Physical Multi-Layered Authentication In Wireless Network Based on Multiple Correlated Attributes

Thanish Sivakumar M[1], Dr. Sundar[2]
[1]Dept of Computer Science and Engineering
[2]Associate professor, Dept of Computer Science and Engineering
[1, 2] Christian College of Engineering and Technology, oddanchatram, Dindigul, Tamilnadu-624619, India.

Abstract- *In this proposed plan, we showing a novel security primordial utilizing on firm AI hurts click spell, It might nothing just attempts equivalent to advance together and make it to resistance just as utilizing of riddle. The points it might to build up the security of riddle IMAGE. image pixel, OTP Stab to do these distinctive objectives to achieve security Login. This may use-to builds up the login of breezing through the test esteems; to bear the cost of a lexicon work for abusers to learn with reference to the significance. In the expansion, the client can be put on the highest point of Image pixel Selection. Security-Image confuses settling utilizing AES calculation and OTP Generation. Security primordial depends on firm AI hurts. A principal client and security is to make Image pixel Selection. Utilizing Image and check utilizing Bitmap design, confirmation utilizing pixels as proselyte into coordinate values.*

Keywords- OTP generation, AES calculation, image pixel login, graphical passwords, image selection

I. INTRODUCTION

With computer security an increasing concern in many areas, researchers are working on a new approach to an old technology: the password. Researchers are developing various graphical alternatives to the traditional text password Passwords are the most broad way of verify client, Creation of cryptographic natives makes the graphical passwords undetectable to aggressors and programmers. Cryptographic natives depend on hard AI issues for check suppliers that push toward from a little zone. A little secret phrase area empowers enemy to test to login to accounts by attempting "word reference assault". Therefore, the word reference assault catches client records and picture astound, where the assault breaks the records of merchants with great notorieties so as to lead false sell-offs

Alludes to the Graphical secret word is a learning based validation component where the client enters a common mystery as proof of the client's personality The client is required to recall a picture as secret word rather than a word with characters and numbers, for example, managing an account subtleties, charge card data. The individual data is then used to get to the person's record and can result in wholesale fraud and monetary misfortune. Other than Internet phishing, there is telephone phishing additionally, where a message on the phone received from a fake bank officer or other official sounding individual will ask you to dial a number and type the pin codes and account number of your account to verify the bank account. unsuspicious victims who call the fake number and provide all the necessary information will soon find out that some money is missing from their accounts A few riddles be founded on network numerical issues. By new worldview, underexplored. By enduring this paper, we showing an, Image explaining security that is, a relations of graphical Image frameworks caught by Pixel, OTP login, that we call Puzzle as Tolerance passwords . is Image Puzzle and a graphical secret phrase plot. Graphical creating picture secret phrase utilizing as impacts of secret word to verify the resilience secret key by giving riddle login security of picture choice security-Image astound tackling utilizing AES calculation and OTP age of major accreditation, starting listen in to improving on the web security. The secret word administrator stores the content passwords for the sites facilitating client accounts and sends the passwords to the client when they are required.

II. RELATED WORK

The most striking crude concocted is Image, which recognizes human clients from PCs by showing a test, i.e., a pixel confound, past the capacity of PCs however simple for people.

Picture is presently a standard Internet security method to shield online email and different administrations from being mishandled by bots. This current worldview has made only a restricted progress as contrasted and the cryptographic natives dependent on hard math issues and their wide applications. An extensive number of graphical secret word plans have been proposed.. They can be more tasteful into three classes as per the undertaking engaged with remembering and entering passwords: acknowledgment, review, and prompted review.

Among the three kinds, acknowledgment is considered the most effortless for human memory though unadulterated review is the hardest . Acknowledgment is ordinarily the weakest in opposing speculating assaults. Many proposed acknowledgment based plans basically have a secret phrase space in the scope of 213 to 216 passwords. An examination detailed that a huge segment of passwords of DAS and Pass-Go were effectively broken with speculating assaults utilizing word references of 231 to 241 sections Image depends on the hole of abilities among people and bots in taking care of certain hard AI issues There are two types of visuals: text and Image-Recognition (IR). image can be circumvented through relay attacks whereby Image challenges are relayed to human solvers, whose answers are fed back to the targeted application.

