



Figure 4: Normalized Iris before enhancement



Figure 5 : Normalized Iris after enhancement

Image Feature encoding was done with 1D Log-Gaber wavelet. 2D the pattern was normalized into a number of 1D signal. The rows belong to circular ring in the iris region. The angular direction is taken on the column side. The features extracted will be in code of 0 and 1.

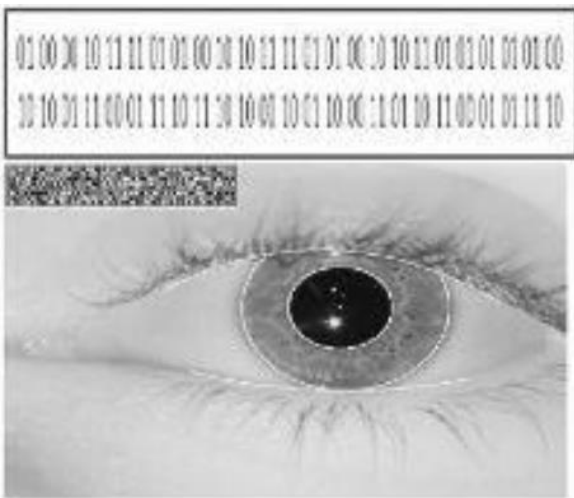


Figure 6: Extracting the codes from features

C. Matching Results For User Validation

The user who needs to do online payment will launch into their mobile phone embedded with iris recognition and they will send their scanned image to the bank for verification which will be scanned with the image in the bank data base. Once verified a notification about valid user will be sent to the user.

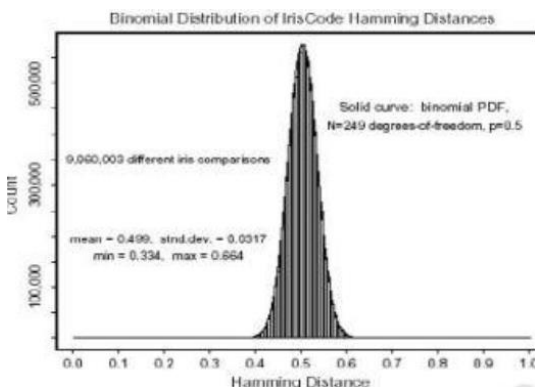


Figure 7 Matching of images through hamming distance

D. Implementing Visual Cryptography

The account credentials given by the user are encrypted by initially encrypting them by text steganography and further for visual cryptography where 'n' number of shares are made and they were shared with the bank.

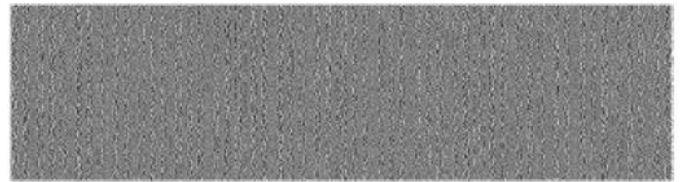


Figure 8(a): First share kept with the bank

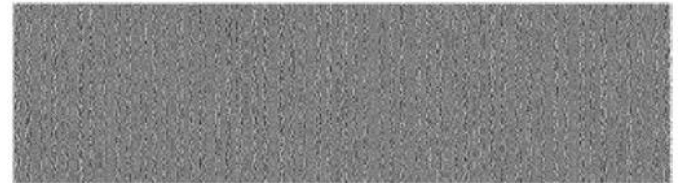


Figure 8(b): Second share kept with the customer

E. Verifying Shares

Once the share reaches the bank it is stored in data base. Then the share from the customer is verified with the share in the bank. Once the share gets verified then it gets redirected to the further transaction.

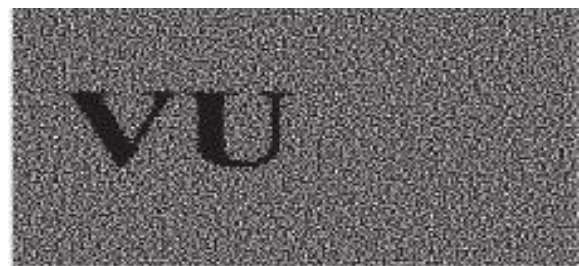


Figure 9: Decrypted image at the bank side

IRIS RECOGNITION AND VISUAL CRYPTOGRAPHY

In proposed method Iris Recognition is done by using Daugman algorithm[2][5]. Iris Sample is encoded into a 256 byte iris code. Then demodulating it with 2D Gabor wavelets. The generated iris code is unchangeable under translations and dilations. Iris images are matched by using the Hamming Distance (HD). For a project iris image the unwanted areas covered by eyelids, deep shadows, specular reflections are removed and the boundaries of pupil and iris are gathered by field optimization. Iris code which is to be matched is changed into 512 bytes[3].

