

## A New method for classifying corneal data

<sup>1</sup>Payam Porkar Rezaeiye, <sup>2</sup> Marsa Rayani, <sup>3</sup> Mohammad Iman Ghiasi, <sup>4</sup> Mohammad Reza Amini

<sup>1</sup>Department of Computer, Damavand Branch, Islamic Azad University, Damavand, Iran

<sup>2</sup>Faculty of Computer Science and Information Technology, University Putra Malaysia, 43400 UPM, Serdang, Selangor, Malaysia

<sup>3</sup>Research Institute of Petroleum Industry (RIPI), Tehran, Iran

<sup>4</sup>Department of Computer, Damavand Branch, Islamic Azad University, Damavand, Iran

<sup>1</sup>damavandiau@mail.com, <sup>2</sup> marsarayani1@gmail.com, <sup>3</sup> ghiasimi@ripi.ir, <sup>4</sup> moreza\_amini@yahoo.com

### Abstract

Today intelligent systems are used in different applications like classifying complex pattern in physician industry. This paper present a real work with eye bank based on quality assignment of corneal donated. Here there is a statistical way in classification of physician data (corneal topography). Results have tested in database of corneal topography and show a better result. Utilization of computer to classify different data for improving of eye junction operation is the goal of this paper. Classification of corneal topography can used different methods but this paper introduced a new statistical method and show that this method is more appropriate for separation of corneal data and it also shown few applications that might be used in future.

**Keywords:** K nearest neighbor method, classification, topography, corneal.

### 1. Introduction

Utilization of statistical classifier for categorized large mass data is important. Applications example are fingerprint classification [1], face recognition classifier [2, 3] and etc. to gain this goal, different statistical methods were introduced for example bays classifier [4, 5], fisher classifier [4, 5], Hidden Markov Models [6] and etc. In this paper we have introduced K nearest neighboring method for classification. Also appropriate feature extraction could be used to improve speed and recognition ratio of classification. Among all of methods have been introduced, statistical feature selection for face recognition used neural networks [7] and other methods that designate in [8] and [9]. In this paper we have introduced a new feature for convenience in classification that shows an increase in recognition ratio. One important problem that is relevant to ophthalmology and especially in eye junction operation is quality assignment to corneal donated because junction operation for both ophthalmologist and sickness complex process are affected very from corneal quality. For instance although satisfaction of ophthalmologist from operation, most of donated eyes but couldn't improve original person's observations. One possible reason is the lack of quality assignment of cornea's donated before junction operation. This cause sick hurt and ophthalmologist dissatisfaction [10].

Primarily this paper use some image processing algorithms to provide information for next steps; eliminated redundancy sections. In fact, we have trying with the help of image processing algorithms on eyes donated images to classify eyes donated pattern to earn improvement in corneal junction operation. Then some important features extracted form cornea's topography

classification. All results were tested on Noor clinic's eyes bank. Results shows with the help of feature's selection Lasik patterns and non Lasik patterns K nearest neighbor classifier cause a significant improvement.

### 2. Preprocessing

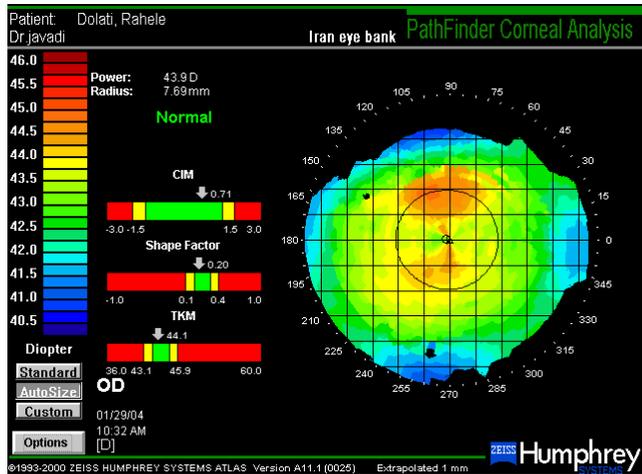
For doing this project we have used collected images from two devices Humphrey, Orbscan [11-13]. Although corneal topography from these two devices was different, we use image processing algorithms over these images to obtain additional information in a way appropriate feature extraction. We also show a high precision classifier. In next sub section we have represented all related image processing algorithms and a description of two devices.

