International Journal of Engineering Technology Science and Research
IJETSR
www.ijetsr.com
ISSN 2394 – 3386
Volume 3, Issue 2
February 2016

A Low-Cost Contactless Palm Print Device to Recognize Person based on Texture Measurement

Sharad B. Jadhav
School of Technology,
S. R. T. M. U. N.,
Sub-Centre,
Latur (MH), India.

Mr. Shriram D. Raut
School of Computational Sciences,
Solapur University,
Solapur (MH), India.

Dr. Vikas T. Humbe
School of Technology,
S. R. T. M. U. N.,
Sub-Centre,
Latur (MH), India.

T. Kartheeswaran
Lecturer
Dept. of Comp Science
Uva Wellasaa
University, Sri Lanka.

Abstract—Today's Biometrics is playing a very important role for person recognition. A palm print has a great set of features such as principal lines, ridges and minutiae. The paper discusses about the contactless palm print recognition system. We have developed our own contactless palm print image database using low cost image acquisition device. The palm print recognition system is formed using texture feature of palm such as filled area, mean and standard deviation. These measurements are found to be unique and distinct. The result gives a 100% total success rate.

Keywords- Biometrics, feature, pattern recognition, enrollment, identification, texture, statistical Property.

I. INTRODUCTION

Recently most of the researchers engaged to form a robust and reliable multimodal biometrics system. The Biometrics identification of an individual can be done using physiological or behavioral characteristics. Palm print is a unique and reliable biometric characteristic with high usability [1] [3]. Biometrics plays a very vital role in person's recognition systems as far as authentication is concern. A palm print refers to an image acquired of the palm region of the hand. The biometric use of palm prints uses ridge patterns to identify an individual. It is rich in its features: principal lines, wrinkles, ridges, singular points and minutiae points [2] [4]. Even the identical twin has the difference palm print features [5]. The previous biometric system uses emotive biometric scanners [4] [7] and devised image database like CASIA, POLYU etc. We propose an innovative tool to make a person identification using low cost contact-less palm print recognition device.

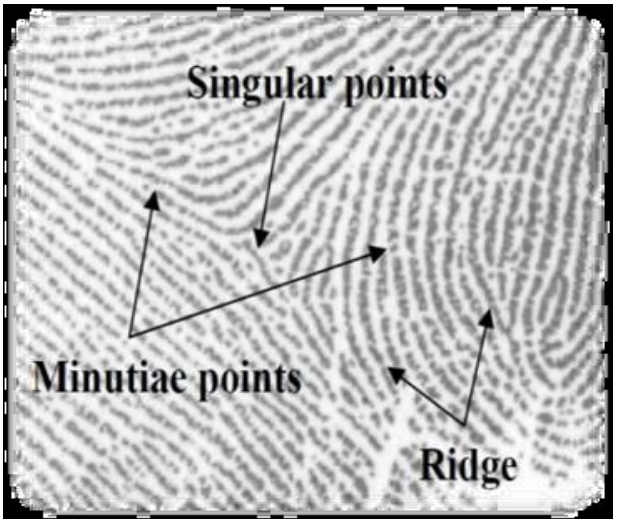


Fig.1. Features of Palm Print Image

II. METHODOLOGY AND RECOGNITION SYSTEM

The methodology is concern with implementation with respect to texture measurement such as filled area, Mean, Standard Deviation. The measurements of acquired palm print image are calculated. The measurements are found to be unique and distinct and stand with variability. Transforming the input data into the set of features is called feature extraction [8] [10]. These groups of marks which are used in palm print identification. The texture measurements are used with following discrimination.

a) Filled Area: The scalar specifying the number of pixels in filled image. The actual number of pixels in the region of palm print image.

b) Mean: Average or mean value of array. It returns the mean values of the palm print image matrix along different dimensions of an array [6].

