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Performance Evaluation of Image Based Authentication using Illusion-Pin for Shoulder Surfing Attack

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Abstract — Shoulder surfing attack is happened in many places all over the world. To avoid the shoulder surfing attack Image Based Authentication Using Illusion-Pin (IBAUIP) method has been proposed. In this pin entry system using hybrid images of the two blended keypads in single digit. Every authentication the keypad is shuffled. The pin numbers are arranged in different order. The hackers cannot recognize or recall the user pin number and the IBAUIP model provides more security for authentication. In this IBAUIP model is used to perform the efficiency with human perception as parameter. The measures of this parameter performed with the existing method.

Keywords—Authentication, Human Perception, Image, Illusion-pin, Shoulder surf.

I. INTRODUCTION

Shoulder surf is the big threat happen every where for this digital world. People are engaged in this digital world. They were connect everywhere at any time. So the need of people satisfies with the help of digital economy. The shoulder surf happening in most crowded places include bus stand, railway Station and subway. The crowded places attack can be easily done with the help of hidden camera. The hacker gathers the user's personal information or financial data without their knowledge. Example-Someone unlocking their mobile phone this is facilitate to gather the user's details without their attention. The Shoulder surf attack is occurred in touch screen devices. The proposed IBAUIP model is mainly used in touch screen devices as Bank ATM, Kiosk, Smartphones, etc to prevent shoulder surfing attack.

II. RELATED WORKS

Research in any field requires the literature review is a Written document that Knows about the topic of study. It provides the outline of the research work. So that readers can easily understand the research background. Ankit Maheshwari et al.[1] states that PIN based security and introduce the concept SPOSS-Secure Pin-based-Authentication Obviating Shoulder surfing. To restrict human attack and record based attack. The recorded devices include microphone, camera, etc. These devices able to capture the entire login process of user's pin entry. So that the shoulder surfing is easily made. The author can analysis the evaluation measures with two parameters Usability and Security can be equally balanced. Priyanka N Karale et al. [2] proposed the PassMatrix is a graphical based authentication offers no hint for hacker to perform shoulder surf. The passmatrix has two phases registration phase and Authentication phase. The image can be set as password in grid of images. Every authentication the images can be randomly arranged. The drawback is alignment of grid images should be correct then only the user able to login the passmatrix.

Monali pawar et al. [3] refers the graphical based password of cued click point (ccp). The cued click point is user has to select one point per image among the number of images then the next click point is based on the previous selected point. In registration phase user is able to select the cued images. In Login phase has the text login user enter the alphanumeric as password later graphical login has cued click point of images selected by the user as match as registration phase. The drawback is user memory has to select the cued images. Toan Van

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Nguyen et al. [4] presents the draw a pin using fingers on touch screen devices. The user drawn pin number can be verified and then device able to recognize the user distance to draw a pin with finger using pattern matching algorithm. The viewing distance is less than the threshold value the user is permitted to access. The drawback is hacker able to capture the biometric of user. Bagade Om et al. [5] offer the color pass of the pin entry mechanism. The hacker can't able to identify the pin number. Instead of pin number user has to chosen four colors. The users enter his account number in database then generate the challenge pin numbers in colorpass. The pin has predefined color for each number.

The color code of pin number is selected by the user in the login phase. At the time of authentication user chosen color can be verified with the respected pin number. If the match is found the user is able to process the system otherwise the user can't able to perform anything in the system. The evaluation measure with two parameters are login time and user friendliness. The drawback is security attack as password guess attack. Priyanka Nimbalkar et al. [6] states the pass-matrix consist of n number of images. In registration phase user has select one image by simply touching or clicking. The design of both horizontal and vertical bars used to cover the entire pass image. To evaluate the measures with two parameters are memorability and usability. The drawback is longer login time. Nagamani k et al. [7] implement the text based graphical scheme represents the circle is divided into eight equally sector. The color of eight sectors is different. The circle consist of seventy two characters are arranged randomly. The characters can be moved from one sector to another sector by rotating the circle either clockwise or anticlockwise direction. Atlast to confirm the password is valid or not. After the validation is success then another OTP is generated. The drawback of this method is moving the set of characters from one sector to another sector is difficult.

III. PROPOSED METHOD

The proposed IBAUIP model specially designed to resist the shoulder surf attack in touch screen devices. The design of Illusion pin (I-PIN) offers the blended of two keypads in single digit and these digit arranged in different order. The user is close to the screen able to see one keypad to enter the user four digit pin and the hacker able to see another keypad resist the shoulder surf attack. The keypad is randomly generated in every authentication. The IBAUIP model uses the visibility algorithm. This algorithm provides the distance as filtering, visibility index and the threshold value. The figure 1 shows the IBAUIP architecture represents the flow of the proposed IBAUIP model. The visibility algorithm gives the illusion pin to resist the hacker.

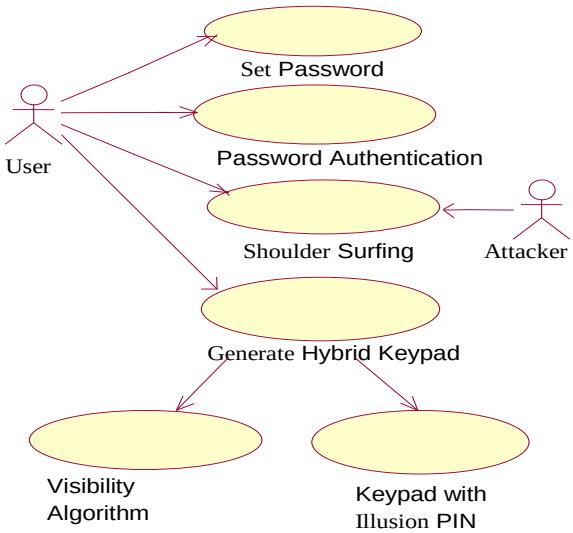

Figure 1: IBAUIP Architecture

The visibility algorithm has inputs a hybrid keypad I and a viewing position is N in 3Dimensional space. A binary prediction on the user's keypad of I is visible to an observer in the position N. This prediction is used to estimate the minimum safety distance.