It was introduced in to use both Image and password in a user authentication protocol, which we call Image-based Password Authentication protocol, to counter online dictionary attack As the one-time password is no law at all, so its confidentiality and reliability is greatly increased. At present, the one-time password authentication scheme is wide, but mostly there are some problems. Literature common problem is that server should assign each user and maintaining a set of symmetric keys, adding to the burden on the server. Meanwhile, literature has authentication sequence number, you need to initialize the system on a regular basis and there are a lot Hash operations From the above analysis, there are some problems in the existing schemes such as need to initialize the system on a regular basis, large computation, the authentication process is complex and security risks. In order to overcome the shortcomings of the above schemes, improve the security of the scheme, reduce the burden on the server, making the authentication process more simple and effective, this paper proposed a new one-time password authentication scheme based on SHA1 algorithm .

III. PROPOSED WORK

In this system we have overcame the disadvantages by providing a multilevel security namely as password, OTP, personal authentications, graphical password. Here we focused on generating a OTP as a result of inputting a valid image pixel to login or to access the system , whereas the inputting image pixel value is volatile for every access. Even the password that can be hacked the other level of security ensures high level security, which seems to be more protective to the users .This project proposes one way of providing security to user in combination with OTP and image pixel processing. Also only the particular number input chances are only provided which stops the intruders at a certain level to attack We using the username & password. To image both image and Puzzle solving and a graphical password scheme uses OTP & random generation OTP.

As in fig.1 , The first step involves the registration process by the user where he is required to complete the text scheme and image-recognition scheme to create the password. The user selects the password schemes and progresses towards supplying information for password generation. A Password Guessing Resistant Protocol (PGRP) was a proposal from the authors to restrict brute force attacks, online password guessing attacks, and online dictionary attacks. Such restriction can be done by limiting.

ENCRYPTION CODE ALGORITHM:

1. start
2. Cipher cipher = Cipher. GetInstance (“AES/ECB/PKCS5Padding”);
3. SecretKeySpec secret Key = new SecretKeySpec(key, “AES”);
4. cipher.init(Cipher.ENCRYPT_MODE, secretKey);
5. String encrypted String = Base64.encodeBase64String(cipher.doFinal(strToEncrypt.getBytes()));
6. return encrypted String;
7. stop

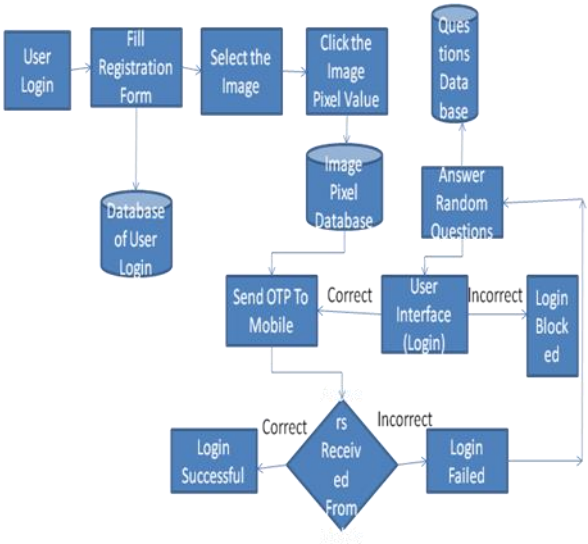


Fig.1 System Architectural Diagram

As shown in fig.2 After a user registers with the OTP provider, she may want to use her OTP with any service provider that have service level agreement with the OTP provider. Enabling the OTP usage in a service provider requires some attention as the user’s privacy may be violated

or her access to the service provider can be blocked by another user. Therefore, service provider activation requires all of the parties actively join the protocol. This is required for fairness of the protocol. The service provider activation requires three parties at once It is initiated by the user. User sends her OIDl i, respective username (Nk,j i) for the service provider Sk to the OTP provider. Before storing Nk,j i and OIDl i pairing to a table, OTP provider requires the user to prove that she can generate valid OTPs.This is required to not to pair invalid users to a service. Pairing invalid users may easily turn out to be an effective DoS attack when the OID of a user is known.We using the username & password. To image pixel scheme uses pin & random generation OTP.