#### 2.1 preprocessing for Humphrey device:

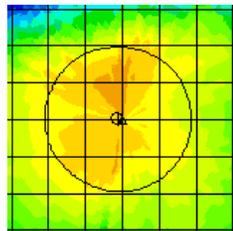
This device has nine output images types that have different applications. Here we have used from topography images which named Pathfinder. This step concerned on all types of input images. For instance output images of Humphrey device that is shown in Figure 1.

As figure 1 shows the image of corneal topography have surplus details. Therefore in first step we have needed to divide sections. For this reason we use a preprocess program to extract 159\*159 dimensions square corneal topography from input machine images. The result has shown in Figure 2.

**Fig.1.** The Instance of Pathfinder topography using Humphrey device.

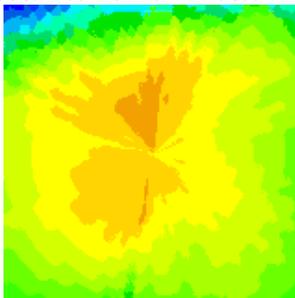


**Fig.2.** Division section of corneal images in dimensions of 159\*159.



As we can see in figure 2, this image composed of lines to help ophthalmologist. These lines sometimes have misunderstandings for machines. So we should use an elimination algorithm before every evaluation. To gain this purpose we have used image processing methods with the help of average neighbor color to find filled black point. Also we have used median filter. To obtain the best result, we have done a little change in popular median filter that has an ordering color capability. Darker colors more than thresholds were eliminated from list and median color have gotten from primary color image. The sample of this operation presented in Figure 3.

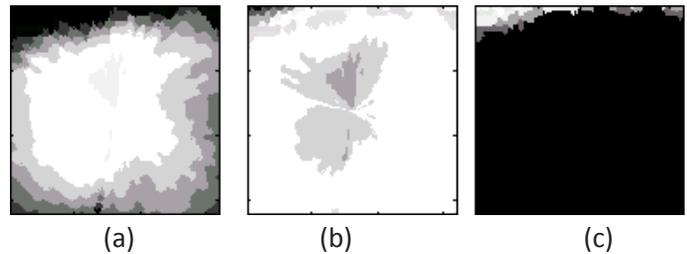
**Fig.3.** The image obtained from eliminated lines program.



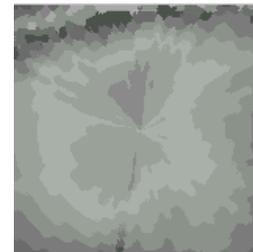
As we can figure out from the Figure 3, distinct this program retrieved principle images very suitable. We should consider that this filter only operates in black points and other information remains without any changes. It has a wide application where we want to eliminate all black points and where ever we cannot ob-

tain real data and also does not have any changes to real data. In figure 4 measurement associations of red greens and blue colors are shown.

**Fig.4.** The image shows the role of three principle colors that have converted to contrast image (a) red (b) green (c) blue.



**Fig.5.** Shows final image after using of filtering process.



### 3. Obtaining Features:

Obtaining a feature is one of the most important process in every recognizing system, and it's very important to supply features that can distinguish data very well. Here both mathematically and mentally. Sensitively features are used for creating separating space.

In this task a lot of features are discussed to obtain desired quantities that distribute data in a sample space and among them all we can mention issues such as correlation, auto correlation, cross correlation, fast furia transform and spectrum of the discussed picture, all of them are mathematical features. Based on this, some features like picture spectrum are not appropriate for classifying and other features such as correlation, auto correlation, cross correlation and furia transform have their own effect on distinguishing classes of lasiced-eyes and not lasiced-eyes, so using one of them would be enough.

The distribution of patterns are too complicated and using one feature doesn't allow to distinguish the results well. Despite the FFT is not a good feature by itself but it's been considered because it shows good results in the mixture by correlation in a way that it was possible to distinguish classes. On the other hand as the patterns are gathered together in a complicated manner and besides the number of sample patterns were few so to increase the insurance for better distinguishing the classes, searching other features seems to be necessary.

Also according to the information gained by the second system or Orbscan, it was detected that this system does other measurements too which are indistinguishable in the discussed

pictures. For instance of one of the pictures (specially shows the thickness of the corneal and called pochemtery) different quantities obtained by the system showed that these quantities are (5) which shows the maximum thickness of the five main points of the corneal.