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A. Distance-As-Filtering

The distance-as-filtering hypothesis simulate an image is perceived from a viewing distance by applying low pass filter. The user directly viewing an image and the hacker viewing an image for a distance is completely different. The perception of an image is based on the visual angle.

B. Visibility Index

The visibility index is mean value of 10 mean structural similarity index (MSSIM) value from the matching buttons. The user keypad is out of the human perception then the maximum index value is 1. The human perception is able to extract the structural information from the viewing distance. The MSSIM index is easier to calculate.

C. Threshold Value

The threshold value of the visibility index V of a particular hacker is able to recognize the digits of the victim's keypad. The visibility algorithm is used to calculate the visibility index V with the input value is I and N. Later compare the input values with V. The V value is greater than the input values then the user's keypad is not able to recognize by the hacker. Suppose the V value is less than the input values then user's keypad is recognized by the attacker.

IV. RESULT AND DISCUSSION

The authentication is the process of identification by both the user and the machine. The personal identification number (pin) usually used for secure transaction. The user pin transaction is implemented in ATM for secure transaction using illusion pin to resist the shoulder surf attack. In ATM transaction user has to register their details like account number, user name, user contact, etc. The Figure.2 shows the user profile information provided by the user in customer application form for banking.

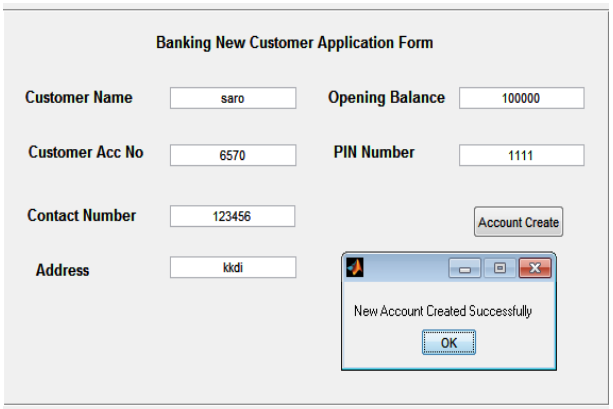

Figure 2: Customer Application Form

The user provides the valid information so that the pin number can be verified at the time of pin entry in ATM. The user information is incorrect when compare in authentication phase the transaction is not possible. The user information is correct then the functions can be accessible by the user.

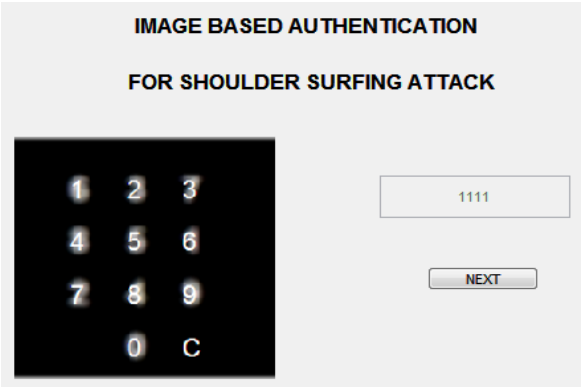

Figure 3: Illusion pin image based authentication

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A. IPIN Generation

I-pin is a pin based authentication for resist the shoulder surfing attack. The Figure.3 shows the illusion pin entry system provides more security to resist the shoulder surf attack.

The user close to the screen is able to know the I-pin and the observer cannot identify the pin.

B. Performance Measure

The Performance Measure of a developed algorithm is used to calculate the user's keypad is visible or not a viewing position. The Figure.4 shows the performance measure of the illusion pin and the drawn pin with the parameters of time, space and Human perception.

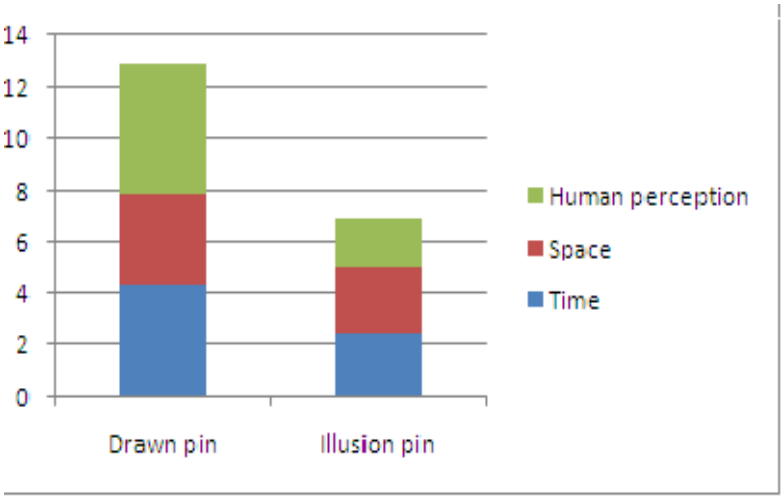

Figure 4: Performance measure of drawn pin and illusion pin

The role of human perception plays a vital role to provide security to the user's pin and resist the shoulder surf attack.

V. CONCLUSION

This model has been experimentally evaluated for performance benchmark. It provides more security to the user pin and it can't be known by anyone. This model can be used in various applications like the creation of illusion pin for android mobile which leads to improve the mobile security and automated systems.

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