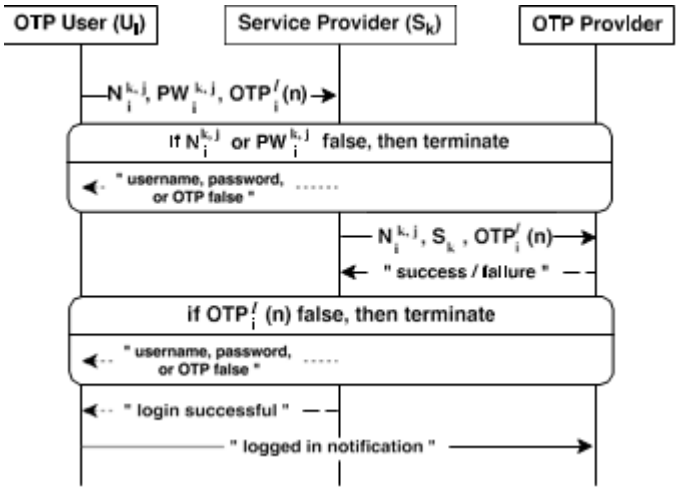


Fig. 2 Message flow for authentication to a service provider, first, Ui sends username, password, and newly generated OTP to the SK , then , SK forwards username and OTP to the OTP provider. If OTP provider confirms $OTP_i(n)$, then U_i sends a notification to the provider.

Alice is the legitimate transmitter, which sends a message to the intended receiver Bob, while *K* spoofing attackers (Eve_1, ... , Eve_K) intend to masquerade as Alice and send spoofing signals during other communication time slots. The main object of this paper is to authenticate the uplink signals.

In this paper, we proposed a general multi-attribute based authentication model, where the attributes used for authentica- tion include both the channel-based attributes and the device- imperfection-based attributes. Specifically, the channel-based attributes should be selected as many as possible in static scenar- ios due to their strong recognition for users, such as CSI, RSS, and AoA. The device-imperfection-based attributes are stable in time-varying channels, such as CFO and IQI, which are preferred in dynamic situations. Similar to [25], the identifying signature of the received signal at time *t* is constructed by *m* PHY-layer attributes, modeled by a multi-dimension random variable as

$$\boldsymbol{A_t} = [a_{t1}, a_{t2}, \ldots a_{tm}]^T, \qquad (1)$$

where a_{tj} is the *j*-th attribute. According to [37], [38], the mean vector $\boldsymbol{\mu}$ and the covariance matrix $\boldsymbol{\Sigma}$ of identifying signature are different between users located in different positions and equipped with different devices.

The clustering stage is summarized as Algorithm 1. Since the initial cluster centers are searched according to the heuristic algorithm, the iteration number of this clustering stage will be decreased effectively. Meanwhile, the cluster stage stops after the cluster centers no longer change instead of enumerating all samples. Thus, the clustering result is a suboptimal solution

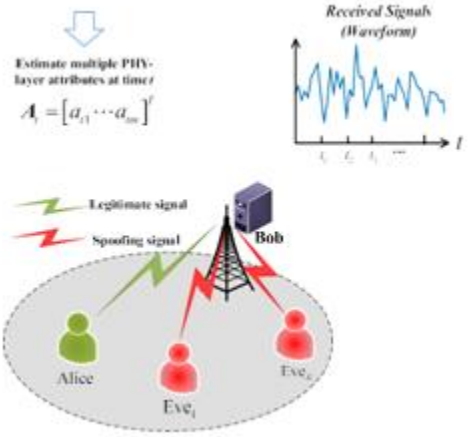


Fig. 1. Multi-attribute authentication scheme.