International Journal of Engineering Technology Science and Research
IJETSR
www.ijetsr.com
ISSN 2394 – 3386
Volume 3, Issue 2
February 2016

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} \quad (1)$$

C) Standard Deviation: Standard Deviation is a widely used measurement of variability or diversity used in statistics and probability theory. [6] [9].

$$\sigma = \sqrt{\frac{1}{n}\sum_{i=0}^{n}(xi - \bar{x})^2} \quad (2)$$

Where 'x' is a vector, returns the standard deviation. The result is the square root of an unbiased estimator of the variance of the population from which 'x' is drawn, as long as 'x' consists of independent, identically distributed samples. In our proposed work the feature selection is based on the texture measurements of a palm for Palm print Recognition System.

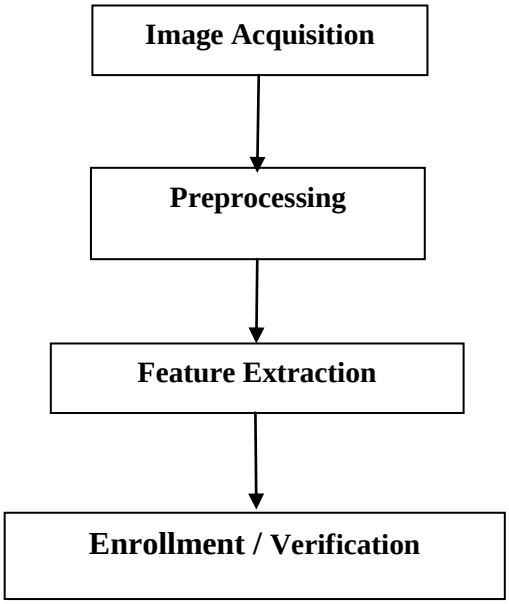


Fig.2. A brief methodology of Contactless Biometric Palm Print Recognition System.

III. FEATURE SELECTION

Transforming input data in to the set of features is called as feature extraction. Feature selection or feature extraction: selecting variables from the measured set that are appropriate for the task. These new variables may be obtained by a linear or nonlinear transformation of the original set (feature extraction) [6] [10]. In our work the feature selection is based on the texture measurements of a palm.

$$s = T(r) = \int_0^r Pr\,(w)\,dw \quad (3)$$

The work flow of experimentation is basically divided in two phase such as Enrollment and Identification/Verification Phase.

IV. SCS_PALM PRINT DATABASE

The image processing experiment, we require a digital image, so digital image can be inputted and related experiment can be carried and related results can be formed. So such image database is provided to the researcher to explore the scientific research.

We have created own database that is School of Computational Sciences (SCS) 2D Contactless Palm Print Database. The SCS 2D Palm Print Database contains 100 samples collected from 50 different palms. The 20 samples from each of these palms were collected in two separated sessions where 10 samples were captured in each session respectively. The all palm print images area of same size and same dimension such as 384 × 284 and each 2D palm print image recorded in JPG format image file. The palm print images have name sequence and interpreted as follows. Eg.1. Palm Print image name "SCS_001_01_1.jpg" can be interpreted as the initiated word 'SCS'. Then followed '001' indicate the subject enrollment number as it varies with person with respect to palm print image. The followed '01' indicate the session enrollment that whether it is the first or second followed by '1' the sample number and finally file format of image is 'JPG'.

A. About Device

We have used web camera, product by iBall Company. The features are-

i. High Quality CMOS sensor.
ii. Interpolated 20M pixels still image resolution & 2.1M pixels video resolution.
iii. High quality still pictures & motions video capture.

