I J C T A, 9(11) 2016, pp. 5207-5214

EXPAR: A FUZZY RULE BASED EXPERT SYSTEM FOR PALMISTRY

Sanjay Kumar Singh[*], Meenakshi Sharma[**], Prateek Agrawal[***], Vishu Madaan[****] and Amita Dhiman[*****]

Abstract: Palmistry or chiromancy is the investigation of individual characteristics with the assistance of individual hands because our hands hold the entire story of our life. In this research, we are going to formulate the system based on fuzzy logic to investigate the vital personality of a person by extracting features of individual palm. In this work we are going to build up a fuzzy based expert system which provides information of particular individual based on palm features head line, heart line and life line. These extracted features further can be useful in the field of astrological as well as in medical field.

Key Words: Palmistry prediction, fuzzy inference system, Palm features, head line, heart line, life line.

1. INTRODUCTION

Palmistry or chiromancy is the word that is originated from Greek vocabulary kheir and manteia, and foresight the future through the analysis of the palm of individual, also documented as palm reading or chirology. In current picture Palmistry is accepted not simply in India but also in different regions of world. Some people considered that palmistry is simply a false conception, but it is incorrect reflection, in reality it is a science.

Palmistry is a method of investigating the shape of the hand and the lines of the palm, to discover the individuality and viable life experiences of an individual person. The science of

Palmistry is alienated into two wide areas:

- The knowledge of hand structure, or cheirology,
- The knowledge of the lines of the palm, or cheiromancy.

The thought patterns, body nerve linkages and structure of body affects the shape of the lines on hand. Palmistry is the understanding of interpreting and analyzing palm lines, fingers and receiving results [6].

Palm in general hold three flexion creases (principal lines), secondary creases (wrinkles) and ridges. These three flexions are hereditarily dependent; most of other creases are not [3].In lots of cases both hands are similar in context of texture, colour and shape features. [2].Though, it is easy

[*] Department of Computer Science Engineering, Lovely Professional University, Phagwara, Punjab, India
sanjayksingh.012@gmail.com
[**] meenakshis84@gmail.com
[***] prateek061186@gmail.com
[****] vishumadaan123@gmail.com
[*****] amitadhiman3001@gmail.com

to discover some individual person where exist some differences among right and left hands. This exists because some individual change the inherited pattern artificiality or due to some disability.

There are lots of lines that are visible on a palm. The mainly significant from all the lines that exist on palm are the heart line, the head line and the life line. These lines are easily visible on approximately all hands and considered primarily by this system are:

- The heart line is the line that exists at top of the palm below the fingers. It basically depicts the heart matter which shows emotional traits of individual.
- Further the head line comes which originated at the boundary of palm below index finger. It basically depicts the mind state and knowledge of individual.
- Finally, the most notorious line on the hand is the life line. The life line extends from the boundary of the palm over the thumb. This line is assumed to signify the person's liveliness and physical health.

In recent years various software's are developed that's used by palmist to make predictions [5]. In our proposed work automated system is developed by using Fuzzy Toolbox. In last year's a range of system are developed using Fuzzy concept [7] [8] [9].

Medical palmistry is another upcoming stem of palmistry, which provides mechanism for the identification of apparent diseases by observing some signs in individual palms [4].

2. PROPOSED METHODOLOGY

The methodology of pal reader basically divided in two parts. First part of this paper includes palm line extraction. Second part of this paper includes designing of fuzzy inference system with three inputs life line, head line and heart line. Various steps involved in design of palm reader system are shown in Table 1.

Table 1
Steps involved in Palm Reader

Steps	*Description*	
1	Data Base Preparation	Palm Line extraction
2	Image Pre-processing	
3	Life, Head and Heart Line extraction	
4	Fuzzification	Fuzzy Inference System
5	Fuzzy Rule Construction	
6	Defuzzification	
7	Evaluating and Analyzing performance	

2.1 Palm Line extraction

This part of paper includes basically three steps, data base preparation, image pre-processing and life line, head line and heart line extraction.

Data base preparation

We have collected the picture of 50 right hand palm for males and 50 left hand palms for female include 50 Male and 50 female. For this purpose we have taken the palm print of various

age groups range from 15-40 year male and female. Table 2 shows the number of persons and their age group involved for this paper.