DECRYPTION CODE ALGORITHM:

1. start
2. Cipher cipher = Cipher.getInstance("AES/ECB/PKCS5PADDING");
3. SecretKeySpec secret Key = new SecretKeySpec(key, "AES");
4. cipher.init(Cipher.DECRYPT_MODE, secretKey);
5. String decryptedString = new String(cipher.doFinal(Base64.decodeBase64(strToDecrypt)));
6. return decryptedString;
7. stop

a. ARCHITECTURAL MODULES DESCRIPTION

In this architectural modules listing by the client. As in Fig.3 While registering into the website the user enters

his/her security key which gets stored into the respective bank server permanently. Using visual cryptography this security key is changed to image format .The user is required to load the pin number that he/she has received during the first registration. When the user loads the pin number, the server checks whether it matches with its previous one. If yes, the password field grants permission for transaction. Now the system will show random image which the user uploaded in the registration module. As fig.4 shows After verification, the system user is redirected to picture password. If the user clicked wrong pixel, the system redirected to login page. The system sends login fail Mail to user Registered mail-ID. The user has to give credentials again. Now the system will show random image which the user uploaded in the registration module. This module authorizes the user into the system. This adds security to the client's information. The login certifications are verified by encryption and they are decoded back by the server to abstain from listening stealthily. User give their credentials to authenticate, System get their credentials and check with the Database if exists. Otherwise proceed to registration module.

The product's x_b that are utilized for the task are net beans and sql Net beans are x_b utilized to x_b construct proficient OS-free work area applications and sql is utilized to refresh database, execute inquiries and oversee consents. Java is a general-guideline PC programming language that is synchronized, class-based, object-situated and only intended to have few execution conditions as likely .It is an abnormal state programming language ..The Java program is both complied and interpreted. With a compiler, you translate a Java program into an intermediate language called Java byte codes – the platform independent codes interpreted by the Java predictor. With an predictor, each and every Java byte code instruction is parsed and run on the PC.

The clustering process automatically divides identifying signatures into different cluster sets. The signatures in the same cluster can be regarded as the samples coming from the same user. In this case, the authentication of identifying signatures is

transformed into the authentication of clusters.

The principle of the clustering process is based on the similarity comparison between signatures. However, the introduction of the correlation analysis woul

d introduce exponentially growing computational complexity for the clustering algorithm. There- fore, the reconstruction of attributes is proposed to simplify the clustering process.

A. Decision Process

The cluster center O_k reflects the statistical characteristic of identifying signatures for a particular user, which is a stable observation for users.

A. Clustering Stage

The clustering stage is to find the optimal cluster set under a pre-defined cluster number by iterating the cluster center. However, the random selection of identifying signatures as initial centers may bring large iterations.

A. Segmentation Stage

The segmentation stage is to determine whether current clusters are further separable based on the two-cluster model. According to [45], the essence of the two-cluster model is that if the two closest clusters of all potential cluster pairs are separable, then the rest of the cluster pairs are separable.

In the two-cluster model, three distance measures are defined for describing the sparsity of clusters. Firstly, the border distance is defined as the average minimum

Secondly, the average element distance is defined as the average minimum walk distance among the elements of one region to measure the sparsity of the region. For example, the region x_b contains the elements $A\tilde{}i$ ($i = 1 \ldots N_x$), where the two farthest elements are assumed to be A_1 and AN . The calculation of minimal walk distance can be described as follows. Start

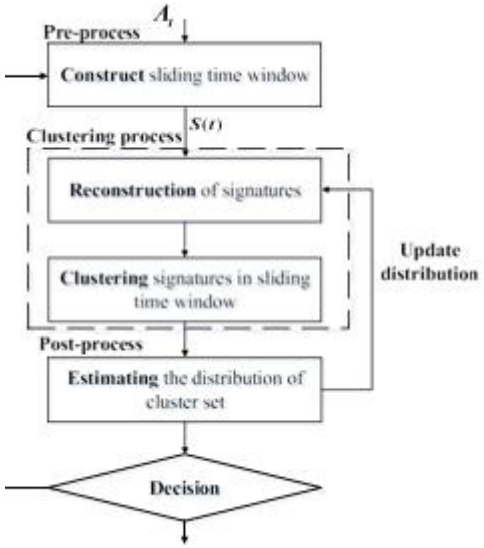


Fig. 2. Architecture of the authentication scheme.