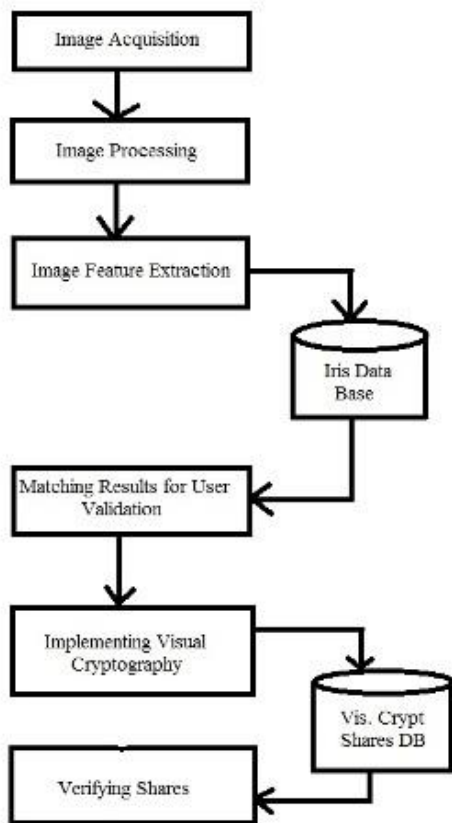


Figure 10 Steps in securing online payment

Normally the hamming distance for images to be matched is 0.342. Daugman algorithm has the potential for comparing 14 billion iris samples in just a time span of less than 2 seconds. Also the Daugman algorithm has an accuracy level of more than 99.90%.

Table 1. Performance of algorithms

Algorithm [Reference]	FAR/FRR	Overall % Accuracy
Avila [5]	0.03/ 2.08	97.89
Li Ma [9]	0.02/ 1.98	98.00
Tisse [13]	1.84/ 8.79	89.37
Daugman [15]	0.01/ 0.09	99.90

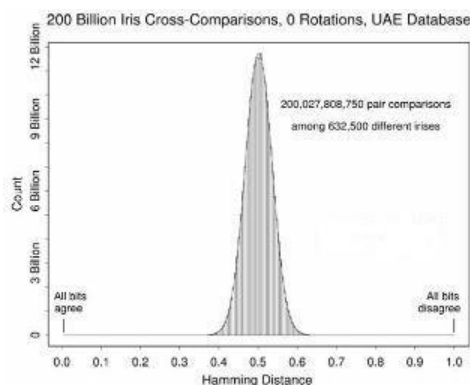


Figure 11 Exhaustive comparison using daugman algorithm

Daugman algorithm excludes the upper and lower portions of eyelids this helps the algorithm to work even faster. Integro-Differential operators are then used to detect the centre and diameter of the iris then the pupil is also detected using the differential operators.

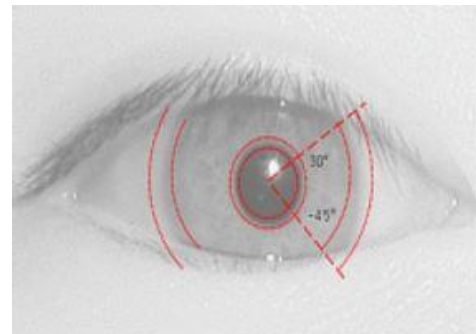


Figure 12 : Iris and Pupil Detection

The next algorithm utilized in this proposed system is Visual Cryptography (VC). It is a cryptographic technique in which data to be secured is mapped into the image and they were converted into 'n' number of shares. All these individual shares are meaningless which will never reveal any data. When any one of the image share is stolen it can never be utilized in any of the ways. Only when all the shared images are collected they can be decrypted and produces the original image. As the name suggests visual cryptography is linked to human visual system[7]. To decrypt the shared images all the shared images are stacked together and it reveals the secret image.