Table 2
Age Group Involved

Sr. No	*Age group*	*No. Males*	*No. Females*	*Number of palm prints*
1	15-20	10	10	20
2	21-25	10	10	20
3	26-30	10	10	20
4	31-35	10	10	20
5	36-40	10	10	20
Total	**18-40**	**50**	**50**	**100**

Image Pre-Processing

Image pre-processing steps includes mainly two steps resize the image and image enhancements. All 100 palm images are stored in the size of 256 x 256 true colour image. The purpose of this step is to set the limit of each line range in between 0 to 256. Image enhancement includes conversion of true colour image to grey image using Matlab 2014 software [10].

Let R, G and B is the red, green and blue component of true colour image then gray image intensity is computed using

$$Y = 0.2989 * R + 0.5870 * G + 0.1140 * B \qquad (1)$$

In image enhancement tasks we have converted all the images in gray scale image and enhance the quality of image using histogram equalization. Figure 1 represents original image

and gray scale enhanced image.

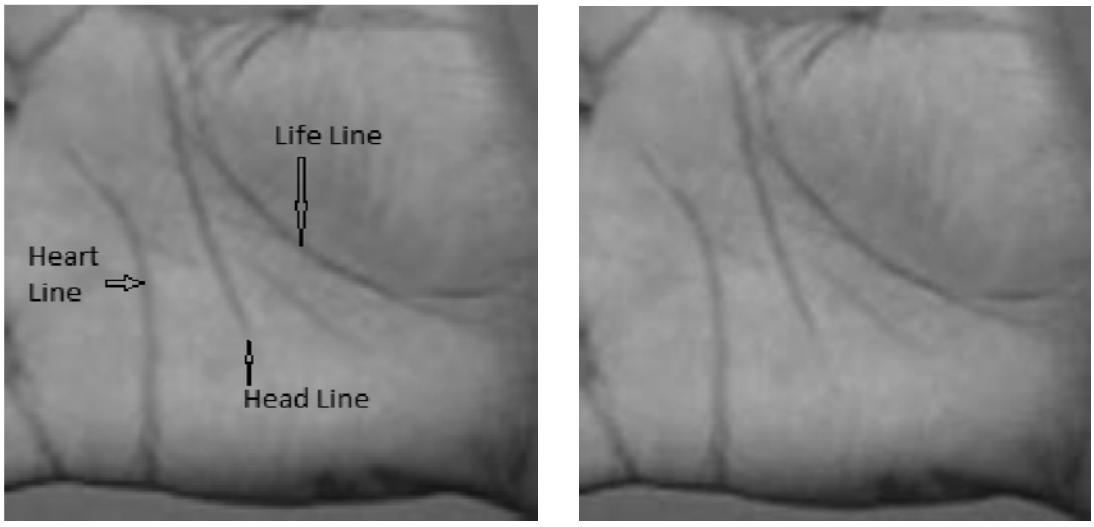

Figure 1: Original Input Image (Left) and Gray Scale Enhanced Image (Right).

Life, Head and Heart line extraction

In this task using gray level thresholding technique and normalization technique we have extracted principle lines of palm. Figure 2 shows the segmented image and their length is calculated using Euclidean distance using Matlab. The Euclidean distance D between two vectors X and Y, of equal length is