International Journal of Engineering Technology Science and Research
IJETSR
www.ijetsr.com
ISSN 2394 – 3386
Volume 3, Issue 2
February 2016

(a)

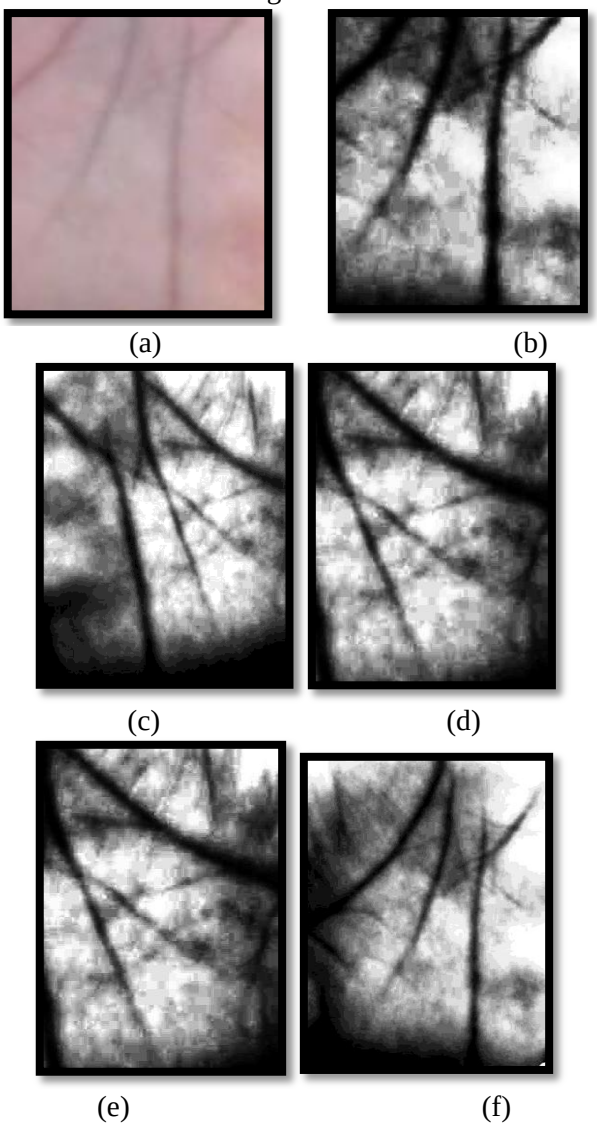
(b)

(c)

Fig.3. (a) The outlook of image acquisition device (b) The device is being used to collect palm print image samples (c) The "SCS_001_01" Palm Print Image

V. EXPERIMENTS

The Experiment was performed over the palm image from our own image database that is School of Computational Sciences (SCS) Contactless palm print database. We have used a high resolution web camera, low cost device as compare to other implemented biometric system and being contactless too. So innovative idea or work is to capture the users palm image at a particular distance for recognition, users doesn't require to touch image capturing device for their palm print to be extracted for an investigation.



(a) (b)

(c) (d)

(e) (f)

Fig.4. (a) ROI palm print SCS_001_01.jpg palm print image from SCS Palm Print Database (b) converted color palm print image into grayscale image. The samples in grayscale image (c) SCS_003_01.jpg (d) SCS_004_01.jpg (e) SCS_005_01.jpg (f) SCS_006_01.jpg

International Journal of Engineering Technology Science and Research
IJETSR
www.ijetsr.com
ISSN 2394 – 3386
Volume 3, Issue 2
February 2016

A novel hand tracking and palm print Region of Interest (ROI) extraction technique are used to way and captures the users palm in real time. The following are the preprocessing steps performed as these are useful to provide a part of palm visible with principal and secondary lines, wrinkles etc.

- Crop the image(ROI)
- Converting image from RGB to Gray Scale Image
- Apply the Histogram Equalization as the image enhancement operation.

As per table 2; the calculated texture measurements are distinct, unique for each and every individual. So a contactless palm print matching has done using these texture measurement features. The testing image who's Filled Area, Mean and Standard Deviation measurements are being tested to lead with one to one matching by comparing it with trained samples. As per experiment, the time estimation for the enrollment of one palm print image sample will take 09381 microseconds. The corresponding matching sample of testing palm sample has got matched based on texture measurements such as Filled Area, Mean and Standard Deviation of the palm print image. The time for finding a match of test sample from a train sample will take 0.1547 microseconds. Hence the Biometrics identification of individual can be done on the basis using the above stated scheme.