IMPROVED SYSTEM EVOLUTION ALGORITHM

In this section, based on the evolution (SE) algorithm pro- posed in [45], the improved system evolution (ISE) algorithm is proposed for clustering the identifying signatures. The ISE algorithm is a hierarchical clustering algorithm,

including the clustering stage and the segmentation stage. The clustering stage is used to obtain K optimal cluster set. Moreover, the segmenta- tion stage is performed to determine whether the current cluster set is the optimal clustering results. The ISE algorithm introduces the heuristic algorithm to search the suboptimal cluster center locally instead of searching the cluster center globally in the SE algorithm. With a small loss of clustering accuracy, the iteration of the ISE algorithm is signifi- cantly reduced compared with the SE algorithm. Therefore, the ISE algorithm is more suitable for the authentication scenarios that are more complex sensitive. Meanwhile, the ISE algorithm retains the advantage of the SE algorithm, which can accurately cluster under a small number of samples.

The segmentation stage is to determine whether current clus- ters are further separable based on the two-cluster model. Ac- cording to [45], the essence of the two-cluster model is that if the two closest clusters of all potential cluster pairs are separable, then the rest of the cluster pairs are separable.

As shown in Fig. 3, the two-cluster model can be divided into three parts. The border region $\boldsymbol{x_b}$ is the set of N_x samples chosen from cluster x that is closer to cluster $\boldsymbol{y}$ than any other samples. The central region $\boldsymbol{x_c}$ is the set of N_x samples in cluster $\boldsymbol{x}$ excluding $\boldsymbol{x_b}$, whose elements are closer to the $\boldsymbol{x_b}$ than other samples. Specifically, the cluster $\boldsymbol{x}$ that contains n_x samples$\sqrt{nx}$2rounding. The number of samples in the border region and the central region is defined as $N_x = {}^{n}\underline{x}$. The overlapping region $\boldsymbol{F}$ is defined as the cross part of clusters $\boldsymbol{x}$ and $\boldsymbol{y}$ that contains half of the samples in $\boldsymbol{x_b}$ and $\boldsymbol{y_b}$.

Algorithm 1: The Clustering Process.

Input: K, $S(t)$, $v = [v_1, v_2, \ldots, v_n]$
Output: $C = \{C_1, \cdots C_K\}$, $O = \{O_1, \cdots o_K\}$
1 Seek out initial centers with the first K smallest v_i.
Assign samples to their nearest centers that constitute the original cluster set C.
do
4 Calculate cost function J as formula (20).
5 **for** $k = 1$ *to* $k = K$ **do**
Calculate the cost function of each cluster as
$$f_k = \sum_{i=1}^{n_k} d(\tilde{A}_i^k, O_k).$$
7 Update the new cluster center O_k by minimizing cost function f_k.
8 **end**
Assign all the other samples to their nearest center to constitute the new cluster set C'.
Calculate the sum of distance form all samples to their new centers that can be expressed as J'.
11 Update the cluster set C by C'.
12 **while** $J' \neq J$;

SIMULATIONS

can be divided into P = parts, where $\langle\cdot\rangle$ denotes the In this section, the performance of the proposed PHY-layer authentication scheme is simulated by the statistical test with the synthetic and real data sets. The computer configurations are Intel(R) Core(TM) i7-4790 U CPU, 3.6 GHz basic frequency, 12 GB of DDR3-1600 RAM, and the simulation platform is MATLAB R2017b.

A. Simulations With the Synthetic Data Set

The synthetic data set is generated on a simulation platform of the single input multi output (SIMO) orthogonal frequency divi- sion multiplexing (OFDM) system. The transmitter and receiver are equipped with single transmit antennas and R receive anten- nas, respectively. A data frame consists of B OFDM blocks with L subcarriers each.

