training. Therefore, we chose to eliminate data with missing values. The final data set contains six meteorological features, as well as an initial moisture feature, and a pending prediction feature of soil moisture. After processing, a total of 1,196 data samples from Yanking area were obtained, including 954 sets of data from 2012 to 2015 to build a training set, 242 sets of data in 2016 to build a test set, and 50 data samples were randomly selected from the test set for model selection. At the same time, a total of 239 data from Shunyi area in 2016 and 235 data from Daxing area in 2016 were used to verify the extensibility of the model.To predict the data, we must first understand the trend of the predicted features. According to the water timing chart of the four years from 2012 to 2016, although the moisture data fluctuates greatly, presenting a periodical status overall, generally from July to September each year represents the data peak, the maximum soil water content is up to 25.6%. From November to February of the next year indicates the period for minimum water content, which is only 7.50%. However, different years show large discrepancies because of different meteorological conditions. Facing such complex prediction features, deep learning is suitable for soil moisture prediction because of its data fitting capabilities.



The regression prediction should be clear about the correlation between each variable and the predicted feature, so that reasonable parameter characteristics can be selected for model training. The first step is to analyze characteristics of the predicted variable. It can be seen from that the autocorrelation graph of the predictive feature has no rapid decay to zero with increases of the delay period, so because the soil moisture characteristic is a stationary time series. Therefore, it is possible to grasp the changing trend of soil moisture characteristics according to relevant meteorological parameters.



The results of the correlation analysis between the features of the data set and soil moisture are shown in. The reference variable of the Taylor map is the soil moisture feature (the REF point of the X-axis), and other features standard deviation divided by the standard deviation of the soil moisture are used to obtain the standard deviation ratio, which can be used to evaluate the similarity between the fluctuation range of other features and the moisture feature, and is then added into the correlation to participate in the analysis. There are seven variables to be analyzed, where points 3 and 4 (average humidity and average wind speed) are outside the standard deviation range. The data fluctuation range of these two points is More than 1.5 times the soil moisture and exhibit data jump phenomena. Point 2 (average pressure) has a standard deviation ratio of less than 0.25 (the data fluctuation is much smaller than the moisture fluctuation range), but the correlation is the lowest. The data fluctuations of the three variables of points 1, 5, and 6 (average temperature, daily precipitation, and surface temperature) are close to the REF data. The standard deviation ratio is approximately 1.5, and the correlation is between 0.1 and 0.3. Point 7 (initial moisture) is the closest to the standard deviation ratio of the soil moisture prediction data, almost coincides with the REF line, and the correlation is close to 0.99, which indicates strong correlation characteristics. Thus, it is an essential training feature to provide maximum weight for soil moisture prediction to improve regression accuracy.

PERFORMANCE EVALUATION MEASURES

Four evaluation measures were selected to indicate the performance of the different models.

Mean Absolute Error (MAE) is:

$$\frac{1}{m}\sum_{i=1}^{m}\left| (y_i-\hat{y}_i)\right|$$

Mean Squared Error (MSE) is:

$$\frac{1}{m}\sum_{i=1}^{m} (y_i-\hat{y}_i)^2$$

Root Mean Squared Error (RMSE) is:

$$\sqrt{\frac{1}{m}\sum_{i=1}^{m} (y_i-\hat{y}_i)^2}$$

R Squared (R^2) is:

$$R^2=1-\frac{\sum_i (\hat{y}_i-y_i)^2}{\sum_i (y_i-y_i)^2}$$

ADVANTAGES

- It's used to predict disease accurately.
- It requires less processing time.
- Provide more accuracy.
- It detects all the eye disease easily.

CONCLUSION

The automated and flexible technique based on multimodal images to tackle the problem of fundus image registration. The designed framework yields high-accuracy registrations including many cases difficult to be handled in real circumstances such as potential changes in the geometry of the vessel structures, lack of focus, and the presence of specular noise. Moreover, we also verified the effectiveness of each core modulus of multimodal images separately, by analysing them individually against existing well established approaches. As demonstrated by a comprehensive set of experiments, VOTUS has produced highly accurate results even when compared against baseline as well as modern registration methods. Also capable of aiding physicians and ophthalmologists under real circumstances, as raised by experienced specialists.

FUTURE ENHANCEMENT

We are currently adapting our approach to addressing multimodal fundus images registration. Originally, VOTUS was not designed to deal with multimodal images; however, competitive results have already been achieved just by setting a minor modification into our pipeline. This particular change simply consists in providing as input to the feature extraction step of our framework the gradients of both color and grayscale multimodal images instead of the raw images. Some preliminary results involving patients diagnosed with diabetic retinopathy, aiming at eventually contributing towards other medical applications such as multimodal registration. In addition, we intend to extend our approach to compute 3D stereoscopic reconstruction of fundus images, which is another underlying problem related to the context of diagnostic assistance as well.

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