With other comparison some more features were obtained as below:

1: (Maximum Power) maximum value = middle value of the corneal – maximum value of the four sides numbers.

2: (Minimum Power) minimum value = middle value of the corneal – minimum value of the four sides number

#### 4. Statistical classifier of Nearest Neighbour

In KNN rule for classifying each unknown sample of  $x$  in a  $n$  dimension space  $K$  finds the nearest neighbour base on a distance scale and among this,  $K$  finds nearest neighbour of the class contains majority and attribute  $x$  to that class. Now if this majority is not decisive or if is a forced majority, in order to find  $K$  nearest neighbour  $x$  starts searching in a long distance from that and in this way there'll be the case of uncertainty in decision making. Here for decreasing the fault in decision making, making decision would be rejected or called the sample  $x$  reject.

1: ambiguity reject 2: distance reject, based on this it seems necessary to explain these two kinds shortly.

#### 5. Using general classifier with the KNN method based on using obtained features:

In this part the classifying is considered based on using three purpose features as below:

1: FFT, correlation and maximum value 2: FFT, correlation and minimum value 3: FFT, correlation, maximum value and minimum value. By using this experiment it got obvious that the second method didn't help to improve classifying process however the third and first methods were more successful in distinguishing classes and probably we can say classifying was done in the best for the existing patterns. However in the third method, four features are used and naturally, this would decrease the speed of decision making, but based on the few number of patterns the third method is more assured than the first one. But we're to consider in order to gain high accuracy in the task the third method was used that it's data are in a four dimension space.

#### 6. Conclusion and future work

Utilization of statistical classifier for categorizing large mass data is important. There are variety of different models that have introduced for classification like bays classifier.

In this paper we have introduced  $K$  nearest neighboring method for classification. Also appropriate feature extraction could be used to improve speed and recognition ratio of classification. And we have showed that we have taken better effective-

ness. Our plan is to introduce a more effective algorithm with the help of Support Vector Machine.

#### 7. References

1. Andrew Senior, "A Hidden Markov Fingerprint Classifier", Asilomar Conference Systems and Computers, 1997.
2. Donald, Tanguay, "Hidden Markov Models For Gesture Recognition", Department of Electrical Engineering and Computer Science, Massachusetts Institute of technology, August 1995.
3. B.A.Sherman, H.Bunke, "Combination of Face Classification for Perso Identification", Proceeding of the 13<sup>th</sup> IAPR International Conference on Pattern Recognition (ICPR), 1996.
4. S.Theodoridis, K.Koutroumbas, "Pattern Recognition", Academic Press, 1990.
5. K. Fukunaga, "Introduction to Statistical Pattern Recognition", Academic Press, 1990.
6. L.R.Rabiner, B.H.Juang, "An Introduction to Hidden Markov Models", IEEE ASSP Magazine, 1986.
7. Siad E. El-Khamy, Onsy A.Abdel-Alim, Mariam M. Saii, "Neural Network Face Recognition Usinf Statistical Feature Extraction", Seventeenth National Radio Sience Conference, Feb.22-24, 2000, Minufiya University, Egypt.
8. Kenji Nagao, "Face Recognition by Distribution Specific Feature Extraction", Matsushita Research Institute, Tokyo, Higashimita, 2000, IEEE.
9. Guang Dai Yuntao Qian, "Face Recognition with the Robust Feature Extracted by the Generalized Foley-Sammon Transform", Computational Intelligence Research Laboratory, Zhejiang University, P.R.China, 2004, IEEE.
10. Noor Clinic, <http://www.noorvision.com>, November, 2004.
11. P.Porkar, M.Gheisari., Gh.H.Bazyari, Z. KaviyanJahromi. "A COMPARISON WITH TWO SENSOR DATA STORAGE IN ENERGY". In International Conference on Intelligent Network and Computing 2011. Bangkok, Thailand.
12. P. Porkar Rezaeiye, "Medicine Irregular Pattern Recognition Using Statistical Method Based On Hidden Markov Model", Lead from Saeed Setayeshi, Azad University Science & Research Branch Artificial Intelligence & Robotic Engineering Department, November 2004.
13. M.Gheisari, A.R.Bagheri,"evaluation two methods on sensor data storage in total data "5th symposium on advanced technology, 5thsastech,Iran,2011