According to [48], [49], the transmitting signal of SIMO- OFDM is modeled as

$$\boldsymbol{X} = [\boldsymbol{x_1}, \ldots, \boldsymbol{x_L}]^T \in \mathrm{C}^{L \times B}, \quad (43)$$

where $\boldsymbol{x_l} = [x_l(1), \ldots, x_l(B)]$ ($l = 1, \ldots, L$) denotes the trans- mitting signal on the l-th subcarrier, and $x_l(b)$ ($b = 1, \ldots, B$) is the complex symbol on the b-th block as

$$x_l(b) = \varepsilon_l(b) e^{j2\pi f l}, \quad (44)$$

where $\varepsilon_l(b)$ is a symbol which satisfies $\sum^{L} \varepsilon_l^2(b) = 1$, and f_l is the carrier frequency of l-th subcarrier.

The received signal of r-th receive antenna in the frequency domain is given by

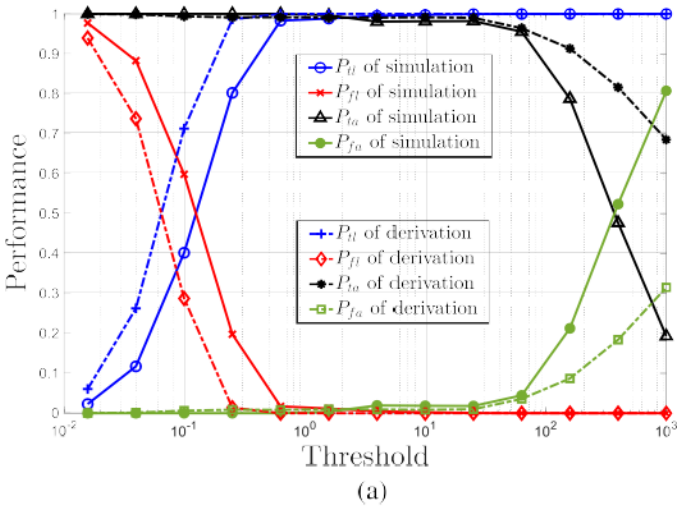
$$\boldsymbol{Y_r} = \boldsymbol{H_r} \cdot \boldsymbol{X} + \boldsymbol{W} \in \mathrm{C}^{L\times B}, \quad (45)$$

where $\boldsymbol{H_r} = diag\{\boldsymbol{h_r}\} \in \mathrm{C}^{L\times L}$ is the channel response matrix. $\boldsymbol{h_r} = [h_{r1},..., h_{rL}]^T$ denotes the complex channel vector with $h_{rl} = \rho_0 dr^{-\gamma} \zeta a_r$, where $\rho_0 = -$ 60 dB denotes the channel power gain at the reference distance, d_r indicates the distance of transmit antenna and r-th receive antenna, $\gamma = 4$ is the path-loss exponent, ζ represents the exponentially distributed random variable with unit mean accounting for small-scale Rayleigh fading, $a_r = e^{-j2\pi r \sin\theta}$ denotes the antenna array steering fac- tor, and θ denotes the angle of arrival. $\boldsymbol{W} = [\boldsymbol{w_1},..., \boldsymbol{w_L}]^T \in \mathrm{C}^{L\times B}$ is the additive complex Gaussian noise matrix with $\boldsymbol{w_l} \sim CN(0, \sigma^2 \boldsymbol{I})$, where $\sigma^2 =$ 111 dBm denotes the noise power.

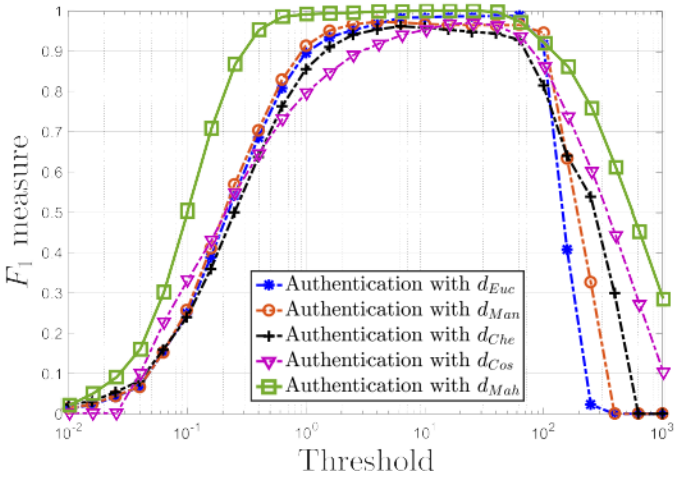
The synthetic data set is generated on a simulation platform of the single input multi output (SIMO) orthogonal frequency divi- sion multiplexing (OFDM) system