VI. RESULTS

The calculated texture measurements of palm print images are found to be unique and distinct for each and every individual. The result and analysis will gives us a 100% Total Success Rate (TSR) of experiment. The perfect match can be drawn by matching statistical values such as Filled Area, Mean and Standard Deviation of palm print image sample.

TABLE.1. Shows the resultant TSR (Total Success Rate), FAR (False Acceptance Rate), FRR (False Rejection Rate)

	Using Statistical Properties
FRR	0.0%
FAR	0.0%
TSR	100%

VII. CONCLUSION

The palm print recognition can play a major role in multimodal biometrics. This paper discuss about the design of a low cost contactless palm print image acquisition and person recognition based on texture measurement of the palm print image acquired using our database. We have developed a palm print image database of the person in the age group in between 21 to 25 ages. A Novel approach for Palm Print Recognition has been proposed using basic statistical properties such as Filled Area, Mean and Standard Deviation. A Histogram Equalization enhancement operation found to be useful to visualize the principal line laid in palm region of hand. The texture measurements are computed that are found to be unique and distinct for each and every individual. Using this approach we can reduce much of the computational cost, and avoid the cyclic redundancy procedure evolved in feature selection and extraction too for the purpose of person recognition.

REFERENCES

1. Anil K. Jain, Arun Ross, Salil Prabhakar, *"An Introduction to Biometric Recognition*", IEEE Transactions on Circuits and Systems for Video Technology, Vol. 14, No. 1, 2004.
2. A. Kong and D. Zhang, *"Palm print identification using feature-level fusion"*, *Pattern Recognition*, vol. 39, no. 3, pp. 478-487, 2006.
3. A. Kumar and D. Zhang, *"Palm print authentication using multiple classifiers"*, in Proceedings of SPIE Symposium on Defense and Security- Biometric Technology for Human Identification, pp. 20-29, 2004.
4. A. Kong, D. Zhang and G. Lu, *"A study of identical twins palm print for personal verification"*, *Pattern Recognition*, vol. 39, no. 11, pp. 2149-2156, 2006.
5. D. Zhang, W.K. Kong, J. You and M. Wong, *"On-line palm print identification"*, IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 25, no. 9, pp. 1041- 1050, 2003.
6. Shriram Raut, Manza R.R, *"Biometric Identification of Individual using Statistical Properties of palm"*, International Journal of Machine Intelligence Volume 3, Issue 3, pp-150-154, 2011.
7. A. Kumar and D. Zhang, "Integrating shape and texture for hand verification", in Proceedings of

Third International Conference on Image and Graphics, pp. 222-225, 2004

8. C.C. Han, H.L. Cheng, C.L. Lin and K.C. Fan, *"Personal authentication using palm-print features",* Pattern Recognition, vol. 36, no. 2, pp. 371-381, 2003.
9. Shriram D. Raut, Vikas T. Humbe, *"Biometric Palm Prints Feature Matching for Person Identification",* International Journal of Modern Education and Computer Science vol. 04, issue 11, Pp. 61-69, 2012.
10. R. O. Duda, P. E. Hart, D. G. Stork, *"Pattern Classification"*, Second Edition, Willey Inter-science, 2002.

Authors' Profiles

Dr. Vikas T. Humbe has completed his Ph.D. degree from University Department of Computer Science and Information Technology, Dr. B.A.M.U. Aurangabad and working as the Assistant Professor at Department of Computer Science, School of Technology, S.R.T.M. University, Nanded, Sub-campus, Latur. He is a reviewer for various International and National Journals and Conferences like Elsevier's Pattern Recognition Letters, Journal on Machine Vision and Applications, Academic Journals, IEEE IJCNN 07 and 09, ACVIT-09 etc. He is Member of IACSIT Singapore, Member of IAEng, Hong Kong, CSTA, USA and Graduate Member of IEEE-USA. He is the IEEE Graduate Member and has immense research recognition worldwide.