Figure 13 Original image

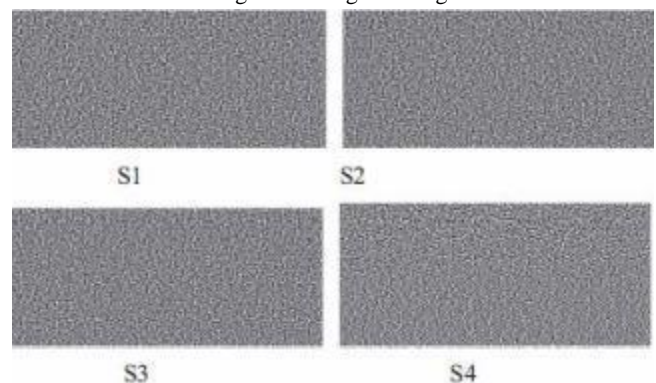


Figure 14 Creating four share S1, S2, S3, S4

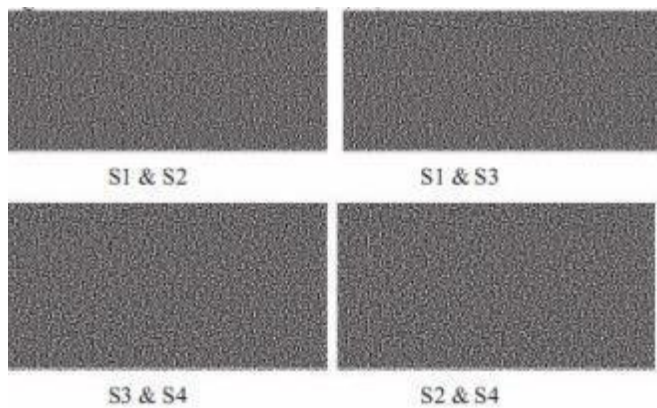


Figure 15 Stacking of two shares never reveal original information

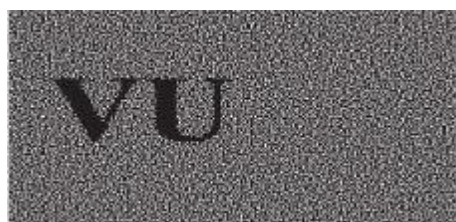


Figure 16 Stacking of all four shares reveal the original information

The above diagram shows how the visual cryptography works and the method of working only if all the shares are stacked together. So, the shares of the customer and the bank are verified and only then the payment page gets redirected and the payment gets completed.

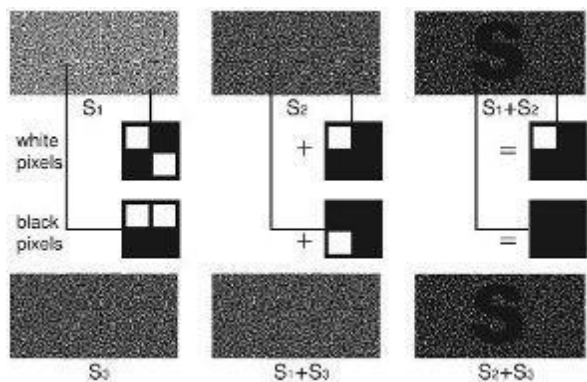


Figure 17 Sharing of images

III. RESULTS AND DISCUSSION

PROPOSED PAYMENT METHOD

The proposed method is more suitable for implementing in mobile phones. As the upcoming mobile phones are embedded with an iris recognizing biometric systems, with which the user can secure the online payment by this proposed method. When a user needs to perform an online payment then the user needs to log in by using the concerned person's iris scan. The inbuilt iris recognizer captures the current user iris image and preprocesses the

image then transfers the processed image to concerned bank. Bank database already contains the iris image of every registered user. The iris sample of the current user is matched with the whole bank database and if a match is found then the bank notifies the user and the user is redirected to the payment page.