The samples of legitimate user randomly distribute in a continued time slot, among which the spoofing samples are interpolated randomly. The legitimate transmitter and spoofing transmitters are assumed to be located at different locations and equipped with different devices, where the identifying signatures of different users present different distributions. Specially, we use $\boldsymbol{\mu_l}$ and $\boldsymbol{\mu_s}$ to represent the mean vector of the identifying signatures for the legitimate user and spoofing user, respectively, and n_l and n_s to denote the number of legitimate samples and spoofing samples.

the performance of the proposed authentica- tion scheme versus the selection of threshold τ . As can be seen from Fig. 4(a), the correct authentication rate P_{tl} increases until it converges to 1 with the increase of τ , whereas the correct detection rate P_{ta} has the opposite trend. Besides, the derivation performance shows the same trend with the simulation, but not wholly consistent. Because the derivation values are calculated based on ideal clustering results, the clustering errors are ignored, thus showing better performance. Fig. 4(b) uses the F_1 measure to reveal the overall authentication performance. It can be seen that F_1 increases until convergence as τ increases, but degrades as τ further increases. Therefore, the threshold τ should be selected in the range of convergence region of F_1. From another perspective, the width of the convergence region of F_1 reflects the difference between the legitimate samples and spoofing samples. The wider convergence region indicates the stronger robustness of the authentication scheme, i.e., the more remarkable ability to mitigate the impact of the time-varying channel and estimated error. Fig. 4(b) also compares the perfor- mance of the proposed authentication scheme with the similarity metrics d_{Euc}, d_{Man}, d_{Che}, d_{Cos}, and d_{Mah}, defined by formula to (9).



(a)



PERFORMANCE ANALYSIS

In this section, we present the mathematical analysis of the performance of the proposed authentication scheme. The per- formance metrics are defined in Section V-A. In Section V-B, the impact of the ISE algorithm on authentication performance

A. *Performance Metrics*

As shown in Table I, true legitimate (TL), false attack (FA), true attack (TA), and false legitimate (FL) are defined to represent the authentication result. Explicitly, TL indicates that

A. *The Impact of ISE Algorithm on Authentication*

The essence of the proposed authentication scheme is to authenticate the cluster set, where the signals in one cluster are authenticated as the same identity. The clustering accuracy di-

rectly affects the performance of authentication. In this section, the cluster set precision and cluster quantity precision are used to measure the performance of the ISE algorithm.

The cluster set precision reflects the degree to which the identifying signatures are clustered correctly. The cluster is considered as a regular cluster if all samples come from only one user

The cluster quantity precision indicates the probability that the quantity of users is correctly estimated. The correct estimation is the situation that the quantity of clusters is equal to the number of users, while other situations are defined as the false estimation. Hence, the cluster quantity precision is defined as the proportion of the number of correct estimation times (n_c) and the total number of clustering experiments (n_t) in multiple repeated clustering processes, which can be expressed as

$P = \underline{nc}$, (33)

n *nt*

where P_n [0, 1], and the higher P_s indicates the higher precision of clusters quantity.

Algorithm 2: The ISE Clustering Algorithm.

Input: $S(t)$
Output: K, C
for $K = 1$ **do**
  Put K and $S(t)$ into Algorithm 1 and return the cluster results C;
  Calculate the Partition Energy $E_p(K+1)$, $E_p(K+2)$ and the Merging Energy $E_m(K+1)$, $E_m(K+2)$ for twin-clusters according to (25) and (26);
  if $E_p(K+1) \leq E_m(K+1)$ *and* $E_p(K+2) \leq E_m(K+2)$ **then**
    Return the optimal cluster quantity K and cluster results C;
  else
    $K = K+1$;
  end
end

IV. RESULT AND DISCUSSION

This application starts with the login page and then to image panel slide to select the image pixel, as in fig.5 then successfully runs through the OTP generation page where it followed by the transaction page as displayed in the screenshots.