Mr. Shriram D. Raut is pursuing his Ph.D. degree in Computer Science. He has completed his M.Sc. degree in Computer Science from University Department of Computer Science and Information Technology from Dr. B.A.M.U. Aurangabad and is working as the Assistant Professor at Department of Computer Science and Application, School of Computational Sciences, Solapur University, Solapur. He is Member of IACSIT Singapore, Member of IAEng, Hong Kong, and CSTA, New York. He worked as the Research Scholar and submitted a project in Computer Science under the UGC SAP (II) DRS Phase-I: 2009-2014 under the theme "Biometric: Multimodal System Development".

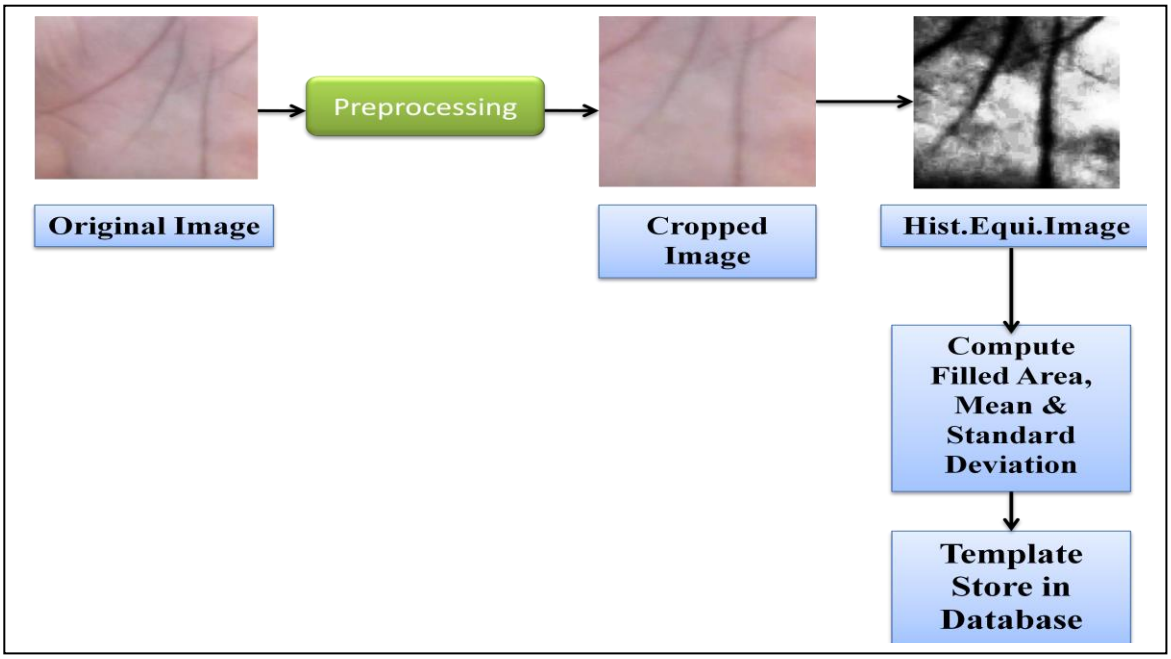
Mr. S.B. Jadhav is pursuing M.Phil. in Computer science. He has completed M. C. A. (Science) from School of Computational Sciences, Department of Computer Applications Solapur University, Solapur. He has two National publications in his credit.