$$D = \sqrt{(X - Y)^2} \quad (2)$$

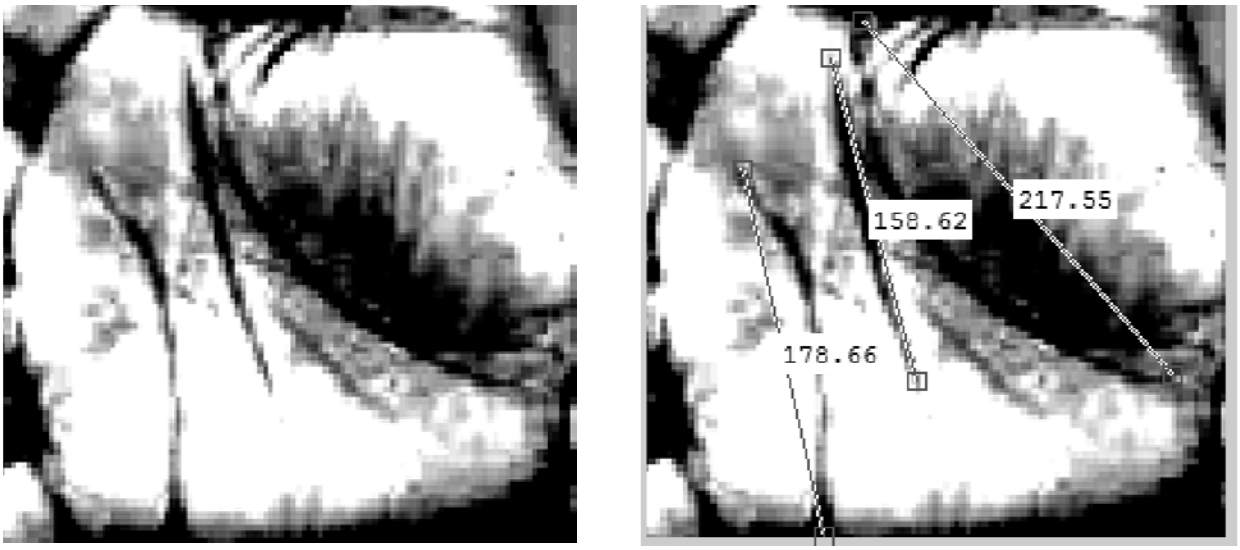

Figure 2: Segmented Image (Left) and Length of Lines of Palm (Right)

2.2 Fuzzy Inference System

Second part of this paper focus on preparation of fuzzy inference system. This system includes mainly three steps Fuzzification, fuzzy rule construction and defuzzification.

Fuzzification

After computing the lengths of life, head and heart lines, then there is a need to fuzzify those input values. Fuzzification of lengths of life, head and heart line was carried out by converting inputs into membership values of the fuzzy sets. Life, head and heart line length is input variables of the fuzzy logic based system. The fuzzy sets of the input variables and their range are given in Table 3. Each line has divided in five fuzzy set very small, small, medium, large and very large as shown in Figure 3.

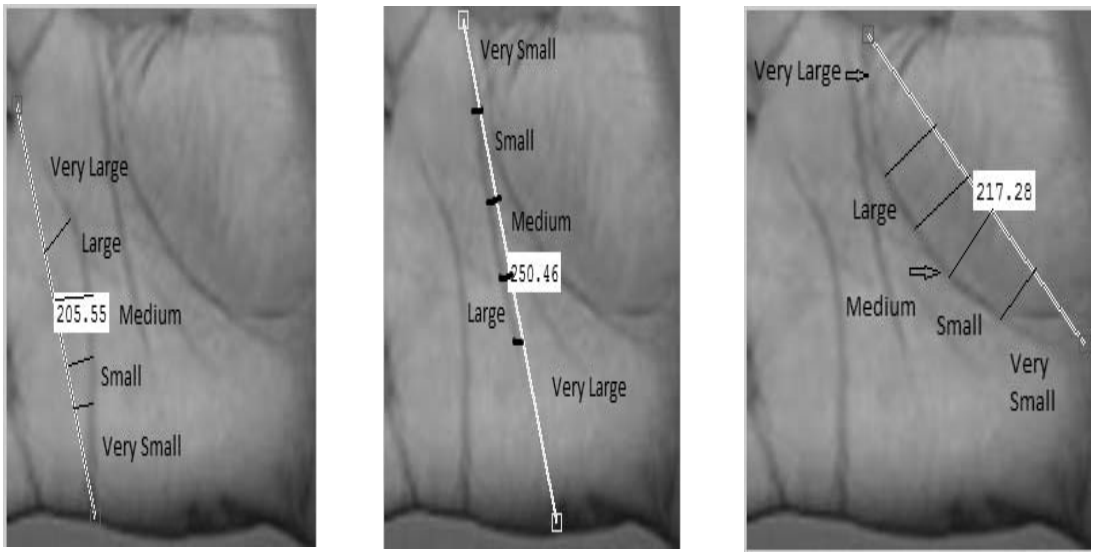

Figure 3: Fuzzification of hear line (left), head line (middle) and life line (right).

Each input variable has five trapezoidal membership functions. The fuzzy input and output variables are shown in Figure 4 and example fuzzyfication of input variable life line is shown in Figure 5.