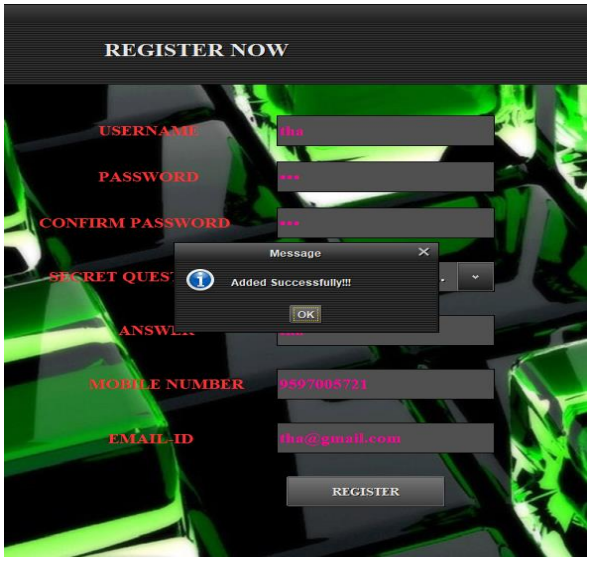


Fig. 3 User registration page.

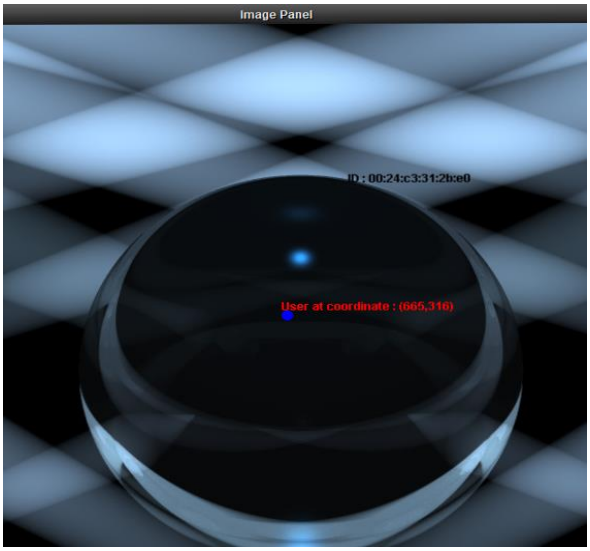


Fig. 4 Image pixel input page.

Fig. 5 OTP generation page.

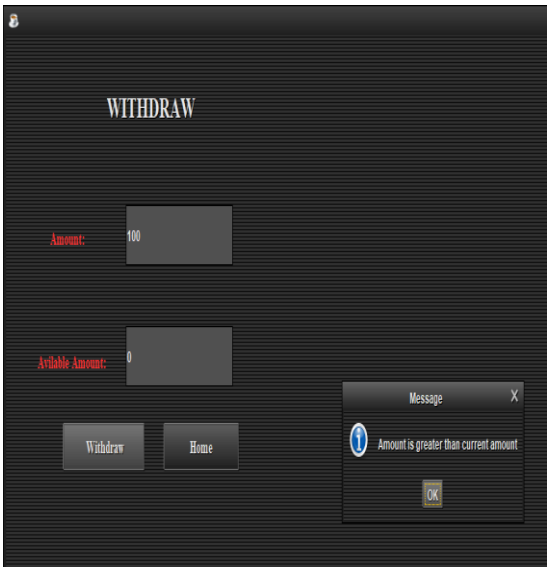


Fig. 6 Final transaction page

V. CONCLUSION

This paper proves the Picture passwords are an alternative to textual alpha numeric passwords .It satisfies both conflicting requirements i.e., it is easy to remember pin and it is hard to guess image pixels .By the solution of the OTP with image pixels it becomes more secure. By implementing encryption techniques and Hash function for storing and retrieving pictures and pixels, one can achieve more security. Future work can be of reducing the gross login and transaction time by providing the same level security.

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