Figure 18 Mobile Phone with Iris Scanner

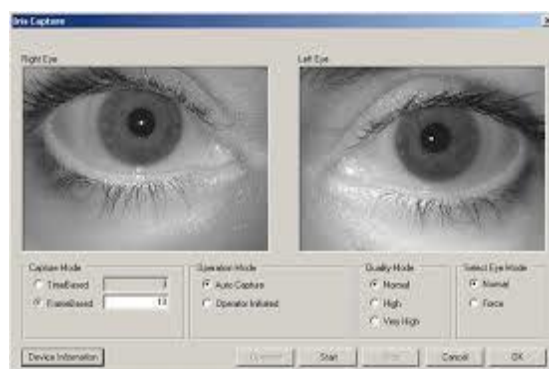


Figure 19 Scanned left and right images

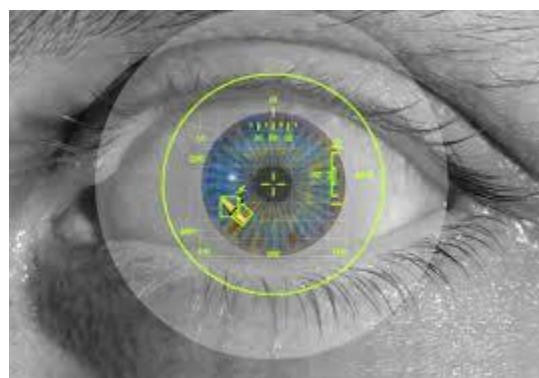


Figure 20 Iris image with pupil and iris boundary fixed

Once the iris recognition gets succeeded then the user is redirected to the payment page where the user needs to provide their account credentials and all those details will be converted into ASCII values and then to their corresponding binary values which will be of 8 bits and those will be split into two 4 bits. For all those 4 bits corresponding English alphabet will be chosen from the Vedic numeral table [6].

Table 2 : Vedic number assignments

Letter	Number assigned	Letter	Number assigned
E	15	M	7
A	14	H	7
R	13	G	6
I	13	B	5
O	12	F	4
T	11	Y	4
N	11	W	3
S	10	K	3
L	10	V	3
C	9	X	2
U	8	Z	2
D	8	J	1
P	7	Q	0

Once the corresponding alphabet is chosen then those modified string will be sent for visual cryptography where the image shares are produced and then shared with bank and the sender. For the payment to complete the sender will be sharing his corresponding share with the bank and once the bank verifies the shares the payment gets completed.

IV. CONCLUSION

The proposed payment system combines the Iris recognition with the visual cryptography by which customer data privacy can be obtained and prevents theft through phishing attack [8]. This method provides best for legitimate user identification. This method can also be implemented in computers using external iris recognition devices.

False Match Rate vs Criterion (200 Billion Cross-Comparisons)

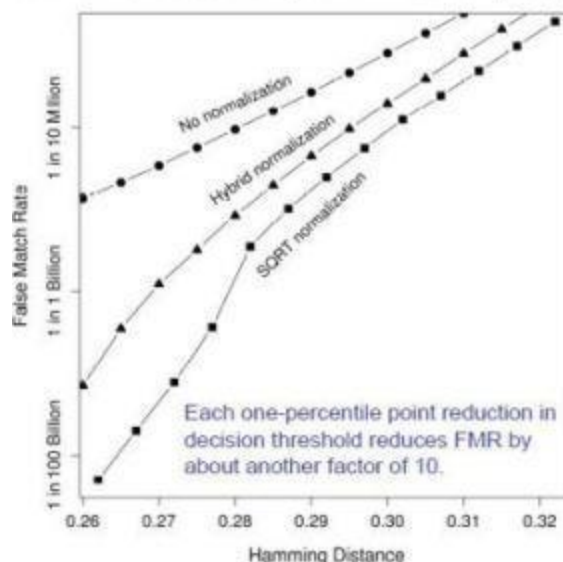


Figure 21 : SQRT normalization

By using SQRT Normalization method we can achieve false match to a minimum of 1 in 100 billion.

V. REFERENCES

- [1] Ms. Swati S Bobde¹, Prof. D. N. Satange, "Biometrics in Secure e-Transaction" in International Journal of Emerging Trends & Technology in Computer Science, April-2013
- [2] Prateek Verma, Maheedhar Dubey, Praveen Verma, "Daugmans algorithm for iris recognition a biometric approach" in International Journal of Emerging Technology and Advanced Engineering, June 2012
- [3] R. P. Ramkumar, Dr. S. Arumugam, "A Novel Iris Recognition Algorithm" in Third International Conference on Computing, Communication and Networking Technologies, IEEE 2012
- [4] Argles, D, A. Pease, R. Walters, "An Improved Approach to Secure Authentication and Signing," Advanced Information Networking and Applications Workshops, AINAW '07, 2007.
- [5] J. Daugman. How iris recognition works. Proceedings of 2002 International Conference on Image Processing, Vol. 1, 2002.
- [6] Souvik Roy, P.Venkateswaran, "Online Payment System using Steganography and Visual Cryptography" in IEEE Students' Conference on Electrical, Electronics and Computer Science, 2014
- [7] Xuehu Yan, Shen Wang and Xiamu Niu "Equivalence proof of two (2, n) progressive visual secret sharing" in Tenth International Conference on Intelligent Information Hiding and Multimedia Signal Processing, 2014
- [8] Biswapati Jana, Madhumita Mallick, Partha Chowdhuri, Shyamal Kumar Mondal "Cheating Prevention in Visual Cryptography using Steganographic Scheme" in International Conference on Issues and Challenges in Intelligent Computing Technique, IEEE 2014