Table 2. Shows the calculated values of statistical properties, Filled Area, Mean, and Standard Deviation

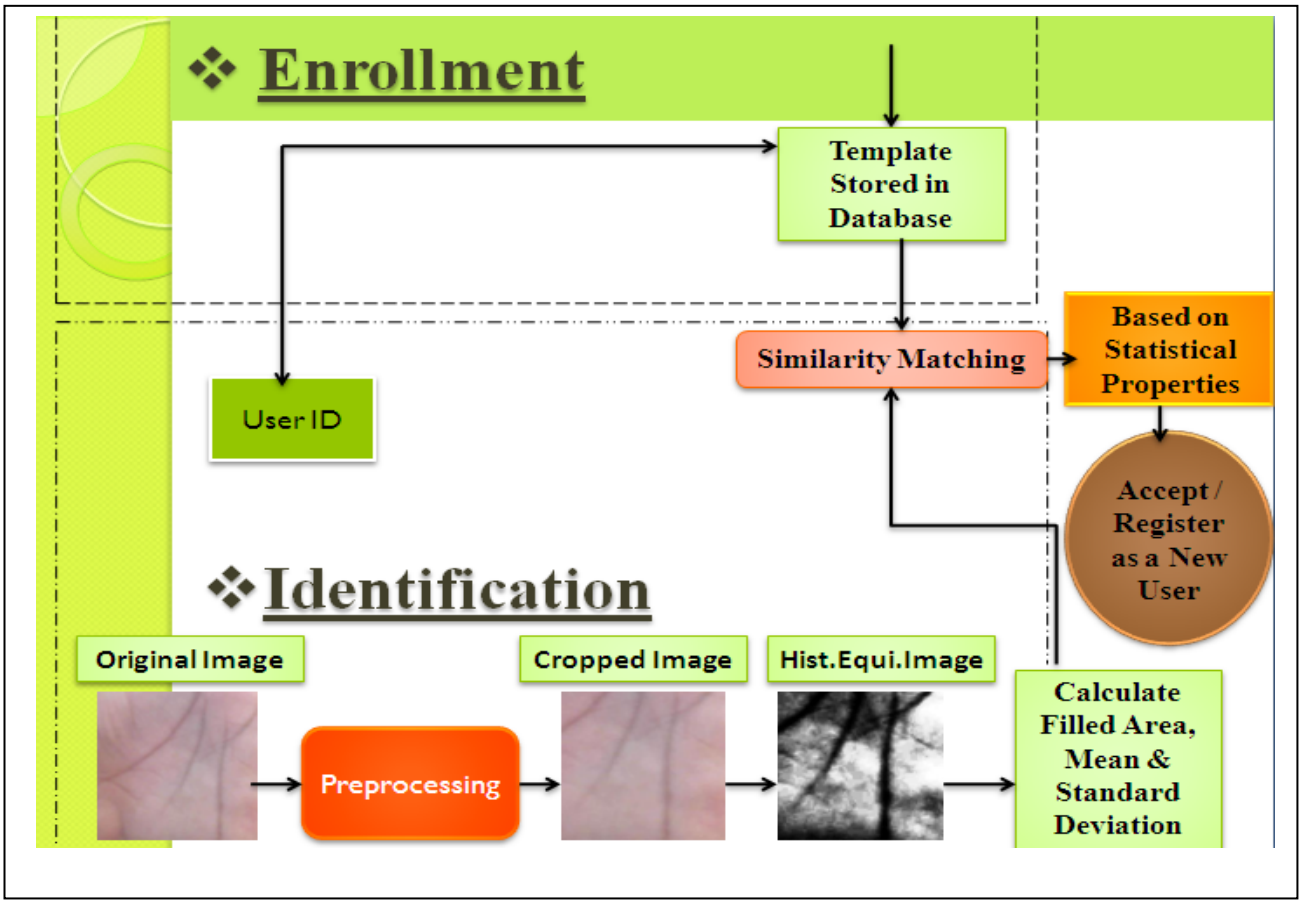
Sr. No	Image Name	Filled Area	Mean	Standard Deviation
1	SCS_001_01	158102	127.052	74.3920
2	SCS_002_01	156221	127.517	74.7832
3	SCS_003_01	154985	127.658	74.7707
4	SCS_004_01	153844	127.634	74.1567
5	SCS_005_01	155409	127.575	74.6821
6	SCS_006_01	157025	127.727	74.4897
7	SCS_007_01	154862	127.392	74.8865
8	SCS_008_01	156071	127.160	74.0075
9	SCS_009_01	157034	127.212	74.8318
10	SCS_0010_01	156810	127.650	74.5950
11	SCS_0011_01	155973	127.614	74.4542
12	SCS_0012_01	156056	127.585	74.6707
13	SCS_0013_01	155582	127.681	74.4273
14	SCS_0014_01	154713	127.806	74.5080
15	SCS_0015_01	157814	127.640	74.7710