Table 3
Fuzzy linguistic variables and their fuzzy elements

	Fuzzy linguistic input variables Membership value range(0-256)						*Fuzzy Linguistic Output variable with membership range(0-10)*				
	Very Small	Small	Medium	Large	Very Large		Very Poor	Poor	Average	Good	Very Good
Head Line	0-70	50-120	100-150	120-200	180-256	Result					
Heart Line	0-50	30-100	80-150	120-180	160-256		0-3	1-5	3-6	4-8	6-10
Life Line	0-70	50-120	100-150	120-200	180-256						

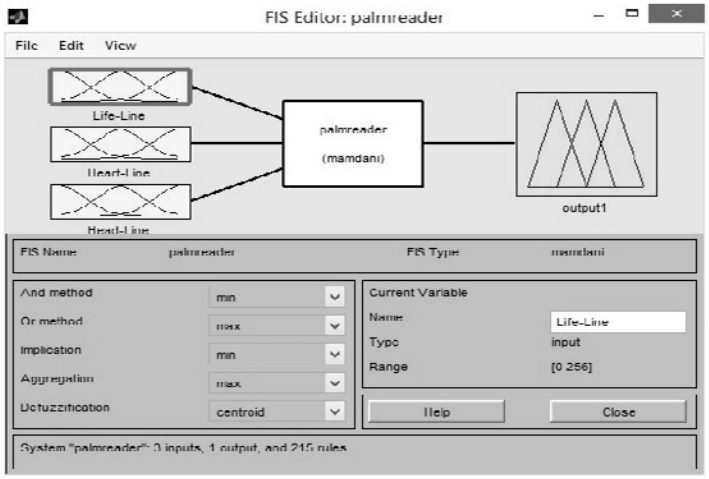

Figure 4:- Fuzzy input and output variables

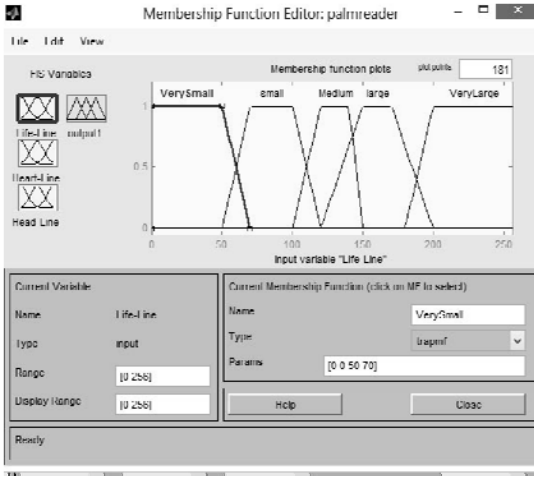

Figure 5: Membership function for input variable life line.

Fuzzy Rule Construction

Fuzzy rules are constructed after fuzzyfication of input variables. Fuzzy inference system uses these rules for making inferences. The knowledge base of system stores knowledge in form of rules and performance of overall system is depends on accuracy of the rules. Each fuzzy rules are in term of if-then rules. For example

$$P \rightarrow Q.$$

Here P is called antecedent and Q is called consequent. This rule can be applied if P is true. We have constructed 215 rules that include all combination of input variables except all null. Some of the rules are shown in Figure 6.

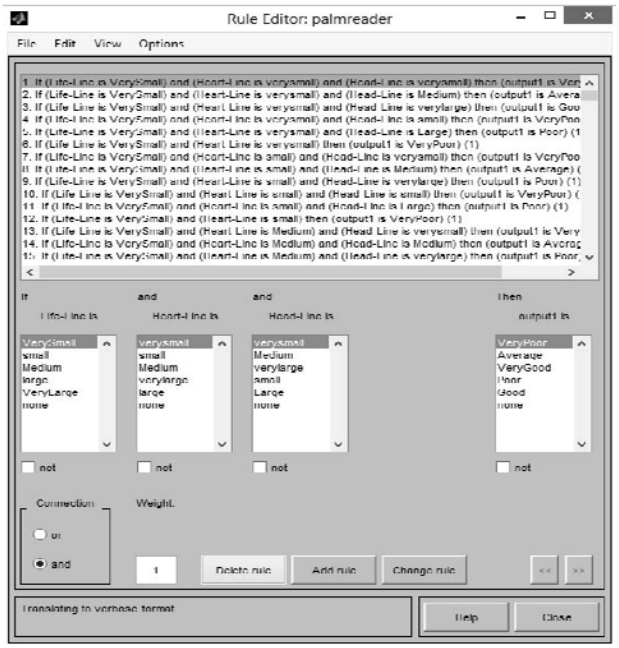

Figure 6: Fuzzy Rule Base for Palm Reader.

To design this system, Mamdani system is used for inference, as it is most popular inference system to be used. Mamdani system follows 4 steps evaluate the antecedent for each rules, obtain each rule's conclusion, aggregate conclusions of all rules and defuzzification to calculate the Max-Min composition of each rule. In Mamdani inference system, Max-Min composition is used [9].

2.2.3 Defuzzification

Defuzzification is the process to convert fuzzy value to crisp value. The most popular defuzzification method is the centroid calculation, which returns the center of area under the curve. There are five built-in methods supported: centroid, bisector, middle of maximum (the average of the maximum value of the output set), largest of maximum, and smallest of maximum. We have applied centroid, bisector and middle of maximum methods on input sets and compare their ranks.

3. EVALUATING AND ANALYZING PERFORMANCE

For evaluating and testing the results, we are using the feature extracted of palm images. The inference engine used here is Mamdani fuzzy system. Results of some palms and their ranks are as shown in Table 4.

Table 4
Ranking of different performance obtained by defuzzification methods

Person	*Head Line (0-256)*	*Heart Line (0-256)*	*Life Line (0-256)*	*Defuzzified Output and ranks*					
				Centroid	*Ranks*	*Bisector*	*Ranks*	*MOM*	*Ranks*
1	158	178	217	3.63	4	2.6	4	1	1
2	179	89	180	3.03	3	2	1	1	1
3	120	152	207	5.17	4	7	8	5	4
4	88	160	168	3.69	5	2.8	5	2.89	3

Table 4 Ctond…

5	130	205	212	5.2	4	6.1	7	5	4
6	208	188	200	5.17	4	7	8	5	4
7	190	210	187	4.22	3	3.4	3	1	1
6	156	120	78	2.67	2	2.3	2	2.20	2
8	196	146	94	2.25	2	2.1	2	1	1
10	118	130	176	3.39	3	2.30	3	1	1

Table 4 shows that the ranks of the performance values by different fuzzyfication techniques are approximately same.

4. CONCLUSION AND FUTURE SCOPE

In this paper fuzzy logic is used to read the palm and find the characteristics of people. In this work firstly palm lines are extracted and further fuzzy inference system is designed with three inputs life line, head line and heart line. For this purpose palm prints of various age groups range from 15-40 year male and female are used. In this paper gray level thresholding technique and normalization technique is used to extracted principle lines of palm. This paper shows that ranks of the performance values by different Fuzzification techniques are approximately same.

Considering more features of palm, other lines also may predict good features of individuals. An automatic system may be considered to calculate the length and submit these values to fuzzy expert system for reading. More number of rules may reflect the results.

References

[1] Xianggqian Wu, David Zhang, Kuanquan Wang, Bo Huang “Palmprint Classification Using Principal Lines”, Pattern Recognition, Elsevier, vol. 37, Issue 10, year 2004, pp 1987-1998.

[2] Sharma, P. V. Speed Palmistry. Nadi Science India.

[3] A. Kong, D. Zhang and G. Lu, “A study of identical twins palmprint for personal verification”, Pattern Recognition, vol. 39, no. 11, pp. 2149-2156, 2006.

[4] Hardik Pandit, Dr. D M Shah “Application of Digital Image Processing and Analysis in Healthcare Based on Medical Palmistry”, International Conference on Intelligent Systems and Data Processing (ICISD), year 2011, PP 55-59.

[5] Navpat, A. K. (7-8 April, 2012). Application of Prediction Software in Palmistry. International Journal of Computer Applications , PP 6-8.

[6] History of Palmistry, http://www.palmistry.com.au/history_of_palmistry.html

[7] Vishu, Prateek Agrawal, Sanjay Kumar Singh and Leena Jain,"Fuzzy Rule Based Expert System to Automate University Examination Grading", International conference on computing sciences (ICCS),Wilkes100,Elsevier,year 2013, PP 612-621.

[8] Nidhi Gumber, Prateek Agrawal, Sanjay Kumar Singh and Leena Jain,"Fuzzy rule based Expert System for Employee Appraisal based on UGC guidelines", International conference on computing sciences,Wilkes100,Elsevier, year 2013, pp 80-87.

[9] Parwinder Kaur, Prateek Agrawal, Sanjay Kumar Singh, Leena Jain, “Fuzzy rule based students’s performance analysis expert system”, Issues and Challenges in Intelligent Computing Techniques (ICICT), IEEE, year 2014, PP: 100-105.

[10] The mathWorks,Inc. www.mathworks.com, 2016.