International Journal of Engineering Technology Science and Research
IJETSR
www.ijetsr.com
ISSN 2394 – 3386
Volume 3, Issue 2
February 2016

❖ **Enrollment Phase**

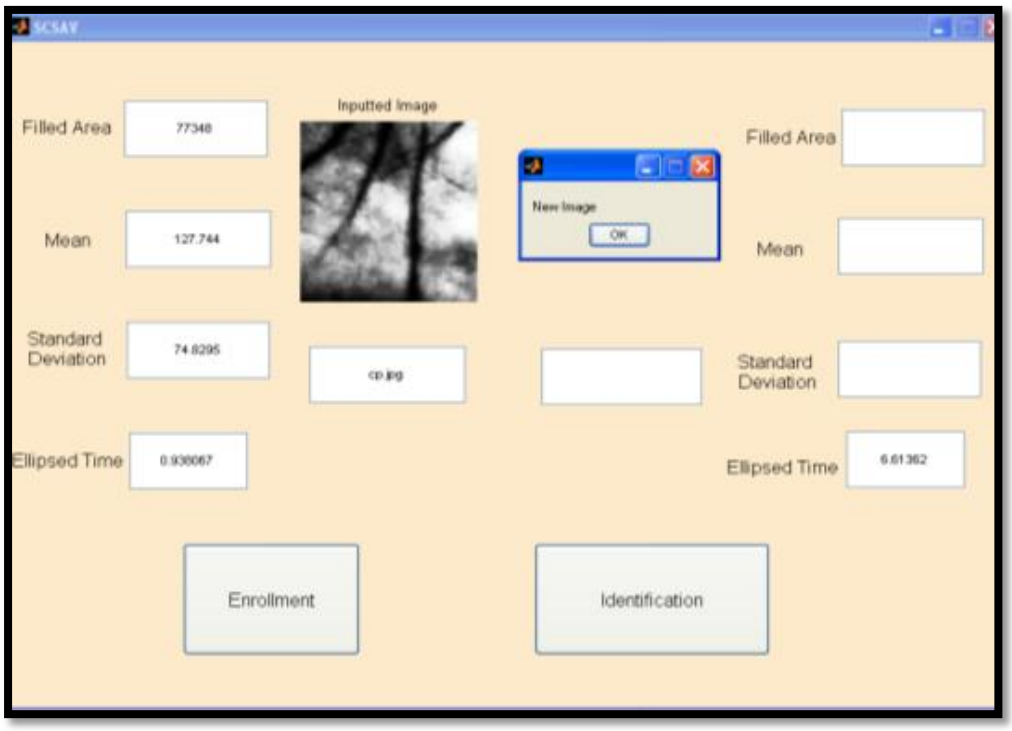


❖ **Identification Phase**



International Journal of Engineering Technology Science and Research
IJETSR
www.ijetsr.com
ISSN 2394 – 3386
Volume 3, Issue 2
February 2016

1- Graphical User Interface for Identification phase.



2. Graphical User Interface for Identification phase.